GREAT BASIN NATURALIST MEMOIRS

# The Bark and Ambrosia Beetles of North and Central America (Coleoptera: Scolytidae), a Taxonomic Monograph

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Stephen L. Wood[1]

## PREFACE

The first insect I examined critically and collected for permanent preservation was *Trypodendron retusum* LeConte. At the age of 14 years I was introduced to it by T. O. Thatcher on 21 June 1939 at Lehman Creek Canyon, White Pine County, Nevada, near the base of Wheeler Peak. The attraction was immediate and permanent. An important factor in reinforcing that initial attraction was W. J. Chamberlin's (1939) *The Bark and Timber Beetles of North America*, which kept the interest alive and served initially as a guide to its expansion.

The human population explosion of this century applied increasing worldwide pressure on forests and agricultural resources to increase the efficiency with which their products are formed. Since bark and ambrosia beetles constitute an important destructive element that interferes with this production and with the esthetic values derived from our forests, increased knowledge of these insects should be of value to our society in dealing with them. Because of the enormity of the task, I selected one small facet, fundamental in nature, for my contribution.

The first and most fundamental step in the solution of a problem in biology is the accurate identification of the organism under investigation. Without it, all else is meaningless, because effective communication is not possible.

Among my first experiences in scolytid taxonomy was the discovery that numerous errors in identification had been made. They were made partly because of a faulty species concept possessed by early taxonomists and partly because of a consuming desire on the part of a few authors to indelibly engrave their names in the annals of science by naming species they presumed were new to science. More recently, we have learned that the behavior of a population in nature determines whether or not it is a species, not the taxonomist. Many of the early contributions must now be rejected as a result. Even so, those early contributions established the foundation on which we now build.

There has been a tremendous need for a comprehensive review of the Scolytidae of North and Central America to aid in the identification of species and to serve as a guide and reference work in the training and

[1]Life Science Museum and Department of Zoology, Brigham Young University, Provo, Utah 84602. Scolytidae contribution No. 72.

in the professional work of entomologists, foresters, and others directly or indirectly concerned with these insects. This volume treats a sufficiently high proportion of the fauna and is based on sufficient research involving primary types that it should serve as an important standard of reference for several decades to come.

With the exception of a few cited instances, all the work is original with me. However, in the early stages of preparation of the manuscript, well-intended colleagues knowingly published as new to science several species which I had in manuscript form in order to "make them available" to my study. As a means of self-preservation and to avoid an endless comedy of locating types, rewriting manuscript, etc., all species new to science and almost all new synonymy were published as discovered. Those descriptions were originally written for the present work and were modified only slightly to get them into print in the minimum possible time. To this extent this work partly duplicates published literature.

A working knowledge of the world fauna was indispensible to the present study. Thus far, 45 species introduced into North and Central America from foreign lands were found. Most of them had been named as native species and their true origins had not been suspected. As knowledge of the world fauna is increased, this number will expand. It will be most surprising if 10 to 20 additional introduced species are not now established and await detection.

The preparation of this work has been an educational experience far exceeding original expectations. It was conceived in 1952, although writing did not commence until 1967. It was scheduled for completion in 5 years; it took 12.

This work is dedicated to those who unselfish contributions to this aspect of my life made this study possible, most particularly to T. O. Thatcher, W. H. Anderson, J. M. Swaine, and W. J. Chamberlin; to my wife and children, who endured decades of hardship and sacrifice for it; and to those young enthusiasts who will find it useful, correct its weaknesses, and continue the work.

The National Science Foundation supported the project directly or indirectly through most of the period from 1959 to 1977. Appreciation is expressed to those officials and colleagues who made these grants possible.

Publication of this volume was sponsored by substantial grants from the Boise Cascade Corporation, the Weyerhaeuser Company Foundation, and the National Science Foundation. Their concern and foresight in the support of basic research in forest science is recognized and greatly appreciated—and in this instance especially needed. They are outstanding examples of the support and interaction that has and should exist between private enterprise and the scientific community.

Following the completion of this volume, Schedl (1979) published posthumously a catalog of the type material in his collection. Included were (1) several neotypes, which have no standing in nomenclature because they were not published in a revisory work, and (2) numerous lectotypes. Although many of the lectotype designations are valid, a high percentage of the species involved had previously selected lectotypes designated for them; complications pertaining to ownership of the material also cloud part of that action. Because the article did not become available until this volume was beyond recall, and because the work needed to unravel this unfortunate act was enormous, no attempt to deal with this problem was attempted here.

# INTRODUCTION

The dramatic increase in the human population during the present century has focused ever-increasing attention on forests and their products. This once unlimited natural resource no longer satisfies the demands placed upon it. These circumstances have led to an increased interest in forest protection and an awareness of the destructive capacity of forest insects. We have learned a great deal about the biology and ecology of many destructive forms and now know how to reduce or eliminate much of the loss. Although much has been accomplished, much more remains to be learned before a new ecological balance in a managed forest is achieved.

In the primeval forest an ever-shifting ecological balance existed between the natural reproduction and growth of trees and the depredations of insects, fire, floods, disease, and climatic factors. When great losses resulted from any one or a combination of these destructive agents, natural ecological succession gradually restored the balance. It wasn't particularly important that several hundred years might be required to restore the original forest.

A managed forest must satisfy a multiplicity of needs ranging from the most ethereal esthetic end of the spectrum to the economic realities of tree farming at the other end. Losses from insects, fire, and disease are regarded as avoidable and action may be taken to reduce or eliminate them.

Although insects superficially appear to be the least dramatic of the destructive agents in a forest, they actually kill more trees each year than the combined total of all other natural factors (R. F. Anderson 1960:203). Among the insects, one group consisting of the two families Scolytidae and Platypodidae, commonly known as bark and ambrosia beetles, stand alone in their destructive capacity. It has been estimated that, in the United States, 90 percent of all tree mortality is caused by insects and more than 60 percent of the total is caused by representatives of the Scolytidae (Anderson 1960:203). The Platypodidae, almost entirely tropical in distribution, equal or replace the Scolytidae in this role in tropical countries. For a variety of reasons the Platypodidae will not be considered further in this volume.

More than 6000 species of bark beetles have been named from throughout the world wherever woody plants grow. About 477 species occur in the United States, with approximately 179 of these, plus a few endemic species, extending their ranges into Canada and Alaska (Bright 1976). About 605 species are found in Mexico and about 632 in Central America; allowing for overlap in distributions, there are about 1,430 species in North and Central America combined. Most species restrict their breeding activity to one or a limited number of host plant species. In addition, most species have specialized ecologically to infest only a restricted part of their host plant. For example, some species confine their attacks to the cones or fruits of their host, others infest only tiny twigs, others small branches, limbs, boles, or roots. Some breed only in shaded-out branches of standing, living trees, others in felled or broken material, etc. A few are very aggressive and attack healthy, living tissue, and others prefer dying or dead plants.

Because of the large number of species and the extreme diversity in their habits, bark and ambrosia beetle attacks on economically important plants can be evaluated and meaningful corrective action taken only if species involved are correctly identified. In addition, research notes based upon incorrectly identified specimens may not only be meaningless, but misleading. This volume was written to simplify the process of identification of Scolytidae for those who work with problems involving these insects. Coleopterists and zoogeographers will also find information compiled here useful in their work.

Three noteworthy attempts have been made to classify North and Central American

Scolytidae (Blandford 1895–1905, Swaine 1918, Chamberlin 1939). Almost as noteworthy are series of revisional and other taxonomic articles relating to classification by Hopkins, Blackman, Wood, and Bright. This volume attempts to summarize and update their contributions as well as to add new information not previously reported.

## BIOLOGICAL ACTIVITIES

### Ecological Niche

Most bark and ambrosia beetle species live only in recently cut, injured, or unthrifty tissues of woody plants that are in the process of dying. In most genera, they complete one generation only in this material then abandon it to search for other material in suitable condition. Host tissues must contain sufficient moisture for the completion of development. Such material usually bears wilted or yellowish green leaves. Older host material usually is unattractive to the beetles; however, a few species apparently prefer host material that is completely dead. Several other species normally attack healthy, living tissue of vigorous plants and cause its death. A few species of ambrosia beetles (e.g., *Corthylus columbianus* Hopkins) are capable of attacking a living tree, completing a system of galleries, and emerging a generation later without killing the host, although a permanent scar remains in the wood.

Bark and ambrosia beetles usually are the primary attackers of recently injured or felled woody plants. Most species complete their development in about 20 to 90 days then move to fresher material. Other wood- and bark-feeding insects usually arrive later or develop more slowly, thus reducing or eliminating competition. Those scolytid species with longer life cycles and those arriving late in the ecological deterioration of their host usually encounter much greater competition for survival from other insect groups.

### Host Specificity

Most Scolytidae are restricted in the number and variety of host species in which they can successfully reproduce. In general, phloeophagous (phloem infesting) species tend to be more restricted or specific in their selection than are xylomycetophagous (wood-boring ambrosia beetle) species. The apparent reason for this difference is that the former feed directly on host tissues, and the latter feed on fungal spores; any host on which the symbiotic fungus can survive will be satisfactory for beetle development.

Only two known species (*Coccotrypes*, tribe Dryocoetini), one in Malaya and one in New Guinea, confine their attacks to Pteridophyta. Representatives of 14 of the 25 tribes recognized here in the world fauna normally breed in Gymnospermae, but of the 10 most primitive tribes worldwide only the Hylastini, Tomicini, and Scolytini are included within these 14. It is of interest that all species of the Hylastini are restricted to the family Pinaceae of the Gymnospermae. Representatives of all tribes, with the exception of Hylastini, breed largely or exclusively in the Dicotyledoneae, although the American Polygraphini occur exclusively in conifers. Fewer than a dozen known species confine their activities to Monocotyledoneae, but only one of these represents a primitive group (*Cnesinus vestitus* Eggers, tribe Bothrosterini). In addition to these, several species of polyphagous *Xyleborus* may also breed in various palm logs, but host preference is not involved in the selection.

Within tribal or generic groups host specificity may be extreme, with most species confining their breeding activity to one or to a very restricted number of host species. For example, American *Scierus*, *Hylurgops*, *Hylastes*, *Carphoborus*, *Polygraphus*, *Cryphalus*, *Crypturgus*, *Dolurgus*, *Pityogenes*, *Orthotomicus*, *Pityokteines*, *Ips*, and *Pityoborus* are restricted to the Abietineae of Pinaceae, *Phloeosinus* to the Cupressineae or Taxodioideae of Pinaceae (many Oriental species occur in other plant families), *Phrixosoma* to the Guttiferae, *Dendrocranulus* to the Cucurbitaceae, *Pseudopityophthorus* to the plant genus *Quercus*, etc. The Bothrosternini, Cryphalini, and Xyleborini are unusually polyphagous.

### Host Selection and Dispersal

Scolytid beetles are dependent upon their power of flight to move from their brood tree to a new host. The original pioneer beetles

are guided in their flight (primary attraction) by volatile oleoresins, terpene hydrocarbons, alcohols, or other substances given off by the recently injured or dying host tissue (Rudinsky 1966). When such odors are in the air, flight is oriented and usually proceeds upwind to the source; when attractive odors are not detected, the dispersal tends to be random.

The objective of this flight is the location of new host material, but the use of that material varies with the reproductive readiness of the insect. When the gonads are mature, as is usually the case, a new tree in which brood can be produced is sought. In many species, however, the beetles seek the green bark of a healthy host, where they bore into the outer phloem and feed or hibernate for a period of time before emerging to seek a host in which to reproduce. In some species the construction of feeding tunnels is not a regular habit but may function as an emergency means of waiting for the availability of suitable host material. At times these emergency tunnels are formed in hosts not normal for the species and have resulted in numerous erroneous host records.

The original pioneer flight may be taken by either the male (e.g., *Ips*) or the female (e.g., *Dendroctonus*) beetle, but, regardless of which sex makes this flight, the habit is consistent for the species. Once a pioneer has found a suitable host, it bores in then begins to release a chemical sex attractant or pheromone that attracts both males and females of its own species to that host. Thus, subsequent flights are oriented by both tree volatiles and pheromones until sufficient beetles are present to overcome any resistance to the attack that might be given by the host.

## CLIMATE

The factors which constitute climate, that is temperature, precipitation, humidity, soil moisture, sunshine, air currents, and air pressure, are of extreme importance in determining the distribution and abundance of bark and ambrosia beetles and of the predators, parasites, and other organisms with which they are associated. Except for a few hours once each generation, during which time the dispersal flight takes place, these insects live entirely within the host plant, where the substrate and micro-environment are remarkably constant. This constancy in the immediate environment has had an obvious effect on intra-populational variability and apparently has reduced the effect of climate; but certain long-range effects are clearly evident. For example:

1. In Canada and Alaska fewer than 10 percent of all scolytid species are xylomycetophagous, and more than 90 percent are phloeophagous; in Costa Rica and northern South America approximately 60 percent are xylomycetophagous, and 40 percent have other habits, only part of which are phloeophagous.

2. Of the genera treated in the present study 50 percent (including far more than half the species) are largely or entirely tropical in distribution, 30 percent are largely or entirely temperate in distribution, and 20 percent occur in both areas (but a disproportionate majority of the species in these genera are tropical). Comparatively few species are found in Alaska and Canada and, among those that do occur there, the distributions of a high percentage of them are restricted to southwestern British Columbia or to the southern tip of Ontario.

3. Scolytid species are comparatively uncommon in deserts. A surprisingly high percentage of the genera present in desert regions are restricted to desert or semi-desert areas (*Chaetophloeus*, *Cactopinus*, *Stenocleptus*, etc.).

4. Temperate groups of scolytids may extend their distributions into tropical areas along mountain ranges, providing the altitude is high enough to assure cool temperatures, and a dry season is sufficiently pronounced to produce conditions suitable for the growth of their host plants.

5. Unusually high or low temperatures cause fluctuations in bark beetle populations over extensive areas. High and low lethal temperatures vary from species to species, from one developmental stage to another, and with the length of exposure (Rudinsky 1962). This principle has been used in controlling certain species by exposing infested material to solar radiation during the hot summer season. It is also noted that, in a fallen log, one species may infest the uppermost

(hottest and driest) surface, another may infest the sides (moderately cool), and others may infest the lower (coolest) area. In addition, it is observed (Dixon and Osgood 1961:3, Wood 1963:17–18) that, in a given widely distributed species, more generations are completed at the southern than at the northern limits of the range, presumably the result of a longer season of favorable temperatures.

6. Prolonged drought may reduce the resistance of trees to a point where they cannot resist bark beetle attack (Rudinsky 1962:342). Many species of twig borers cannot be reared successfully outside a growth chamber unless melted wax or liquid plastic is painted over cut ends to conserve moisture. It is also a common practice of bark beetle collectors to cut limbs of trees and place them in a cool, shaded place, where moisture loss is minimized, so that they might remain attractive to scolytids.

7. In their dispersal flight bark and ambrosia beetles normally move only short distances (a few meters) from one host to another. Occasionally, however, these weak fliers are caught by the wind and carried distances up to 15 km (Rudinsky 1962). Their occurrence on certain oceanic islands suggests flights of considerably greater length.

8. Flood waters undoubtedly have had an effect on bark beetle populations, either by covering infested hosts and drowning the local population, or by carrying infested material downstream to initiate an infestation in a new area. Living larvae immersed in water cooled to near the freezing point have been kept alive by me for 200 days. Infested logs presumably could be carried completely immersed for hundreds of kilometers during spring floods and still produce living beetles.

## HIBERNATION AND ESTIVATION

Unfavorably high or low temperatures, such as those encountered during the tropical dry season or the northern winters, cause a cessation of beetle activity. The life cycle usually is synchronized with the seasons, and the most resistant stage predominates when the period of physiological stress begins. Estivation, the period of inactivity during hot or dry weather, occurs principally in tropical regions and apparently may be as short as two weeks or as long as five months, depending on the climate. In all probability, this inactivity is not controlled hormonally (except *Xyleborus dispar* (Fabricius)), but may be interrupted at any time by the return of favorable temperature and moisture.

HIGH TEMPERATURE.— Bark temperatures of 42–50 C (107–122 F) usually cause disorganized behavior of bark beetles and, in time, thermal paralysis, and death. Higher temperatures, 50–55 C (122–131F), are lethal in a shorter period of time.

Graham (1920, 1924) found in Minnesota that the thickness, color, structure, and surface features of bark and the light intensity, solar attitude, and angle of incidence influenced the subcortical temperature of logs. He found that midday subcortical temperatures reached maximum levels of 45–60 C, with the highest levels in dense, dark, thin-barked, rough logs. The highest levels of 60 C (140 F) were reached in *Pinus strobus* on a day when the air temperature was 40 C (104 F).

Patterson (1930), using *Pinus contorta* logs in Oregon, recorded midday subcortical temperatures of 43–51 C (110–123 F) while air temperatures were 24–26 C (75–78 F); subcortical temperatures in adjacent standing trees were 22–24 C (72–75 F).

Miller and Keen (1960) summarized 45 years of studies on the effect of high temperatures on *Dendroctonus brevicomis* LeConte. Decreased activity was noted at 35 C (95 F) and thermal paralysis at 38 C (100 F). Currents of warm air with low humidity could be fatal to larvae at 38–41 (100–105 F) within 30 minutes. At "normal" humidity paralysis commenced at 42–43 C (108–110 F) and death at 43–46 C (110–115 F). No larvae survived even brief exposures at 48 C (118 F). In field tests, sustained temperatures of 38 C (100 F) resulted in 34.2 percent mortality, and at 49 C (120 F) 100 percent mortality.

LOW TEMPERATURE.— The mortality of bark beetles due to low temperature apparently is an important factor in determining local abundance and the expansion and contraction of distributions.

Beal (1933) reported that the egg stage of *Dendroctonus brevicomis* LeConte was the most resistant of all immature stages to low

temperature. Air temperatures of -21 C (-5 F) did not affect the hatching of eggs; however, temperatures as low as -12 C (10 F) resulted in 43 percent mortality of larvae in the moist cambium (moisture level 200 percent of dry weight) while larvae in the outer bark (moisture level 30 percent of dry weight) suffered almost no mortality. When exposed to -21 C (-5 F), mortality of larvae was 100 percent, pupae 90 percent, and adults 100 percent in the moist phloem. Pupae and adults in the dry, outer bark suffered almost no mortality at this temperature.

Miller and Keen (1960:71-73) reported cold periods in the winters of 1924 (-29 to -32 C or -20 to -25 F) and 1932-1933 (-29 to -39 C or -20 to -38 F) in which *Dendroctonus brevicomis*, larval mortality was estimated at 25-80 percent and 50-90 percent, respectively. Unprotected summer brood larvae exposed in the laboratory at -18 C (0 F) suffered 20-50 percent mortality, at -21 C (-5 F) 75 to 100 percent mortality, and at -21.7 C (-7.5 F) almost always 100 percent mortality. At 10 C (50 F) larvae become sluggish and dormant; at -9.5 to -12.2 C (15-10 F) larvae freeze but recover when returned to warm temperatures. A "brief" exposure of eggs at -21 C (-5 F) resulted in 90 percent mortality; none hatched after exposure at -23 C (-10 F). Results with the exposure of pupae were about the same as for larvae. Adult mortality commenced at -10 C (14 F) and was complete at -12.2 C (10 F).

Massey and Wygant (1954:23-24) studied the effect of low temperatures on cold-hardy *Dendroctonus rufipennis* (Kirby) and report 100 percent mortality at -26 C (-15 F) for adults and -34 C (-30 F) for larvae. Low temperatures in Colorado in 1951 extending in some areas down to -49 C (-56 F) killed approximately 75 percent of the overwintering larvae above the snow line; adults hibernating below the snow line at the bases of their hosts were not affected by these temperatures.

Hopkins (1909b:24) attributed the complete extermination of *Dendroctonus frontalis* Zimmermann in Virginia and West Virginia to the unusually cold winter of 1902-1903.

ACTIVITY RANGE.— From the above data it would appear that bark beetles are active at temperatures of about 10-38 C (50-100 F).

Daterman, Rudinsky, and Nagel (1965) report that the minimum threshold air temperature necessary to initiate flight ranges from 12-13 C (54-55 F) in *Pseudohylesinus nebulosus* (LeConte) to 20-22 C (68-72 F) in *Scolytus unispinosus* LeConte. It is noted, however, that once flight is initiated it may continue even though temperatures may decrease to 5 C (41 F) in *Pseudohylesinus* spp.

The spring flight usually commences when daytime temperatures reach this threshold. As the season advances and temperatures increase, the period of flight is restricted to the early morning and evening periods to avoid desiccation.

HIBERNATION.— Whether or not the life cycle is synchronized with the seasons, most scolytids do not hibernate in the true meaning of the term. Instead, when subcortical temperatures fall below the threshold activity ceases; when temperatures rise above that threshold activity is resumed. In *Xyleborus dispar* (Fabricius) true hibernation occurs (French and Roeper 1972); however, the mechanism governing it has not been investigated.

The winter may be passed in any stage of development, but the overwintering stage is constant and characteristic in each species. The larval stage is the most commonly represented. Most species appear to make no special preparations for winter; others bore into the sapwood (e.g., *Scolytus rugulosus* Müller) or into the outer bark (some *Dendroctonus*); others fly to living trees where feeding tunnels are excavated in green tissue (e.g., some *Phloeotribus*), or they overwinter in the duff on the forest floor (e.g., *Ips*, *Trypodendron*).

ESTIVATION.— This phenomenon has not been reported in the literature. In Costa Rica during the latter part of the dry season I found *Metacorthylus velutinus* (Wood) in an inactive state in radial tunnels 1-2 cm deep in a log too dry for reproduction. Apparently, they were waiting for spring rains before resuming activity. Tropical *Dendrocranulus* apparently pass the wet season outside their normal hosts, then appear in large numbers as the dry season begins. Hibernating specimens were not found. Many tropical scolytids apparently ignore the seasonal changes observed by other insects and continue their reproductive activity throughout the year.

## ECOLOGICAL SPECIALIZATION

Each group of organisms entering a new adaptive zone, as did the Scolytidae when they began to utilize unthrifty and dying tissues of woody plants, soon discovers that its food resource is limited and its greatest competitors for food and space are other members of its own kind. The resulting competition results in an adaptive radiation or ecological specialization along numerous avenues that enables the group more completely and more effectively to utilize the available food source.

For example, it probably would be physiologically impossible for one species of scolytid to develop that could utilize both bark and wood of all woody plants in all parts of the world. Such an occurrence would subject that species to enormous population fluctuations and other natural disasters. It is of greater advantage to the group to develop a variety of species each specialized to meet the requirements of life in a particular climate on specialized tissue of a restricted host. This is essentially what has happened in the evolution of the Scolytidae.

Scolytids utilize at least some representatives of gymnosperms and virtually all dicotyledonous families containing woody plants. Few species inhabit pterydophytes or monocots. While many woody plant species are not infested by any scolytid species, others (most Pinaceae, etc.) are the host of numerous species. When two or more species share the same host species, competition between them for space and food results either in extinction of one of them or in ecological specialization. Such specialization has resulted in the development of forms that live only in seeds or fruits (certain *Araptus*, *Coccotrypes*, *Conophthorus*, *Hypothenemus*, *Pagiocerus*, *Spermophthorus*, etc.), others only in unthrifty twigs and branches of living trees (certain *Carphoborus*, *Chaetophloeus*, *Hypocryphalus*, *Liparthrum*, *Pityoborus*, etc.), others in cut or broken twigs and branches (certain *Cryptocarenus*, *Cnesinus*, *Hypothenemus*, *Pityophthorus*, *Tricolus*, etc.), others in suppressed seedlings in dense growth (certain *Carphoborus*, *Pityophthorus*, *Xylechinus*, etc.), others in the tops and limbs of overmature trees (certain *Ips*, *Phloeotribus*, *Pityophthorus*, *Scolytus*, etc.), others in slash (certain *Ips*, *Pityogenes*, *Pityophthorus*, *Scolytus*, etc.), others in boles of standing trees (certain *Dendroctonus*, *Ips*, *Phloeotribus*, *Scolytus*), others in butts and stumps (certain *Dendroctonus*, *Dryocoetes*, *Gnathotrichus*, *Ips*, *Xyleborus*, etc.), and others in roots (certain *Corthylus*, *Dryocoetes*, *Hylastes*, *Hylurgops*, etc.). Some species utilize leaves (certain *Cactopinus*, *Hypothenemus*, *Pseudothysanoes*, *Scolytodes*, etc.), and a few live in herbaceous plants (all *Dendrocranulus*, *Hylastinus*, certain *Hypothenemus*, etc.). *Pagiocerus frontalis* (Fabricius) has been reported as a minor pest in stored corn in South America, but not in the northern parts of its range. Several species, particularly in the genus *Hypothenemus*, apparently are capable of living in almost any available source of plant material; for example, *Hypothenemus eruditus* Westwood was named from a series found boring in the cover of a book. It also may live in seeds, weeds, twigs, bark of the bole of large trees, and shelf fungi. Of greatest economic concern, however, are those species that infest healthy, living tissue, such as *Conophthorus* spp., *Corthylus columbianus* Hopkins, several *Dendroctonus* spp., *Hypothenemus hampei* (Ferrari), *Xylosandrus compactus* (Eichhoff), and many others.

## FOOD AND FEEDING HABITS

The Scolytidae are among the few insect groups in which the adults burrow into the host plant for the purpose of depositing their eggs directly in the food substrate to be consumed by the larvae. The concealed tunnels (Fig. 1) offer a greater degree of protection than occurs in many groups; furthermore, the adults usually remain in their galleries to prevent the entry of predators and parasites into the gallery system, thus increasing the protection given to the larvae. Several forms of feeding are associated with this habit.

HERBIPHAGY, feeding upon nonwoody plants, is rare in the Scolytidae. *Hylastinus obscurus* (Marsham) breeds in the roots of various clovers and may become a serious pest. *Chramesus pumilus* (Chapuis) breeds in the larger stems of wild beans. *Hyothenemus pubescens* Hopkins breeds in the fruiting stalks of grass; *H. eruditus* Westwood, *H.*

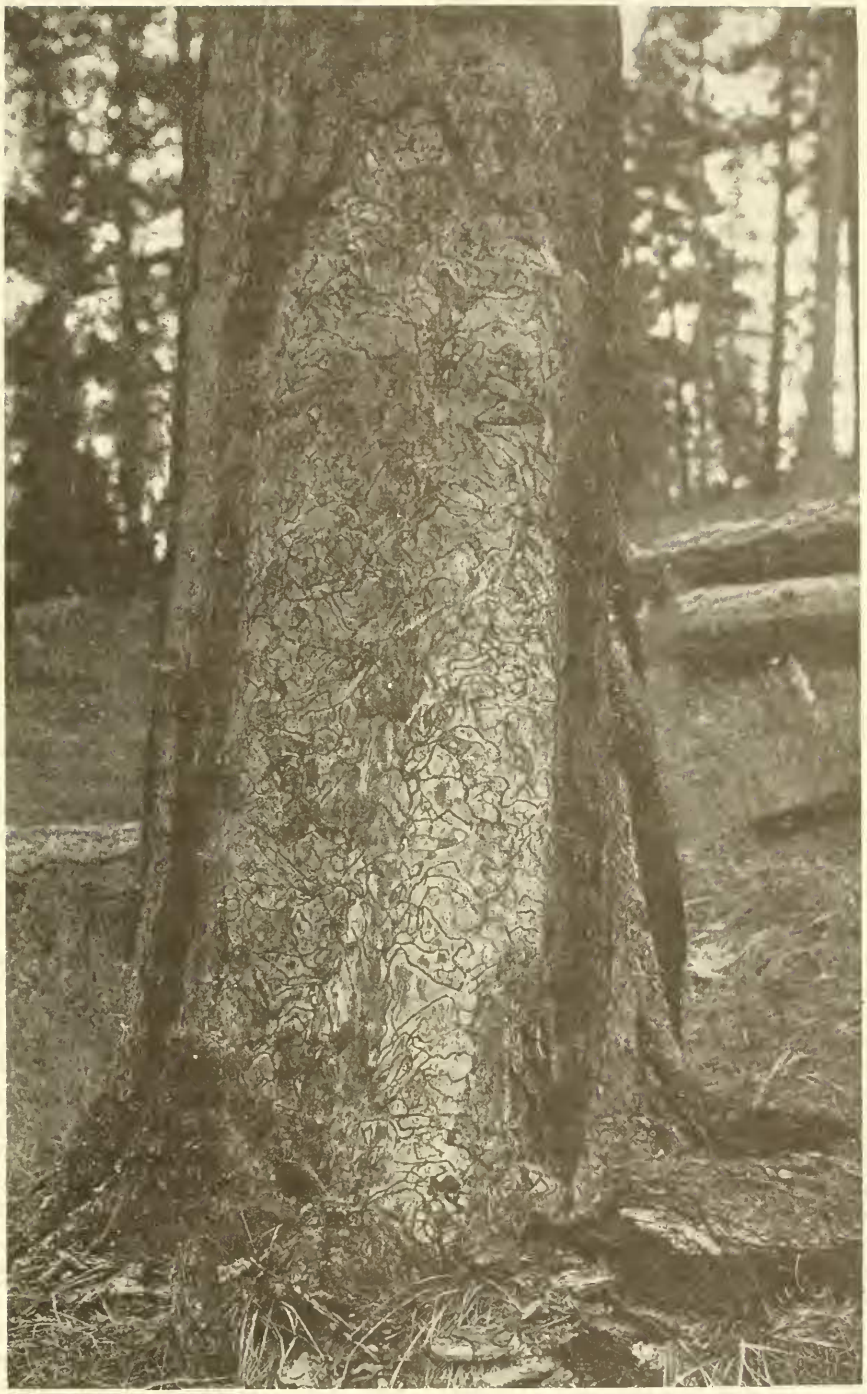


Fig. 1. Galleries of *Dendroctonus brevicomis* on the lower bole of *Pinus ponderosa*. The bark was removed to expose the tunnels. (After Swaine 1914:17.)

*areccae* (Hornung), *H. crudiae* (Panzer), *H. columbi* Hopkins, and occasionally other species may breed in a wide variety of herbaceous vegetation, although they are not restricted to these plants. All *Dendrocranulus* species and allied Old World genera breed exclusively in the stems of cucurbitaceous plants.

SPERMOPHAGY includes feeding on seeds and at least parts of the protective fruit that covers them. In North America this habit is best known in the *Conophthorus* species that infest cones of *Pinus*, particularly those with large seeds. Spermophagy is much more common and widespread among tropical genera such as those listed in the preceeding section (Ecological Specialization).

MYELOPHAGY, feeding on the pith of small stems, evidently is considerably more common in the American tropics than in other parts of the world. Several species of *Pityophthorus* have this habit in the United States and Canada. Almost all species of the Bothrosternini, all *Cryptocarenus* and *Micracisella*, several species of *Hypothenemus*, and a few species of *Araptus*, *Chramesus*, *Scolytodes*, *Tricolus*, etc., also have this habit. A few of these species are extremely aggressive and destructive.

PHLOEOPHAGY, feeding on phloem tissues of the inner bark, is the habit usually associated with this family and is the basis for their common name; however, fewer than half the species in the family are phloeophagous. In temperate areas of the world the most common genera burrow in the cambium region of their hosts and thereby produce the characteristic engravings that show on the surface of peeled bark or wood. Most of the Hylesininae, Scolytini, Ctenophorini, Dryocoetini, and Ipini fall into this category.

XYLOPHAGY includes living in and feeding directly on the xylem or wood tissues. Although almost all ambrosia beetles may be partially xylophagous, they are excluded from this category since their principal food is not xylem. Apparently all xylophagous species are associated with fungi that alter the character of the wood consumed, but the mycelium does not form a conspicuous element of the diet. Xylophagous forms include *Chramesus xylophagus* Wood, two species of *Chaetophloeus*, all *Dendrosinus*, *Lymantor*, *Hylocurus*, *Micracis*, and *Thysanoes*, *Scolytodes multistriatus* Wood, and many other isolated examples in other genera. I am unaware of any nutritional studies involving a xylophagous species; the food source and the modified color and texture of the wood near a tunnel suggest that symbiotic organisms are involved in some way.

XYLOMYCETOPHAGY includes the cultivation and utilization of a symbiotic fungus as a food source. The term "ambrosia beetle" has been applied to the Scolytidae and Platypodidae having this habit regardless of their phylogenetic origin or relationships. The habit apparently has arisen independently in the Platypodinae of the Platypodidae and in the Scolytidae in the Bothrosternini (*Bothrosternus*), Hylesinini (*Hyleops* of Australia), Scolytini (*Camptocerus*), Scolytoplatypodini (*Scolytoplatypus* of Asia and Africa), Xyloterini, Xyleborini, and Corthylini. More than 99 percent of all species of Platypodidae and more than half of all tropical Scolytidae have this habit.

## GALLERIES

The gallery systems of the Scolytidae are unique and represent the product of a long and complicated evolution. These beetles probably arose prior to the Cretaceous geological period from a saprophytic group of beetles found under bark. Early representatives probably formed crude cavities in the phloem after entering the bark through injuries or the excavations of other insects. The earliest galleries probably were of the cave type similar to those presently seen in *Mecopelmus* (Platypodidae), many *Scolytodes*, *Cryphalus*, *Procryphalus*, *Trypophloeus*, and phloeophagous *Coccotrypes*, in which the eggs are deposited individually or in small clusters and mixed indiscriminately in the frass. Later the eggs were placed in specially prepared niches and packed in a mixture of boring dust held together by an adhesive secretion, as now seen in *Liparthrum*. Further specialization of the system included the extension of various irregular pockets for the protection of the eggs; these eventually became egg galleries and may occur either with or without egg niches. The addition of the polygynous and xylophagous habits modified the basic gallery only slightly.

The gallery system of a typical phloeophagous or myelophagous species consists of the following parts:

1. ENTRANCE TUNNEL: The entrance hole (Fig. 2: parts 5, 11, eh) is usually located at a leaf scar, axil, crevice, or other irregularity in the bark; however, many *Micracis* and *Corthylus*, and genera allied to these two, commonly select smooth areas. This short, simple, cylindrical tunnel is usually directed obliquely upward in its passage through the bark to facilitate frass removal and, apparently, to protect the entrance from precipitation. In xylophagous forms (Fig. 2: parts 12–14, 16–18) it is a direct radial tunnel perpendicular to the outer surface. The diameter of the entrance tunnel is very slightly larger than the beetle making it, such that its body might effectively prevent the entry of predators, parasites, or other unwanted intruders when a defensive position is taken in the entrance tunnel. A major task of one of the parent beetles is blocking the entry.

2. NUPTIAL CHAMBER: In many groups, when the entrance tunnel reaches the cambium a flattened (tabular) cavity is usually excavated (Fig. 2:5, 11, NC). This oval or irregular chamber usually has a diameter about three to five times greater than the length of the beetle excavating it. The entrance tunnel usually enters the nuptial chamber at its lowest margin to facilitate frass removal. In the most primitive gallery systems adult participation in excavating the tunnel ends at this point; as indicated above, eggs are scattered indiscriminately or in clusters and larvae enlarge the excavation. In most groups, however, additions are made. The nuptial chamber is best developed in groups in which the male forms the initial parts of the system, particularly when polygyny occurs. It is partly or entirely eliminated in other groups, particularly when a male does not enter the gallery.

3. EGG GALLERIES: When a female enters a tunnel she forms one or more egg galleries (Fig. 2:1–16) that extend along the cambium following a course away from the nuptial chamber. They usually are straight, but curve characteristically in some species. Very commonly it is possible to identify the genus or even the species from the gallery system without seeing the beetles that made it. In their primitive form egg galleries are no more than indefinite pockets along the margin of the nuptial chamber. In their more advanced form they are more slender and longer, and in their most advanced form they are cylindrical, very slightly larger than the width of the beetle forming them, and very long. In most genera the female cuts egg niches along the margins of the tunnels; in others these are absent. The egg niches usually are as wide as the female head and about as deep as wide; their size, shape, position, and spacing usually are characteristic. Long egg galleries in thick bark usually have ventilation tunnels placed at irregular intervals on the outer side. These extend to near the surface of the bark but rarely open to the surface. Their function is not definitely known but they might serve as turning niches, as sources of oxygen, for ventilation and temperature control, or as easily opened avenues of escape in an emergency.

4. LARVAL MINES: After hatching the larvae may (a) feed exclusively on mycelial or other materials supplied to them, (b) enlarge the parental chamber, usually feeding communally (in congress), or (c) form individual larval mines. The latter habit is by far the most common in temperate regions. Larval mines may be little longer than the larval body (*Pityoborus*, etc.), or exceedingly elongate (some *Scolytus*, etc.). Though the egg gallery, nuptial chamber, and entrance tunnel are usually kept entirely free of boring dust, the larval mines are closely packed with frass. In many species the larval mine engraves both wood and bark throughout its length; in others part or all of the mine may be entirely in the wood or entirely in the bark. Near the end of the larval mine an expanded area is usually cleared to form a pupation chamber where transformation occurs. It may be formed in the cambium region, deep in the xylem, or in the outer bark. Following transformation many species emerge immediately through individual exit holes; others require a maturation feeding period before they emerge. The brood of phloeophagous and myelophagous species rarely emerges through the parental entrance hole, although it does in *Pityoborus*, in many *Cryphalini*, and in most ambrosia beetles.

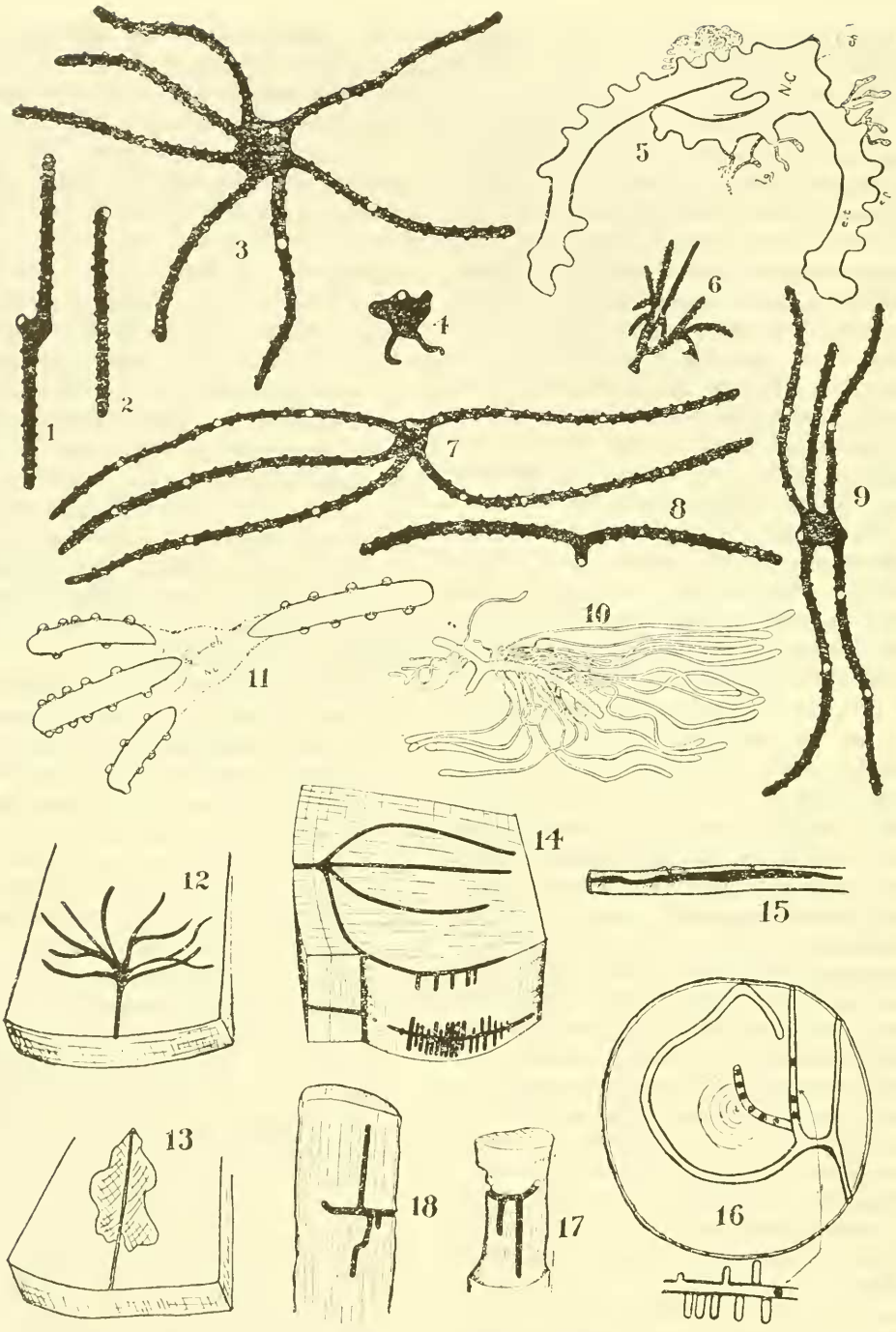



Fig. 2. The common kinds of gallery systems formed by Scolytidae: 1, biramous longitudinal; 2, monoramous longitudinal; 3, stellate, radiate, or multiramous; 4, cave-tunnel (two postoviposition feeding tunnels are shown); 5, stellate system of *Ips concinnus* showing entrance hole (eh), nuptial chamber (NC), egg gallery (et), egg niche (ep), larval mine (lg); 6, modified stellate; 7, transverse stellate; 8, transverse biramous; 9, longitudinal stellate; 10, transverse biramous with larval mines added; 11, modified stellate with nuptial chambers entirely in the bark; 12, ambrosial stellate without cradles (*Xyleborus*); 13, ambrosial cave-tunnel (wood grain runs left to right; in 12 wood grain runs top to bottom); 14, ambrosial stellate with larval cradles (*Monarthrum*); 15, pith tunnel (*Micracisella*); 16, ambrosial stellate, modified, with cradles (poor example of *Gnathotrichus*); 17, 18, ambrosial branching tunnels (*Xyleborus obesus*). (After Swaine 1918:13.)

In xylophagous and in most spermophagous forms the same basic parts of the gallery system are found except that they are distrubuted in a three dimensional system rather than two.

In ambrosial forms the larval mines are usually reduced to larval cradles just large enough to accommodate the new adult or they are eliminated. In most groups having larval cradles the eggs are deposited in niches and the larva enlarges this niche into the cradle as it grows (*Monarthrum*, *Trypodendron*, etc.). In some *Corthylus* the parents form the completed cradles and deposit the eggs only when the ambrosial fungus is well established. In other groups that lack egg niches and larval cradles, the larvae may develop in the adult galleries (many *Xyleborus*) or the larvae may form a common, tabular chamber parallel to the grain of the wood. Numerous variations of these basic patterns occur.

## Gallery Patterns

Scolytid parental galleries might be classified as follows (Fig. 2):

1. Cave-tunnel: A simple cavity formed (1) in the cambium region, (2) in the wood, or (3) in the pith of small stems. When this type of cavity is formed by ambrosia beetles (*Xylosandrus*), most or all of the cavity usually is formed by the larvae.

2. Uniramous gallery: A simple, (a) longitudinal or (b) transverse egg gallery either in the phloem or xylem tissues. Primitively, a conspicuous nuptial chamber occurs at or near the entrance; this chamber may be reduced to a turning niche or, in galleries made by previously mated females, it may be eliminated.

3. Biramous gallery: A system in which two egg galleries arise from the same nuptial chamber. In its more advanced form the nuptial chamber may be eliminated and the pattern is a simple fork. The galleries may be (1) longitudinal, (2) transverse, or (3) diagonal. Among phloeophagous groups it is the most widely distributed pattern. It also occurs in some xylophagous groups.

4. Stellate, radiate, or multiramous gallery: This type of system is most common in polygynous species. Three or more (19 were found in one species of tropical *Pityophthorus*) egg galleries extend from the nuptial chamber. The egg galleries may be (1) straight and radiate in all directions away from the nuptial chamber, (2) curved so as to (a) parallel the grain of the wood, (b) cut transversely across the grain, or (3) form a pattern independent of the grain.

5. Branching galleries: This type of system is rare and apparently occurs only in species communally sharing the same entrance hole, as in *Dendroctonus brevicomis* LeConte, *Cladoctonus boliviae* Wood, apparently *Microborus* spp., and a few other species. In this system, beetles arriving late at the host use a previously made entrance tunnel and follow the gallery of another pair for a distance before starting their own branch tunnel. Phloeophagous species that form tunnels of this type do not remove the frass from the gallery, but pack it tightly a short distance behind the working area. This is also one of the most common systems formed by ambrosia beetles, although the entrance may or may not be communal.

6. Ambrosia beetle galleries: Ambrosia beetles construct gallery systems of the five basic types listed above except that (a) they are adapted to a three dimensional system rather than two, and (b) the larvae may extend and modify the original parental tunnel. as indicated in the preceding section, either the larvae or adults may form series of larval cradles in either one or two ranks both above and below the egg gallery (ambrosial Corthylini, Scolytoplalypodini, and Xyloterini). In many of the Xyleborini the larvae form tabular extensions of the parental tunnel along the grain of the wood that sometimes are enormous when one considers the size of the beetle.

## Social Organization

As with other woodboring Coleoptera in which the adults form tunnels and enter the host to reproduce, the Scolytidae have developed a distinctive subsocial behavior. Most species infest hosts that are unthrifty or in a somewhat living though injured state. When the beetles bore into these living tissues the host reacts by exuding quantities of resin to plug the wound and expel or drown the



Fig. 3. Pitch tube of *Dendroctonus brevicomis* showing an unsuccessful, expelled beetle on a pitch tube. (After Keen 1955:2.)

intruder (Fig. 3). If only one or a few beetles are present a vigorous host usually is successful in resisting the attack. Most scolytids overcome this resistance through mass attacks that overwhelm the resistance of the host. The communication necessary for coordinated attacks is accomplished through secondary attraction with pheromones released by the beetles.

The original pioneer beetles that first enter a new host release one or a combination of chemical substances (pheromones) beginning about the time their tunnels reach the cambium region. These volatile substances are in the fecal pellets that are mixed in the frass and expelled from the tunnel by the beetles. The odors carried by the air currents have a strong attraction to both males and females. Upon arrival at the host under attack the members opposite in sex from the pioneers, seek out an entrance tunnel and, through the process of auditory, tactile, or possibly chemical signals, or a combination of these, the potential mate is identified and admitted to the tunnel. Following mate identification, pheromone production ceases. A masking or repellant pheromone may also be released after the mate is admitted (Rudinsky 1968). An extensive annotated bibliography on secondary attraction in Scolytidae was published by Borden and Stokkink (1971) and Borden, VanDerSar, and Stokkink (1975).

As indicated above, one of the principal functions of pheromones is the attraction of potential mates. The secretive habits of these insects, coupled with their ability to communicate through olfactory and auditory signals, has led to the development of unique reproductive behavior. When the potential mate arrives at the entrance hole, in certain species, it stridulates actively. This stridulation in male *Dendroctonus pseudotsugae* Hopkins causes the female inhabitant of the new gallery to stop the production of the aggregating pheromone and to admit the male (Rudinsky 1968). In Platypodidae this courtship apparently includes tactile as well as auditory elements, and in certain genera (*Diapus*) the female mandibles are equipped with special processes used for identification by the male, which are shed after this event. The elaborate sexually dimorphic sculpture and ornamentation of the head and declivity in one or both sexes of numerous species of Scolytidae suggest that tactile stimuli are used extensively in the Scolytidae for mate identification at the entrance of the gallery. Chemical stimuli also function in this courtship activity, in addition to basic secondary attraction (Rudinsky and Michael 1972).

There are four distinct types or levels of social organization associated with reproductive behavior. These are (1) monogamy, (2) normal (heterosanguineous) polygyny, (3) extreme (consanguineous) polygyny involving arrhenotokic parthenogenesis, and (4) gynogenetic parthenogenesis.

Monogamy is the most common and widely distributed habit. It occurs in all Platypodidae (except *Protoplatypus*), in all Hylesininae (except Polygraphini and some oriental *Phloeosinus*), in Scolytini (except some neotropical *Scolytus*), in Ctenophorini (except a few *Scolytodes*), in all Scolytoplatypodini, Cactopinini, Crypturgini, and Xyloterini, in phloeophagus Micracini, in part of the Cryphalini (*Cryphalus*, *Hypocryphalus*,

*Stegomerus*), in part of the Dryocoetini (*Dendrocranulus*), and in part of the Corthylini (*Pityoborus, Conophthorus, Corthylus*, many *Araptus*, and a few *Pityophthorus*). In monogamous species either sex may initiate the boring of a new gallery, but the habit is constant within a species. For example, in *Dendroctonus* and most *Scolytus* species the female performs this function, but in *Phloeosinus* and *Corthylus* it is the responsibility of the male. In most monogamous species, after pairing has occurred, the female is responsible for boring egg galleries, the formation of egg niches, and laying of eggs and caring for them and the larvae (if the larvae remain in the parental tunnel). The male keeps the nuptial chamber and entrance tunnel clean and expels the frass from the entrance hole. He also blocks the entrance with his body to prevent the entry of predators and other intruders. Kalshoven (1959:170) observed rapid pumping movements of the body (stridulation of a disturbed individual?) and quick, short movements backwards and forwards in the tunnel near the entrance and suggested that these activities might be associated with ventilation of the gallery system. Although similar action has been observed in other Scolytidae, its function has not been investigated.

In monogamous species both sexes usually participate in the construction and care of the galleries. However, in many forms one or both sexes may abandon the tunnel as soon as egg deposition or hatching is complete, and in a few *Scolytus* the male may mate on the bark surface and never enter the gallery system. One or both sexes may then participate in the formation of a second, third, or even fourth set of galleries (Simpson 1929).

The division of labor in tending the gallery system apparently has led to the evolution of much of the observed sexual dimorphism in the groups. Most of these features occur either on the head or elytral declivity and, as suggested above, many of them may be associated with mate identification. However, others clearly are associated with frass removal, preparation of the niches for the eggs, or cultivation and care of the ambrosial fungi. The most radical modifications include the head and antennae (*Camptocerus, Hylocurus, Corthylus*), pronotum (*Amphicranus, Pityoborus*), elytral declivity (*Ips, Monarthrum, Amphicranus*), abdomen (*Scolytus*), and legs (Xyleborini).

Polygyny occurs in many tribal groups and undoubtedly has originated independently several times. Two distinctive types of polygyny are recognized: (1) Heterosanguineous and (2) consanguineous polygyny. In heterosanguineous polygyny the male flies to the new host and (almost always) excavates the entrance tunnel and nuptial chamber. He then admits about two to five females to his chamber (up to 19 females were admitted in one neotropical *Pityophthorus*). The females then push the frass resulting from their activity into the nuptial chamber. The male has the responsibility of ejecting their frass and of protecting the entrance hole. The function of each sex is about the same as in monogamous species. The advantage appears to be the greater speed and efficiency with which the host can be occupied. In addition, a portion of the more vulnerable attacking males can be lost to weather and predation without affecting the population. This polygynous habit occurs in Phloeosinini (some oriental *Phloeosinus*), Polygraphini, Scolytini (certain neotropical *Scolytus*), Ctenophorini (polygynous *Scolytodes*), Micracini, most Dryocoetini, Ipini, and Corthylini (except several monogamous forms and two species noted below). In most xylophagous Micracini, in *Pseudopityophthorus*, and in some neotropical *Scolytus* the male is always associated with two females; a different number may characterize other groups.

In consanguineous polygyny the males are incapable of flight and, consequently, they almost never leave the brood chambers. The deformed, dwarfed, haploid males attain sexual maturity and mate very early and usually die before they are fully colored. The sex ratio of the brood in these species ranges from about 3–50 females per male. Both mated and unmated females may attack the new host. Entwistle (1964) reported that in *Xylosandrus compactus* (Eichhoff) unmated females, and those that have exhausted their supply of sperm, produce only haploid males by facultative arrhenotokic parthenogenesis. The haploid males mate with either their mother or their sisters in order to produce diploid females (see also Norris and Chu

1970). Thus, an isolated female whether or not she has mated prior to isolation, is capable of colonizing a new area. Since both males and females have been observed to wander outside their galleries, it is apparent that some outbreeding might occur if they enter other galleries. Due to the recency of the discovery of the genetic mechanism, it is only speculation that male haploidy occurs in other tribes with consanguineous polygyny. This habit occurs in many Cryphalini (*Hypothenemus*, *Cryptocarenus*), in a few Dryocoetini (*Coccotrypes*, *Ozopemon*), in all Xyleborini, and in two species of Corthylini (*Araptus laevigatus* (Eggers) and *A. costaricensis* (Schedl)).

Reproduction by gynogenetic parthenogenesis was discovered in *Ips tridens engelmanni* Swaine by Hopping (1961, 1962) and was confirmed by Lanier and Oliver (1966). In this example it appeared as though the penetration of a sperm in the egg membrane is required to trigger a parthenogenetic response. Theylytoky, in which female offspring are produced with no participation of the male, has not been reported but almost certainly occurs in a few species such as *Bothrosternus foveatus* (Blackman), where males are unknown.

## Seasonal History and Development

MATE IDENTIFICATION.— In all monogamous and heterosanguineous polygamous species, the first step toward the production of a new generation, after the host has been selected and the new gallery is started, is the identification and admission into the gallery of one or more potential mates. The admitting sex has initiated the gallery and tightly blocks the entrance with its body in order to prevent the entry of a predator, parasite, or competitor. Mate identification to gain entry into the obstructed entrance may involve the exchange of sound stimuli (Rudinsky and Michael 1972), behavioral stimuli (Petty 1977), and, apparently, chemical stimuli, or a combination of two or more of these factors. Female *Diapus* (Platypodidae) have special mandibular processes that are shed after fulfilling a tactile function. Following mate identification, either a position for copulation is taken or else the chosen mate is admitted into the gallery.

MATING.— As indicated in the preceding section, a diverse social order has had its effect on mating behavior. In most species with heterosanguineous polygyny and in many phloeophagous monogamous forms (*Dendroctonus*, etc.) copulation takes place only after both sexes have entered the new gallery system. In these species it most commonly occurs while one member is in the nuptial chamber or turning niche and the other is in the entrance tunnel or at the entrance of an egg gallery. In this protected site it may occur repeatedly throughout the period of oviposition. In Platypodidae, *Scolytus*, *Trypophoeus*, *Procryphalus*, and probably in other monogamous groups, copulation occurs when the female is partly or wholly in the gallery, with her abdomen protruding above the surface, and the male is on the surface of the bark (Petty 1977). In the Platypodidae the male initiates excavation of the tunnel, but, following a courtship or identification ritual, he backs out of the burrow to admit her. Copulation then occurs and he follows her into the gallery (Browne 1961:38). In *Scolytus quadrispinosus* Say the female starts the burrow and, after mating occurs, the male may then enter the tunnel or go in search of another female (Goeden and Norris 1965:772). Males of *Scolytus* as well as *Trypophloeus* and *Procryphalus* (Petty 1977) commonly struggle for dominance by butting or pushing with the head until the loser is upset and falls from the bark. In *Cryphalus* mating may take place on the bark surface of either the brood or parental host (pers. obs.). Species with the consanguineous habit of polygyny have been observed on numerous occasions copulating in the brood chambers (pers. obs.).

EGGS.— Scolytid eggs are smooth, oval, white, translucent, delicate objects varying in size from one group to another (Fig. 4B). In certain small Hylesininae (*Carphoborus*) the egg may be almost one-third as large as the adult body; in larger species (*Dendroctonus*) they are proportionately much smaller. They vary in number in one gallery system from as few as 3 (*Corthylus*) to about 200 (*Dendroctonus*). The number of eggs apparently is smaller in ambrosia beetles and in those species inhabiting highly diverse tropical rain forests and greater in phloeophagous forms

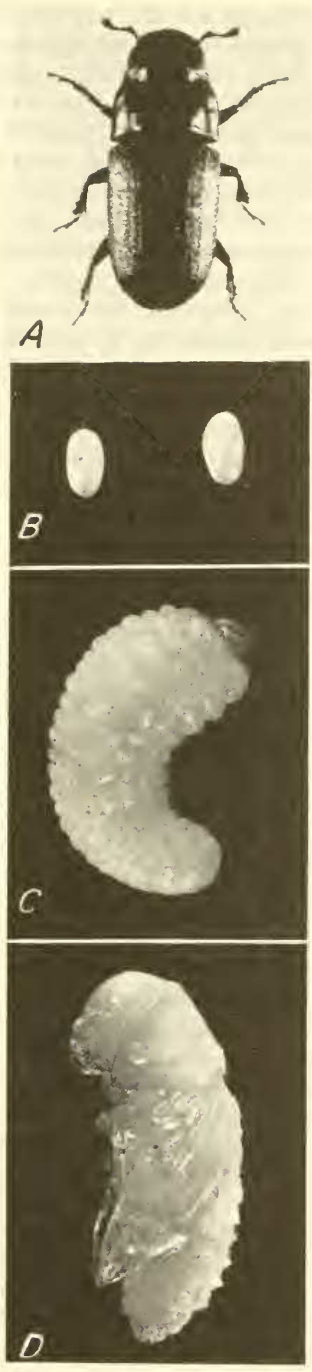



Fig. 4. The four life stages of *Dendroctonus brevicomis*: A, adult; B, eggs; C, larva; D, pupa. (After Keen 1955:3.)

that breed in temperate forests where large stands of one or few host species predominate. In some groups the eggs are deposited in clusters of about 4 to 20 (*Trypophoeus*, *Scolytodes*) or separately but packed in frass in the parental chambers (*Chaetophloeus*); in *Dendroctonus valens* LeConte (etc.) they are deposited in rows in long or short grooves; in most scolytid species they are deposited individually in specially prepared niches and packed in boring dust that is held together by a secretion presumably of oral origin (probably from the maxillary glands). Hatching may require from as little as 3 days (tropical *Scolytodes*) to as much as 30 days or longer (subarctic *Dendroctonus*). Variations in temperature may drastically alter the time required for incubation. Under ideal conditions the eggs of most species hatch in about 7 to 10 days.

LARVAE.— The larvae are white, legless grubs with lightly sclerotized heads (Fig. 4C). They do not change appreciably in form as they grow. Although studies by Thomas (1957) and Lekander (1968a) have greatly increased our knowledge, the larvae are poorly known and deserve considerably more study. The number of larval instars varies from two to five. Lekander (1968b) gives the following based mostly on European species: (a) those having five instars include *Chaetoptelius*, *Hylurgopinus rufipes* (Eichhoff), and *Dendroctonus micans* (Kugelann) (for a variety of reasons I suggest a reexamination of these species before five instars are accepted for any scolytid species), (b) four instars were reported for *Dendroctonus pseudotsugae* Hopkins and *D. simplex* LeConte, *Hylastes*, *Hylurgops*, and *Tomicus*; (c) three instars occur in all Ipini (except *Pityogenes hopkinsi* Swaine, which he suggests is an error), *Dryocoetes autographus* (Ratzeburg), *Pityophthorus*, *Xyleborus*, *Hylesinus*, and *Polygraphus*; and two instars in *Conophthorus*, *Crypturgus*, *Cryphalus*, and *Ernoporus*.

The length of the larval period varies from as little as 12 days (estimated for some tropical *Scolytodes*) to more than two years (arctic *Dendroctonus*). Under ideal conditions it ranges from about 30 to 90 days in most species. The larvae may feed in congress while extending the parental chamber (*Cnesinus*, *Scolytodes*, *Dendroctonus valens*), or they may form independent mines (*Ips*, *Pityophthorus*). Their tunnels may be long and tortuous (*Phloeoborus*, some *Phloeotribus*), or just

large enough to accommodate the adult body (*Pityoborus*, *Monarthrum*). Most *Xyleborus* and *Corthylus* larvae depend entirely on tunnels excavated by their parents.

PUPAE.— Usually, the end of the larval mine is enlarged slightly and cleared of frass to form a pupal chamber. In other forms the larva may bore into the wood (*Scolytus rugulosus*) or into the outer bark (*Dendroctonus approximatus* Dietz) before forming the pupal cell. The pupal stage (Fig. 4D) may range in length from about 3 to 30 days, but tends to average about 6 to 9 days under ideal conditions. It rarely is selected as an overwintering stage except in areas where the winters are very mild.

ADULT.— Upon transformation to the adult stage (Fig. 4A) the beetles may emerge immediately, even before becoming fully colored (*Scolytus*), or they may require a period of maturation feeding before emerging (some *Dendroctonus*, *Ips*). Many species fly from the brood host to a living host, where they excavate maturation feeding tunnels in living tissue before reaching reproductive maturity (*Scolytus multistriatus* (Müller), etc.). Others use this as an optional habit only when suitable host material is not immediately available for rearing their brood. After completing one gallery system it is not uncommon for the parent beetles to reemerge and construct a second, third, or fourth system of tunnels to produce an equal number of broods. A previously mated female will sometimes produce a second brood without the association of a second male, thus giving a false impression that parthenogenesis has occurred. A few old adults may survive the winter and participate in the production of the spring brood. However, a majority of the adults die in their tunnels after producing one brood. Chapman (1956) demonstrated that the flight muscles of parent adult *Trypodendron lineatum* (Olivier) deteriorate during oviposition and brood production, but regenerate later when flight is again required. Vité and Rudinsky (1957) present a technique for estimating the degree of maturity in each of the developmental stages of *Dendroctonus pseudotsugae*. The progressive appearance of various structures and pigmentation enabled them to estimate the approximate age of each developmental stage.

REPRODUCTIVE CYCLES.— As indicated in the preceding sections, scolytids are able to complete their life cycles in as little as 20 days or they may require at least two years. Temperature and moisture factors in the subcortical microclimate have a tremendous influence on life cycles and can radically shorten or prolong them. Some species, such as *Dendroctonus ponderosae* Hopkins, have one annual life cycle closely correlated with the seasons. Others may have two or more generations per year equally correlated with seasonal change. Many species, however, have a succession of overlapping generations complicated by the production of several broods from a given set of parents each year, as in *Polygraphus rufipennis* (Kirby). Even those species usually follow definite annual patterns of emergence, flight, etc. *Dendroctonus pseudotsugae* in the southern Rocky Mountains apparently has a life cycle out of sequence with the seasons, but has predictable outbreaks (Furniss 1965). In tropical areas cyclical activity in most forms is correlated with the dry and wet seasons and may be just as conspicuous as in temperate regions.

## PHEROMONES

Bark beetle pheromones, airborne long distance chemical messengers that announce to others of their species the location of host material or the availability of mates, have received much attention in the past decade. Since their main function is the coordination of activity in local populations, it has been supposed that they might also be used to disorganize normal behavior patterns and thereby achieve control of economically important species.

Pheromones have been reported in the Hylesinini (*Hylesinus*), Tomicini (*Dendroctonus*, *Pseudohylesinus*, *Tomicus*), Phloeosinini (*Phloeosinus*), Polygraphini (*Carphoborus*, *Polygraphus*), Scolytini (*Scolytus*), Ipini (*Ips*, *Pityogenes*, *Pityokteines*, *Orthotomicus*), Xyloterini (*Trypodendron*), Cryphalini (*Cryphalus*), and Corthylini (*Pityophthorus*, *Gnathotrichus*) (Borden and Stokkink 1971). They apparently have not been reported from any species with the habit of consanguineous polygyny.

The pheromone of male *Ips paraconfusus* Lanier consists of three terpene alcohols; I, (–)-2-methyl-6-methylene-7-octen-4-ol; II, (+)-*cis*-verbenol; and III, (+)-2-methyl-6-methylene-2, 7-octadien-4-ol (Silverstein, Rodin, and Wood 1966). Although none of these was an effective attractant alone, compound I in combination with either II or III was partially attractive. It is of interest that compound I was marginally attractive to *Ips latidens* LeConte, but I and II used together were highly attractive; the addition of compound III eliminated the response (D. L. Wood, Stark, Silverstein, Rodin 1967). Cameron and Borden (1967) report that female response to the male *I. paraconfusus* pheromone fluctuates with the season, being lowest in January (24.2 percent response) and highest in May and June (76.6 percent response). D. L. Wood and Bushing (1963) found that the *I. paraconfusus* pheromone appeared in the frass about 9–12 hours after males were introduced into preformed entrance tunnels. The substance is produced only after feeding commences, indicating that the precursor is ingested and metabolized or else that food activates specialized secretory cells; it is passed from the adult male in the fecal pellets (D. L. Wood, Browne, Silverstein, and Rodin 1966). Borden and Slater (1969) induced pheromone secretion by topical application of juvenile hormone, indicating that the pheromones are secreted. The sensilla trichodea on the antennal club are the olfactory recepters for these substances in *Ips* (Borden and Wood 1966).

As examples of how pheromones function, the following is included. The principal sex pheromone of female *Dendroctonus brevicomis*, exo-7-ethyl-5-methyl-6, 8-dioxabicyclo [3.2.1] octane, designated as *brevicomin*, occurs in the hind gut (Silverstein, Brownlee, Bellas, Wood, and Browne 1968). Males of this species produce as their chief pheromone 1, 5-dimethyl-6, 8-dioxabicyclo [3.2.1] octane, or *frontalin* (Kinzer, Fentiman, Page, Foltz, Vité, and Pitman 1969), this substance is the principal pheromone of female *D. frontalis* Zimmermann (Renwick and Vité 1969). In *D. brevicomis*, brevicomin attracts mostly males and frontalin attracts females (Pitman 1969). In addition to the above, the pheromone complex of both *D. brevicomis* and *D. frontalis* includes *trans*-verbenol in the females and verbenone in the males. (*Trans*-verbenol is a principal mass aggregating pheromone in female *D. ponderosae*.) In all three of these *Dendroctonus* species volatile components of host resin, in addition to one or more pheromones, were necessary to produce mass attack. In *D. frontalis* and *D. ponderosae* the terpene α-pinene was the most effective; in *D. brevicomis* α-pinene, β-pinene or myrcene used separately, or the latter two in combination were effective in combination with pheromones (Renwick and Vité 1970, Bedard, Silverstein, Wood 1970). In contrast to that seen in *Ips*, *D. frontalis*, and apparently in other *Dendroctonus* species, pheromone release may commence before breeding begins (Vité and Crozier 1968). In *D. frontalis* frontalin and *trans*-verbenol are released by the female immediately upon reaching the host tree. As boring commences the addition of α-pinene enhances their attractiveness, resulting in a mass attack in which males predominate about 3:1. As males arrive they produce verbenone, which reduces the response by other males. When the concentration of verbenone reaches a sufficiently high level the response of both sexes is inhibited and the attack then focuses on neighboring trees. In *D. brevicomis* the pattern is similar except that *trans*-verbenol does not appear to have a significant function. A small amount of frontalin is also released by female *D. brevicomis* and is highly attractive when combined with host resin (Vité and Pitman 1969). In *D. ponderosae* α-pinene attracts the pioneer beetles to the host. These females then produce *trans*-verbenol 12–16 hours after feeding commences, which, in combination with α-pinene, attracts large numbers of males and other females (Pitman, Vité, Kinzer, Fentiman 1968). Although the males produce brevicomin in substantial quantities, the function of this substance is not known in this species. The attraction stops when *trans*-verbenol and α-pinene production are discontinued (Vité and Crozier 1968). In *D. pseudotsugae* the pheromone frontalin, together with the monoterpene camphene, induces mass attack on Douglas fir (Pitman and Vité 1970). Two additional components of the *D. pseudotsugae* pheromone complex have been identified, namely

the ketone 3-methyl-2-cyclohexen-1-one and the alcohol 3-methyl-2-cyclohexen-1-ol, but their functions in communication have not been determined (Vité, Pitman, Fentiman, and Kinzer 1972).

Pheromones probably occur throughout the Scolytidae and play a vital role in the survival of species. They are an important isolating mechanism. The occurrence of various chemical substances and their biological function appears to follow definite patterns. A thorough knowledge of the composition of pheromones and their distribution within the family should greatly enhance our understanding of phylogeny within the family.

## ECONOMIC LOSSES

### Ecological Role in a Primeval Forest

In a primitive forest one of the greatest obstacles to continued growth is the recycling or removal of dead and dying plants. A slowing or stagnation in the removal of this material throws the entire ecosystem out of balance to the great disadvantage of most organisms contained in it. The Scolytidae breed principally in unthrifty, broken, overmature, and dying woody plants. Usually they are the first biological agents to attack these tissues. Not only do they consume the tissues of their hosts, but they introduce or provide avenues for the entry of other disease-causing or saprophytic agents that accelerate the deterioration of dead or dying plant material. The removal of these suppressed, stagnated, injured, diseased, unthrifty, and fallen trees opens the way to more vigorous growth of the surviving plants in a healthier forest community.

### Host Susceptibility to Attack

Trees differ significantly in their susceptibility to bark beetle attack depending upon their site, vigor, age, and physiology. Over a period of time these seemingly minor differences in susceptibility may alter the character of a forest, at least locally, or eliminate certain tree species from marginal sites.

It is generally recognized that trees growing on poor sites are more vulnerable to attack that those growing on choice sites. A conspicuous example is seen in certain arid areas of the western United States where trees growing on chronically dry sites rarely attain maturity before being killed by bark beetles. Wet sites, near the margin of moisture tolerance for the species, have a similar effect in other areas. Miller and Keen (1960:155) indicate in their summary of work with *Dendroctonus brevicomis* that slow-growing trees are attacked more readily than vigorous trees whether they are on a poor or a good site. They also report that considerably more beetles are required to kill a vigorous tree than one growing at a slower rate. In ponderosa pine fast growth, thick bark, and large heavy crowns are associated with this resistance. When there is an increase in the number of susceptible trees in a given area the bark beetle population is high; when there are few susceptible trees it is low. However, when the beetle population is high the degree of selection is reduced and previously resistant trees are also killed. Under epidemic conditions they report (p. 159) a tendency for the fast-growing trees to be attacked, except that in any age class the first trees attacked were either suppressed, showed evidence of injury, or had deteriorating crowns. Once these "key trees" were occupied, the attack spread to neighboring trees regardless of size, vigor, or other factors.

In view of the above, Keen (1936, Miller and Keen 1960:177) developed a system of ponderosa pine classification based on age and vigor in an effort to predict which trees were most likely to be attacked (Fig. 5). That system was replaced (Keen and Salmon 1942) by a more accurate, simplified risk rating that measured current tree health. Removal of all high risk (Class 4) trees in California did not result in greater infestation of trees in the remaining three classes (Miller and Keen 1960:187). In Oregon, only 67 percent of the predicted total volume of loss of high risk trees on a 640 acre plot were actually killed by insects over a five-year period; the removal of such trees resulted in a 90 percent reduction in infestation (p. 188). It must be recognized that sanitation salvage can be practiced only on well-managed forests with suitable access roads. There are also complicating factors that make it difficult to

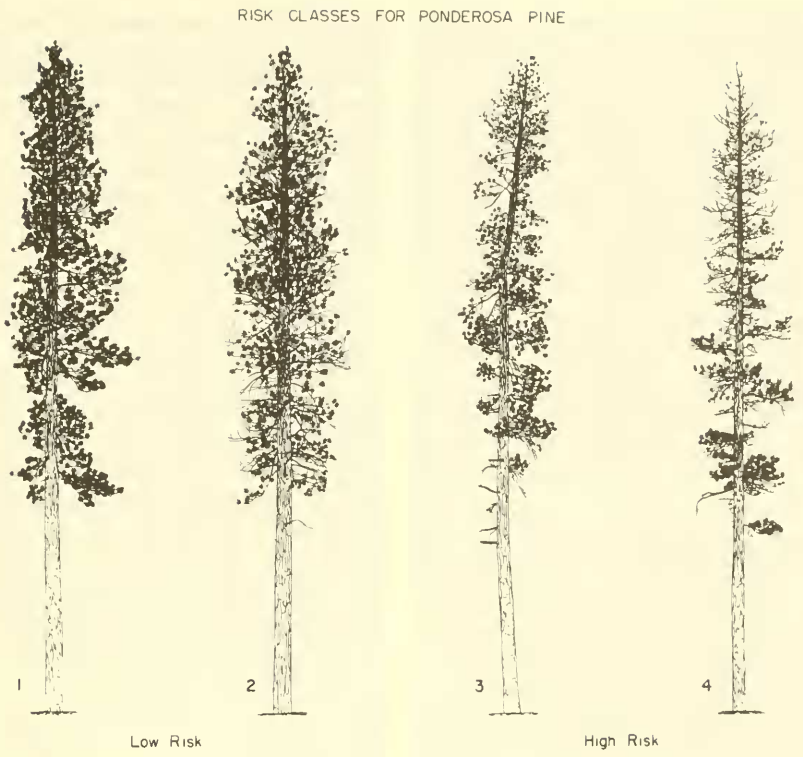



Fig. 5. The classes of risk in ponderosa pine to western pine beetle attack. No. 1, Low risk: full, healthy foliage, vigorous crown, dark green needles long and coarse, virtually all twigs with normal foliage, no weakened areas in crown. No. 2, Moderate risk: fair to moderately healthy crowns, with some imperfect areas, needle length average or above, color fair to good, some twigs and branches lack foliage but without definite weak areas. No. 3, High risk: crown health fair to poor, ragged or thin in some areas, foliage thin in some areas, needles shorter than average, their color fair to poor, some to many twigs and branches lack foliage or are fading or dead, with small, localized areas of crown weakened. No. 4, Very high risk: crowns ragged or thin, often with active insect infestations in upper areas, foliage thin or bunchy, needles short, sparse, color poor, parts of crown weakened, twigs and branches dead in some areas, active top-killing often evident. (After Miller and Keen 1960:183.)

apply the above California example to other tree species in different geographical areas.

Bark beetles differ in their ability to tolerate tree resins (Smith 1963). Individual trees also differ in the monoterpene composition of their resins (Smith 1966). In addition, Smith (1964) demonstrated that ponderosa pine trees being attacked by *Dendroctonus brevicomis* differed significantly in monoterpene content from neighboring trees not attacked by this species. From these and other data it is evident that host resistance to insect attack can be improved through plant breeding. Significant developments in this field are expected in the near future.

## Competition for Food

Other kinds of insects, in addition to Scolytidae and Platyodidae, feed upon the tissues of woody plants. Because of their small size and limited ability to cope with the altered microenvironment, bark and ambrosia beetles usually do poorly in competition involving robbery of the food source. Most species avoid conflicts by being the first to infest the unthrifty or dying tissue and rear their broods before the eggs of competitors hatch. Those scolytids with long life cycles and those arriving late at the host commonly experience difficulty in completing their development

without being subjected to the starvation or physical disruption that results from competition.

Round-headed borers (Cerambycidae) and flat-headed borers (Buprestidae) are the families of greatest concern. When abundant, larvae of these families may remove up to 75 to 95 percent of the phloem of a given tree (Blackman 1931:52). These larvae usually are considerably larger and live much longer than do the scolytids. When they encounter scolytid tunnels they consume all phloem tissues without deviating from their course and thereby destroy the occupants. Those that do escape often are unable to complete their development due to the changed phloem ecology.

Another kind of competition results from overcrowding by members of the same species. In most phloeophagous scolytid species the larval mines are independent of one another and never cross except under unusual circumstances. Often, when crowding is extreme, tunnels of larvae near maturity merge or cross and one is usually killed by the other. When young larvae are involved it is not uncommon for some of them to die in their separate individual mines without apparent cause. The resulting mortality benefits the total population by permitting at least part of them to attain maturity.

Several scolytid species, including *Carphobius arizonicus* Blackman, many *Micracisella* species, and other twig beetles often breed most commonly in small branches girdled by Cerambycidae. In most of these instances the scolytids complete their life cycle and emerge before the cerambycid larvae become large enough to be a factor in scolytid survival.

## Relation to Fire, Slash, and Natural Disasters

FIRE.— When properly controlled, fire has long been used in maintaining certain types of forest growth and it has been used to control and destroy broods in bark beetle infested trees.

Fire of sufficient intensity will destroy broods under the thin bark of some trees without burning the bark of the infested tree. Uninfested trees may be sufficiently dehydrated by the heat that their tissues are unsatisfactory for brood development. However, trees slightly injured by fire that ordinarily would recover from their injury often are highly attractive to bark beetle attack and may serve as the focal point of a developing epidemic. Broods in infested trees with thick bark are rarely injured by fire unless the bark is burned from the trees (Miller and Keen 1960:220).

Bark beetle species react differently to fire. *Dendroctonus ponderosae* and *D. valens* are reported to attack fire-injured trees almost immediately after the burn, but *D. brevicomis* is not attracted to the burn but concentrates on surrounding trees a year or two after the burn (Miller and Keen 1960:220, etc.). Certain buprestids and cerambycids that normally breed in drier tissues than do scolytids are much more abundant in fire-injured trees. In most instances, *D. pseudotsugae* is dependent for population buildup upon slash and trees that are windfallen, fire-injured, or damaged by other natural disasters. In Tillamook County, Oregon, a major fire in 1933 resulted in the loss of 200 million board feet of Douglas fir during the following three-year period due to *D. pseudotsugae* (Chamberlin 1939:83, Bedard 1950).

Following epidemics in which *Dendroctonus* beetles kill substantial numbers of trees, these dead snags constitute a forest hazard in the event that a fire occurs in the area. The presence of such trees greatly enhances the speed and intensity of the fire, making them a factor to be considered in forest protection.

SLASH.— Numerous species of insects, particularly bark and ambrosia beetles, breed in slash, cull trees, logs, and stumps. Most of those species breed only in slash and other dead material and are of no economic concern other than that they accelerate the deterioration of this dead plant material. In the larger material, however, they can create a definite problem in some areas. *Dendroctonus rufipennis*, *D. pseudotsugae*, *D. murrayanae* Hopkins, and, to a lesser extent, other species in this genus and most species of *Ips* normally breed in this material. Epidemics of these species, whether due to individual species or combinations of them, commonly are traced to an initial population

buildup in slash, stumps, and windfalls. The insects then turn to green timber when the supply of dying material is exhausted (Chamberlin 1939:84, Craighead 1927, Graham 1922, Hopping 1915, Patterson 1927).

In the tropical and subtropical areas of the world the most serious timber losses to insects result from the boring of ambrosia beetles (*Xyleborus*, *Monarthrum*, and Platypodidae) in logs either in the forest, in decking areas, or at the mill. Similar damage occurs in Oregon, Washington, and British Columbia by *Trypodendron lineatum* and *Gnathotrichus* spp. In the tropics swarms of ambrosia beetles often hover about while waiting for a tree being cut to fall and begin boring in before it is cut into logs. It is not uncommon for the sapwood to be so heavily infested that it is entirely discarded when the logs reach the mill. Populations of these ambrosia beetle species usually build up in small trees destroyed by logging road construction before felling begins, and in slash thereafter. Occasionally populations reach a level where green timber is killed, but such attacks are limited and of short duration; epidemics in green timber do not develop. Although statistics on losses in the American tropics do not exist, one major operator at Barinas, Venezuela, indicated that one-fourth to one-third of the total volume of logs reaching his mill was discarded due to ambrosia beetle damage by *Xyleborus ferrugineus* (Fabricius), *X. affinis* Eichhoff, *X. volvulus* (Fabricius), and *Platypus parallelus* (Fabricius).

NATURAL DISASTERS.— During severe thunderstorms, lightning may strike trees. These injured trees are favored breeding sites of several *Dendroctonus* and *Ips* species and may serve as a center from which epidemics develop. It is much more common for severe local winds to blow down large numbers of mature trees in which populations build up then move to green timber.

## RELATIONSHIPS WITH FUNGI AND DISEASE

Based upon numerous field observations and a few laboratory tests, it is apparent that most, if not all, Scolytidae are associated with fungi. The relationships evidently range from the most casual, or perhaps accidental, contact to intimate mutualistic bonds in which neither the fungus nor the beetle could survive without the other.

Some phloeophagous bark beetles, particularly such genera as *Carphoborus*, *Chaetophloeus*, and others that live in rather dry tissue, show little or no evidence of association with fungi. In other phloeophagous species and virtually all xylophagous forms, such as *Dendrosinus*, *Hylocurus*, *Micracis*, *Phloeoborus*, and *Thysanoes*, the tissues in the immediate vicinity of the tunnels are either discolored or in a state of decay far in excess of that found a few millimeters from the tunnels. It is suspected that the nutritional value of xylem is so low that fungi are required to modify it or synthesize other products from it before it can be used as a food source. In addition to those scolytids that use the host tissues as the primary food source, a composite assemblage of unrelated groups of ambrosia beetles culture fungi on their tunnel walls and use the spores as their primary food.

Bramble and Holst (1940) report that the fungus infestation in trees attacked by *Dendroctonus frontalis* Zimmermann includes a complex of species. The primary invasion that interferes with transpiration and kills the tree is by *Dacryomyces* sp. and *Zygosaccharomyces pini*. Later, *Ceratocystis pini* takes the lead in infesting the deeper sapwood and staining it blue to black. *Trichoderma lignorum* and *Monilia* spp. are present, but apparently are secondary invaders of host tissue. These blue stain fungi discolor infested wood, thereby reducing its value, but not its structural quality (Francke-Grosmann 1963). *Ceratocystis ips*, associated with *Ips calligraphus* (Germar), *I. pini* (Say), and *I. avulsus* (Eichhoff), has a similar effect on pine, as does *Trichosporium symbioticum* (brown stain), carried by *Scolytus ventralis* LeConte on *Abies concolor*.

Graham (1967) reviews the mutualistic relationships between fungi and scolytidae and lists the various genera involved.

The blue stain fungi are transported in special integumental sacs, termed mycetangia, by the female beetle. They are inoculated into living host tissue soon after the tunnels reach the cambium region. The mycelium grows very rapidly and interferes with the plant's transpiration. Although there may be some blockage of conducting vessels, other




Fig. 6. Oral mycetangia of a female *Dryocoetes confusus*; b, brain; fs, fungus spores; ms, mycetangial setae; my, mycetangia. (After Farris 1969:528.)

factors are involved that result in the rapid death of the host. This reaction in *Ulmus* to *Ceratocystis ulmi* (transmitted by *Scolytus multistriatus* (Marsham)) is known as Dutch Elm Disease, and the reaction of *Theobroma cacao* to *C. fimbriata* (transmitted by *Xyleborus ferrugineus*, etc.) is the wilt disease of cacao. These and other *Ceratocystis* species are associated with a wide variety of other bark and ambrosia beetles (*Hylurgops*, *Hylurgopinus*, *Orthotomicus*, *Xyleborus*, *Trypodendron*, *Gnathotrichus*) and produce somewhat similar effects on other plant species.

The scolytids' transmission of spores of their symbiotic fungi to their host is not a simple mechanical process. In many instances the spores are incapable of germination until they have passed through a definite period of maturation, which may include proliferation within the body of the beetle. As might be expected in any mutualistic relationship that has reached this level of dependency, the beetles have developed inflections of the body wall into which special glands discharge their nutrient secretions, where the spores are protected and preserved (Francke-Grosmann 1963). These mycetangia apparently have taxonomic significance relative to their location on the body and other features. They have been classified as:

1. ORAL MYCETANGIA.— Saclike pockets at the base of the mandibles beneath the epipharynx that open into the pre-oral cavity. They have been reported in *Dryocoetes confusus* Swaine (Fig. 6), *Xyleborus affinis*, *X. andamanensis* Blandford, *X. fornicatus* Eichhoff, and *X. velatus* Sampson.

2. PRONOTAL MYCETANGIA.— Saclike invaginations on the pronotum occur in *Dactylopalpus* and *Scolytoplatypus* and in numerous Platypodidae.

3. PROTHORACIC-PLEURAL MYCETANGIA.— These are saclike invaginations in the propleural area of the female. In *Trypodendron* (Fig. 7) and *Xyloterinus* they occur near the posterior margin; in *Bothrosternus* and *Phlocoborus* they are near the anterior margin; in *Dendroctonus brevicomis*, *D. frontalis*, and allied species they open at the anterior margin in the cervical membrane.

4. PROSTERNAL-SUBCOXAL MYCETANGIA.— The coxal cavities have enlarged areas (Fig. 8) where spores proliferate in *Gnathotrichus retusus* (LeConte), *G. sulcatus* (LeConte), *Monarthrum mali* (Fitch), and *M. fasciatum* (Say). From superficial examination it appears that all xylomycetophagous Corthylini have similar mycetangia.

5. PRO-MESONOTAL MYCETANGIA.— A pair of invaginations in the intersegmental membrane may be (a) overlapped by and extended beneath the posterior area of the pronotum, as in *Xylosandrus germanus* (Blandford); (b) curved so as to lie beneath the anterior part of the mesonotum, as in *Xyleborus dispar* (Fig. 9); or (c) the mesonotum may be

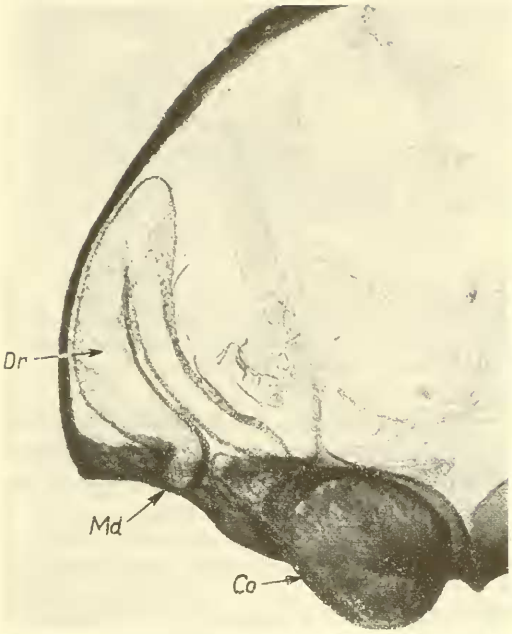



Fig. 7.—Prothoracic pleural mycetangia of a female *Trypodendron lineatum*: Co, procoxa; Dr, mycetangium; Md, orifice of mycetangium. (After Francke-Grosmann 1956:117.)

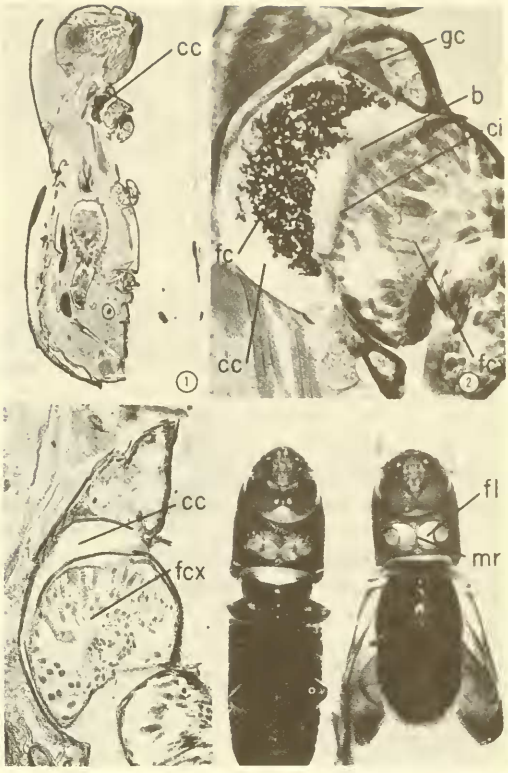



Fig. 8. Prosternal-subcoxal mycetangia of female *Monarthrum scutellare*. (After Farris 1965:31.)

involuted to form a spiral mycetangium, as in *Eccoptopterus spinosus* (Olivier).

6. ELYTRAL MYCETANGIA.— A cavity in the anterior margin of the elytra near the scutellum, which is supported by a cluster of setae surrounding the cavity, occurs in *Xyleborinus saxeseni* (Ratzeburg) (Fig. 10) and, apparently, in all other representatives of that genus.

## INTRODUCED SPECIES

The geographical distributions of animal species are not constant, but expand or contract in response to various natural fluctuations in the environment. In addition, interaction between species may offer unexpected opportunities for range expansion. For example, human commerce has had a conspicuous effect on the distribution of many Scolytidae (Marchant and Borden 1976). The extent to which commerce has affected the North and Central American fauna is summarized by Wood (1977).

Thirty-seven species were introduced to North and Central America and established as breeding populations from an Old World source (Table 3). Of these, 7 were of European origin, 13 were from Africa, and 18 were from southeast Asia (including Indonesia and neighboring islands). It is of interest that 31 of the 37 can reproduce by facultative arrhenotocic parthenogenesis, a means by which an unmated female can establish a breeding population. Only two of these 37 are known to have been introduced more than 100 years ago. Of the 6 bisexual species, 4 were introduced more than 100 years ago.

Of 25 North of Central American species that have extended their ranges within or beyond this area (including the adjacent islands), 17 of them have reached areas in the Old World (including Hawaii). Of these 17, 11 can reproduce by facultative arrhenotocic parthenogenesis. It is not known that any of these 25 reached a non-American area (or Hawaii) prior to 1900. Only 3 of the 8 species that have extended their ranges in America, but have not reached an area outside the Western Hemisphere, have this reproductive habit.

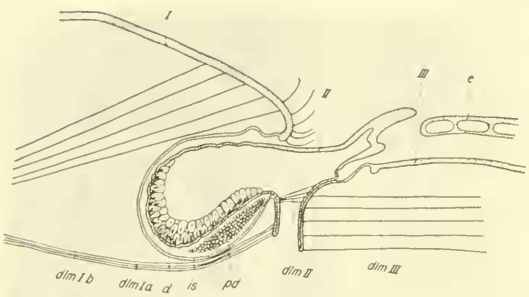



Fig. 9. Promesonotal mycetangium of female *Xyleborus dispar*: I, pronotum; II, scutellum; III, metanotum; e, elytra; is, mycetangium; d, mycetangial gland; pd, spores in mycetangium. (After Francke-Grosmann 1956:288.)

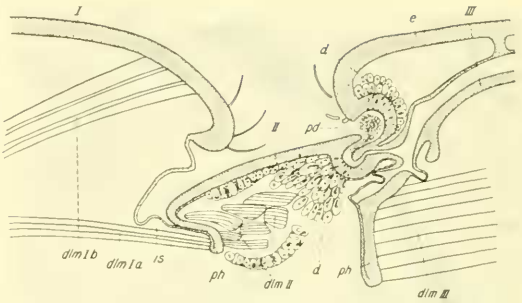



Fig. 10. Elytral mycetangium of female *Xyleborinus saxeseni*: I, pronotum; II, scutellum; III, metanotum; e, elytra; d, mycetangial gland; pd, spores in mycetangium. (After Francke-Grosmann 1956:290.)

It is apparent from the above that many bark and ambrosia beetles have extended their ranges through commerce and that those species having the facultative arrhenotocic parthenogenesis reproductive habit are most likely to successfully establish extraterritorial breeding populations.

TABLE 1. Breeding populations of Scolytidae introduced into North or Central America from a non-American origin. The species are listed alphabetically.

| Species | Origin | Introduced to |
|---|---|---|
| *Coccotrypes aciculatus* | New Guinea | Panama, Brazil |
| *Coccotrypes advena* | SE Asia, Indonesia | Florida (?) to Brazil |
| *Coccotrypes carpophagus* | Africa? | Florida to S America |
| *Coccotrypes dactyliperda* | Africa? | USA to S America |
| *Coccotrypes distinctus* | Ceylon? | Florida to S America |
| *Coccotrypes cyperi* | SE Asia | Florida to S America |
| *Coccotrypes rhizophorae* | Indonesia | Florida, Galapagos Islands |
| *Crypturgus pusillus* | Europe, Asia | E North America |
| *Hylastinus obscurus* | Europe | Canada, USA |
| *Hypocryphalus mangiferae* | India | Florida to S America |
| *Hypothenemus aequaliclavatus* | Indonesia | Honduras, Jamaica |
| *Hypothenemus africanus* | S Africa | USA to S America |
| *Hypothenemus areccae* | SE Asia | Florida to S America |
| *Hypothenemus birmanus* | SE Asia | Florida to C America |
| *Hypothenemus brunneus* | Africa? | USA to Trinidad |
| *Hypothenemus californicus* | Africa? | USA to Mexico |
| *Hypothenemus columbi* | Africa? | USA to S America |
| *Hypothenemus crudiae* | SE Asia? | USA to S America |
| *Hypothenemus cylindricus* | Africa? | Mexico to S America |
| *Hypothenemus erectus* | Africa? | USA to S America |
| *Hypothenemus hampei* | Africa | C, S America |
| *Hypothenemus javanus* | Africa? | Florida to S America |
| *Hypothenemus setosus* | Africa? | Mexico to S America |
| *Premnobius cavipennis* | Africa | Florida to S America |
| *Premnobius ambitiosus* | Africa | (C?) S America |
| *Scolytus mali* | Europe | E North America |
| *Scolytus multistriatus* | Europe | N America |
| *Scolytus rugulosus* | Europe | N, S America |
| *Xyleborinus saxeseni* | Europe | N, S America |
| *Xyleborus dispar* | Europe | N America |
| *Xyleborus fornicatus* | SE Asia | Panama |
| *Xyleborus rubricollis* | SE Asia | E North America |
| *Xyleborus validus* | SE Asia | New York |
| *Xylosandrus compactus* | SE Asia | Florida, S America |
| *Xylosandrus crassiusculus* | SE Asia | South Carolina, Hawaii |
| *Xylosandrus germanus* | Japan | E North America |
| *Xylosandrus morigerus* | SE Asia | Mexico to S America |

TABLE 2. Breeding populations of North and Central American Scolytidae that have extended their ranges in America or have been exported to an Old World area. The species are listed alphabetically.

| Species | Origin | Exported to |
|---|---|---|
| *Araptus politus* | Mexico, C America | Florida, Antilles |
| *Corthylus spinifer* | C, northern S America | Florida, Brazil |
| *Cryphalomorphus jalapae* | Mexico | Worldwide (ephemeral) |
| *Cryptocarenus heveae* | C, S America | Florida, Africa |
| *Cryptocarenus seriatus* | S America | Florida, Antilles |
| *Dendroctonus frontalis* | USA | Honduras |
| *Gnathotrichus materiarius* | USA | Europe |
| *Hypothenemus eruditus* | Tropical America? | Almost worldwide |
| *Hypothenemus obscurus* | Tropical America | Intercepted worldwide |
| *Hypothenemus parallelus* | Mexico | Hawaii |
| *Hypothenemus pubescens* | Tropical America? | Florida, Hawaii |
| *Hypothenemus seriatus* | Tropical America? | USA, Africa, etc. |
| *Ips grandicollis* | N America | Australia |
| *Microborus boops* | C America | Africa, Jamaica |
| *Pagiocerus frontalis* | S America | SE USA |
| *Phloeosinus cupressi* | California | Panama, Australia |
| *Phloeosinus serratus* | W USA | Jamaica |
| *Pityophthorus juglandis* | Arizona | California? |
| *Xyleobrinus aspericauda* | C, S America | Florida |
| *Xyleborus affinis* | Tropical America | Africa, Hawaii to Malaya |
| *Xyleborus ferrugineus* | Tropical America | Africa, Hawaii to Australia |
| *Xyleborus obliquus* | Puerto Rico? | USA, Africa |
| *Xyleborus spinulosus* | Tropical America | Hawaii |
| *Xyleborus volvulus* | Tropical America | Africa, Hawaii to Malaya |
| *Xyleborus xylographus* | Eastern N America | California |

## CONTROL

### Losses Attributed to Scolytidae

In a natural forest the Scolytidae perform a vital role in the maintenance of vigorous growth and in the recycling of dead plant tissue. However, their activities come in direct conflict with man when he diverts forest products for use in his economic or cultural system.

The economic effect of Scolytidae ranges from beneficial values to enormous economic loss. Those species that confine their attacks to shaded-out branches on living trees, such as *Carphoborus*, *Pityoborus*, some *Pityophthorus*, etc., accelerate a natural pruning process that is usually beneficial to vigorous tree growth and reduces the fire hazard. Natural thinning of suppressed, wind-thrown, broken, and injured trees also tends to be beneficial in a similar manner except in those cases where such material can be removed and utilized; *Pityophthorus*, *Xylechinus*, *Pseudohylesinus*, *Pityogenes*, some *Ips*, and various ambrosia beetles are the principal genera involved in a coniferous forest. Such species become an economic problem when commercial logs are attacked. The destruction of cones in *Pinus* by *Conophthorus* is of marginal importance unless rapid reproduction or other use of seed is important. The destruction or injury of living twigs in *Pinus* by certain *Pityophthorus*, etc., may have a comparatively unimportant stunting effect on growth, but, more importantly, they may weaken the trees sufficiently to make them vulnerable to aggressive tree-killing species and may transmit plant diseases. The major conflict between scolytid activity and human interests is directed in a natural coniferous forest at the removal of overmature trees or stagnated growth and involves mostly *Dendroctonus* and *Ips* species. In deciduous and tropical forests very different conditions prevail. The transmission of disease (Dutch Elm Disease, etc.) or the activities of ambrosia beetles in logs may cause the principal economic effect.

The actual monetary loss caused by bark and ambrosia beetles is unknown. Tree mortality caused by bark beetles in North America probably exceeds that of all other agents combined, including fire (Massey 1974).

Values given in the literature vary from author to author and probably are not entirely reliable; however, there is some agreement on the most destructive forms. It is estimated that *Dendroctonus brevicomis* destroys an average of more than two billion board feet of standing timber each year; *D. ponderosae, D. rufipennis, D. frontalis,* and perhaps *D. pseudotsugae* each average about one-half billion board feet annually. Other *Dendroctonus, Scolytus,* and *Ips* species inflict lesser but significant losses in coniferous forests. No measure of losses to fruit trees by *Scolytus rugulosus,* to elm trees by *S. multistriatus,* to forage crops by *Hylastinus obscurus,* to ornamental and horticultural plants by *Xylosandrus compactus,* or to coffee by *Hypothenemus hampei* has been attempted, but the value is immense. Less spectacular losses caused by numerous other species in the temperate region could be cited.

Economic loss caused by scolytids in tropical areas is usually less spectacular and not as easily measured as in temperate areas. It includes the destruction of commercial logs within days after they are cut, by ambrosia beetles; the destruction of seeds and fruits by seed borers; the transmission of disease, such as the wilt disease of cacao, by ambrosia beetles; and the reduction of growth and productivity by twig borers, etc., at much more intensive rates and on a scale not seen in northern areas. Mass attacks on healthy trees are virtually unknown. The damage is much more subtle and difficult to assess.

## Natural Control

Bark and ambrosia beetle populations in nature fluctuate enormously from one season to another and from year to year. These fluctuations may be correlated with life cycle, with biological opportunity, or with other factors inherent in the population or in the environment. All organisms have the capacity to reproduce at a rate greater than is necessary to perpetuate the race. If any species were to reproduce at its maximum potential rate, it would completely destroy its food supply and severely disrupt the biotic community in which it lives after only a very few generations. Natural factors within the community counteract the biotic potential to maintain populations at a more or less constant but fluctuating level.

Factors such as climate, weather, health and vigor of the host population, and natural disasters have a significant effect on insect populations and, at times, have a controlling effect on them. In addition, biotic factors have a more subtle, but often a more constant and significant effect in reducing or controlling populations. These factors include insect parasites and predators, predaceous mites, insectivorous vertebrate animals, nematode parasites, and disease. A prime objective in forest management should be the encouragement of these indigenous enemies in order to reduce the length and intensity of bark beetle epidemics or, possibly, to prevent them from developing. In some instances they have destroyed more than 90 percent of the bark beetle brood in a given generation.

INSECT PARASITES.— Various species of Lonchaeidae (Diptera) are found in bark beetle tunnels and are regarded as parasites (technically they actually may be predators).

Among the Hymenoptera, the families Brachonidae (*Atanycolimorpha, Atanycolus, Bracon, Callihormius, Cenocoelius, Chelonus, Coeloides, Colastes, Cosmophorus, Cryptoxilos, Dendrosoter, Doryctes, Ecphylus, Eubadizon, Glyptodoryctes, Helconidea, Heterospilus, Opius, Orgilus, Paraecphylus, Russellella, Spathius, Triaspis, Vipio*), Bethylidae (*Cephalonomia, Scleroderma*), Chalcidadae (*Trigonura, Perniphora*), Diapriidae (*Cinetus*), Encyrtidae (*Microterys*), Eulophidae (*Entedon, Pediobius, Tetrastichus*), Eupelmidae (*Eupelmus, Eusandalum, Metapelma*), Eurytomidae (*Eurytoma, Ipideurytoma*), Gasteruptiidae (*Autacus*), Ichneumonidae (*Aplomerus, Campoplex, Dolichomitus, Gambrus, Gelis, Helcostizus, Neoxorides, Odontocolon, Xorides*), Mymaridae (*Ooctonus, Polynema*), Podagrionidae (*Euchrysia*), Proctotrupidae (*Cryptoserphus*), Pteromalidae (*Acerocephala, Amblymerus, Caudonia, Cecidostiba, Cheiropachus, Coelopisthia, Dipachystegma, Elachertodomyia, Habrocytus, Halicoptera, Heydenia, Hypopteromalus, Psilocera, Psilonotus, Pteromalus, Rhaphitelus, Rhopalicus, Theocolaxia, Tomicobia*), and Torymidae (*Liodontomerus, Roptrocerus*) were listed by Bushing (1965) as containing species parasitic on Scolytidae.

The Pteromalidae genus *Karpinskiella* is unique in that it parasitizes adult scolytids.

*Coeloides dendroctoni* Cushman (Brachonidae), an important parasite of *Dendroctonus ponderosae* in Montana and Washington is selected as an example of the parasitic Hymenoptera. The mated adult female wasp flies to a tree attacked the previous August where the host scolytid larvae are now about half grown (DeLeon 1935a). As she crawls over the surface she uses her antennae to detect the movement of a larvae. Once a larva is located she positions herself on the bark then inserts her ovipositor in the bark, pierces the larval cuticle, then deposits one egg on the surface of the larva. The egg hatches in 1 to 4 days by which time the host larva becomes inactive and appears paralyzed (apparently the result of something introduced by the female parent). The newly hatched parasite crawls over the surface of the paralyzed host until it finds a suitable place to feed. It then punctures the host cuticle and sucks up the fluid that exudes. Growth requires about 10 days. The pupal cocoon may be spun immediately after growth is completed or it may be delayed up to 60 days. The pupal stage may require about two weeks or it may serve as the overwintering stage. Two to two and one-half generations per year may occur, with three principal periods of emergence distributed from late May to late August (DeLeon 1935a).

INSECT PREDATORS.— The coleopterous families Cleridae, Colydiidae, Cucujidae, Elateridae, Histeridae, Nitidulidae, Rhizophagidae, Staphylinidae, and Trogositidae are reported by Chamberlin (1939) as major predators of Scolytidae. The Othniidae and the genus *Hypophloeus* of Tenebrionidae may also function as important predators.

The dipterous genus *Medetera* (Dolichopodidae) is an unusually important predator during its larval stage. The adults of *Medetera aldrichii* Wheeler tend to congregate on the surface of trees recently attacked by *Dendroctonus ponderosae* (DeLeon 1935b). The females place single or small clusters of eggs under small scales of bark on the surface of the trees. In 10 to 14 days the eggs hatch and the young larvae move to the inner bark, where they feed on eggs, larvae, and pupae of the host. Other small insects are also acceptable prey. The larval period apparently may vary from 1 to 11 months. Pupation occurs in a silken cocoon beneath the bark and requires about 14 to 17 days. Adults apparently emerge through beetle exit holes, cracks in the bark, etc. It was estimated by DeLeon (1935b) that 40 to 50 percent of the bark beetle brood was killed by this species in Montana and Washington.

Many other predaceous insects may prey upon adult bark beetles during the flight period and some may significantly reduce populations. For example, a heavy attack by *Xyleborus spathipennis* Eichhoff in Costa Rica was virtually eliminated by ants as the beetles attempted to begin new galleries (pers. obs. 1966).

MITE PREDATORS.— The extent to which mites prey upon scolytids is not fully known. Moser and Roton (1971) reported 96 species of mites associated with *Dendroctonus frontalis*, of which 3 (*Iponemus*, Tarsonemidae) are known predators and several others are suspected predators. Lindquist (1969) reviewed 18 species of *Iponemus*, 16 of which are considered egg parasites of Scolytidae. Kielczewski (1976) reported more than 170 species of mites associated with 57 species of bark beetles in Poland; the ecological role of most of them is not yet known. Many of the mites are phoretic and are carried from one host to another by the beetles.

Female *Iponemus* mites are phoretic on the emerging brood of the bark beetle tribe Ipini. In the new tunnel the previously mated mite leaves the beetle and crawls along the egg gallery until it locates a niche containing a newly deposited egg. The mite enters the niche and the beetle seals it in with the egg with a plug of tightly packed frass. It apparently is not possible for a mite to enter an egg niche after the frass plug is in position. After piercing the cuticle of the egg, the mite engorges on its contents, causing her idiosoma to swell into a sphere. Engorgement continues until the sphere is approximately equal in size to the host egg (about 0.5 mm). About two days later egg laying commences and continues for several days. Her body then turns dark, becomes flaccid, and dies. Approximately 40 to 80 eggs may be produced by each mite; these usually form a cluster

about her body. The mite larvae emerging from the eggs apparently require no food and rarely move. The larvae, slightly larger than the unengorged parent, apparently derive energy from the fat content of their own bodies. They pass into an inactive, turgid "pupal" stage without molting, from which they emerge as adult mites. Males emerge first and mate with females as they emerge. The females are very active and disperse from the maternal sphere after mating. About two weeks are required for development.

INSECTIVOROUS VERTEBRATES.— Of the forest birds, woodpeckers stand alone as the important predators of bark beetles. They are particularly conspicuous during epidemics, where they have been reported to destroy up to 75 percent of the beetle population (Massey and Wygant 1954:18). Their feeding activity accelerated drying of the bark and resulted in the mortality of far more bark beetles than were eaten. Miller and Keen (1960:92) report the reduction of a *Dendroctonus brevicomis* population in California on ponderosa pine of 73 percent and in Oregon of 72 percent on trees heavily worked by woodpeckers; however, only a small percent of the infested trees were heavily worked by woodpeckers.

Amphibians, reptiles, and mammals (particularly rodents) will feed voraciously on bark beetles and their larvae when the bark is peeled from a tree. Under normal circumstances, however, they feed on them only incidentally during the flight period except for those species (*Ips, Trypodendron*) that overwinter on the forest floor.

NEMATODE PARASITES.— Massey (1974) summarized the biology and taxonomy of nematode parasites associated with bark beetles. Of 33 species of beetles examined in quantity, 31 were infested by nematodes. He found that the rate of infestation varied within any population (0 to 90 percent) and fluctuated in a given area from one year to another (15 to 80 percent). The reasons for the fluctuations are not known. A majority of the nematodes are carried from one host to another beneath the wing covers, in the intersegmental folds of the abdomen, and on the tarsal and tibial joints of the legs. Most of them are obligate parasites and usually do not kill the host.

The nematodes are either oviparous or ovoviviparous. Immature stages are deposited in the beetle egg galleries by infested beetles. Males develop to maturity in the tunnels and impregnate immature free-living females. Immediately after mating the impregnated females penetrate the cuticle and enter the body cavity of the host, which is a larva in about the second instar. Eggs or larvae are released into the body cavity, following which the young larvae penetrate the gut and are then eliminated with the fecal material. The nematode life cycle is usually synchronized with that of the host, so both attain maturity at about the same time.

DISEASES.— Although many viruses or polyhedral diseases are known for insects, none have been studied in the Scolytidae. Numerous fungal organisms, some of which may be pathogenic, have been observed on scolytids, but their effect on a population is unknown.

## Applied Control

A forest is a living, dynamic community that may change dramatically in response to fluctuations and modifications of environmental factors. As indicated previously, in a natural forest bark and ambrosia beetles play an important role in maintaining the health and vigor of the trees by removing stagnated growth and by accelerating the recycling of dead material. Because their natural function in a managed forest usually conflicts with human interests, however, they are transformed from a beneficial to a destructive element. As such, they are regarded in North America as the most destructive natural biotic factor to standing timber in a managed forest, exceeding the combined total of all other factors, including fire, by a wide margin (Massey 1954). A tree that has been attacked by bark beetles usually cannot be saved.

CONTROL BY MANAGEMENT.— It must be assumed that endemic populations of bark and ambrosia beetles are always present in a forest. Since, under endemic conditions, the beetles breed in unthrifty, injured, broken, wind thrown, or felled material, means must be found to maintain the health and vigor of the

stand if damage is to be reduced or avoided. Vigor might be restored to stagnated young stands by a solution as simple as thinning or to older stands by the removal of overmature trees. In other situations the problem may be much more complex and appropriate action may require extensive knowledge of the ecology and population dynamics of the beetle species as well as of the climate, weather, site, and other factors.

In ponderosa pine forests in western North America, *Dendroctonus brevicomis* is the principal destructive species. Under endemic conditions it breeds in unthrifty or injured standing trees; it rarely breeds in down material unless it is elevated well above the ground. With this knowledge Keen (1936) analyzed age and vigor tree groups and developed a risk rating technique that made it possible to identify with reasonable accuracy those trees that would be attacked by the beetles (Fig. 5). The removal of the high risk trees in a managed area reduced remarkably both the frequency and intensity of epidemics. Epidemics that followed were triggered by prolonged drought or other uncontrollable factors (Miller and Keen 1960).

Similarly, *Dendroctonus pseudotsugae* is the principal destructive species in Douglas fir in western North America. Endemic populations breed in broken, wind thrown, or felled trees (Rudinsky 1966). Removal of these susceptible trees generally prevented the development of an epidemic. The habits of *D. rufipennis* in spruce are apparently similar (Massey and Wygant 1954), and similar results are obtained with sanitation salvage (Schmid 1977).

The removal of potential breeding material from a forest, orchard, or isolated ornamental tree to lessen or eliminate bark or ambrosia beetle attack is applicable to almost any host or geographical situation. The practice in some circumstances may become more effective if the material is allowed to become infested before it is removed. However, in order for this latter technique to be effective, greater knowledge of the habits and behavior of the insects is required and thorough destruction of infested materials must be assured or the intended control could lead to a disastrous epidemic.

SURVEYS.— Losses caused by bark beetles usually involve individual trees or clusters of trees irregularly distributed in the forest. Because forests contain vast acreages of trees from which economic return is minimal, insect surveys are made to locate infestations in their early stages, to appraise their potential destructiveness, and to determine the need for direct control. They are used to diagnose and to predict the economic impact a developing epidemic might have. The results provide information useful in direct control and also contribute to our understanding of these insects in nature.

In evaluating populations it is important to know whether an endemic or an epidemic condition exists and, if epidemic, whether the population is increasing or decreasing. Endemic conditions prevail when natural control factors (climate, weather, predators, parasites, disease) hold the population at a more or less constant level at which damage is normal. Epidemic conditions exist when damage exceeds normal limits. With *Dendroctonus brevicomis*, endemic losses are those equal to less than annual tree growth, epidemic when losses exceed annual growth.

Bark beetle surveys are of two kinds. First, detection surveys locate potential epidemics or locate newly established foreign species and establish changes in their distributions; accurate identification of the species encountered may be all that is required. Second, evaluation surveys determine (a) the extent and intensity of the infestation, (b) infestation trends, (c) current and expected damage, (d) need for direct control, and (e) effectiveness of direct control. Evaluations are made directly by measuring the quantity and vigor of the beetle population or indirectly by measuring tree mortality or other damage caused by the beetles. Because of the ease with which it is measured, damage has been used much more commonly in the past, but currently population trends are considered a more reliable indicator in assessing the need for control. Conditions that trigger epidemics, such as wind throw, are also assessed.

Both aerial and ground surveys may be used. Aerial surveys usually require less time, effort, and expense. They may be made visually or with the aid of photography, using various types of film or lens filters that

accentuate features of dead and unthrifty trees (based on the amount of heat radiated). Aerial surveys are usually supplemented by ground surveys when irregularities or suspected embryonic epidemics are encountered. Aerial photographs may make possible the detection of infested trees not recognizable to the unaided eye that can then be located and examined during a ground survey. They also accelerate the speed and efficiency with which ground surveys can be carried out and provide a permanent record which can be reexamined later.

DIRECT CONTROL.— Most of the bark beetle control applied in American forests is directed at members of the genus *Dendroctonus*. The first attempt involved *D. ponderosae* in the Black Hills of South Dakota in 1906. Direct control refers to any attempt to reduce populations by artificial means. Its objective is to reduce bark beetle populations to a point where economic damage is reduced or eliminated. It is used as a last resort when natural and cultural control fail.

Surveys provide the biological and economic data on which direct control decisions are based. First, they identify the insect as one capable of posing an economic threat. Second, they determine that the stand is composed of species and age classes that might sustain an epidemic in trees of economic value or that might threaten an adjacent area of economic worth. Third, they determine whether the insect is endemic or epidemic and, if epidemic, whether the trend is up or down. A decision relative to the necessity for direct control and the methods and extent to which it will be carried out are based on these data.

Several methods of direct control have been used successfully to reduce bark beetle poulations. The method selected depends upon (a) the habits of the beetle, (b) the thickness of bark, (c) the size of the infested trees, (d) the height of the infestation, (e) the forest type, (f) the accessibility to roads, and (g) public pressure. These methods include the following (summarized from Rudinsky 1960, 1978).

1. *Salvage*: Infested trees are felled and removed from the forest before brood matures. To be successful, access roads are essential and the infested material must be removed beyond the flight range of the beetle or else the bark and outer slabs must be treated or destroyed. The expense of a salvage operation usually far exceeds the value of the salvaged timber.

2. *Fell, peel, burn*: This is the oldest method of direct control. It is still in use in areas where chemical control is not feasible. Infested trees are felled, the upper infested bark is peeled then piled along the trunk and fired. It is used particularly in those species where the brood is not exposed on peeled bark at the time the operation is carried out, such as *Dendroctonus brevicomis*. The cost of this method is comparatively high ($4.40 per tree for 62,437 trees, according to Keen 1952).

3. *Fell, deck, burn*: Infested trees are felled, piled in layers that alternate at right angles in direction, then fired. The method is used when infested trees are comparatively small, such as with *Dendroctonus ponderosae* in lodgepole pine. Care must be taken to position fires in open areas where healthy trees will not be scorched, thereby making them susceptible to beetle attack. It may also be necessary to treat the stumps of felled trees to prevent a population buildup in them. The cost per tree is about half that of the fell, peel, burn method.

4. *Oil burning*: This method was developed to treat thin-barked standing trees, such as *Dendroctonus ponderosae* in lodgepole pine. The infested bark on the bole of standing trees is sprayed with slow-burning fuel oil and fired. Because of the limitations of spray equipment, tall trees must be felled for effective treatment of the upper bole. Great care must be exercised to avoid scorching green trees. Careless treatment can precipitate a greater epidemic than the one being treated. Keen (1952) reported the cost of treatment per tree at $0.68 to $1.05.

5. *Peeling*: The infested bark of either standing or felled trees is peeled to expose broods to desiccation and to predation by rodents, ants, etc. It is effective only when the brood is exposed on peeled bark, such as with *Dendroctonus ponderosae* and *D. pseudotsugae*.

6. *Solar-heat*: The infested trees are felled, limbs are removed, and the log is positioned so as to receive maximum radiation from the

sun. In areas where air temperature exceeds 24–26 C (75–78 F), subcortical temperature exceeds 43–51 C (110–123 F), which is lethal to bark beetle larvae (see High Temperature under Hibernation and Estivation, above). Logs must be turned after exposure for several days for the temperature to reach lethal levels on all surfaces. This method was used successfully on *Dendroctonus ponderosae* on lodgepole pine.

7. *Trap trees*: Freshly felled or girdled standing trees may attract bark beetles to a treatment area, where their destruction is carried out. This method met with limited success when applied to *Dendroctonus rufipennis* (Massey and Wygant 1954), but with little or no success with *D. brevicomis* (Miller and Keen 1960).

8. *Drowning*: The storing of infested logs in mill ponds has control value if the logs are submerged six weeks or longer then turned so as to submerge the upper area for an additional period of time. The exposed surface may also be treated with a chemical. This method has also been used to prevent infestation of logs by ambrosia beetles.

9. *Chemical control*: Insecticides applied as sprays in a fuel oil carrier have been used extensively for bark beetle control. Chemicals used include orthodichlorobenzene, benzene hexachloride, ethylene dibromide, and chlorodane. These have been used in various concentrations at the rate of about four fluid ounces per square foot of bark or until the spray begins to run off. They are most effective when air temperatures exceed 16 C (60 F). Although chemical control is the most effective and least expensive means of bark and ambrosia beetle control, the chlorinated hydrocarbons used have had an adverse effect on birds and other wildlife, due to biological magnification in the ecosystem. Due to public pressure to conserve the wildlife, their use has declined dramatically.

10. *Pheromone traps*: Pheromone (sex attractant) traps have been remarkably successful in the control of many insects. Although numerous experiments have been conducted with bark beetle pheromones (with or without tree resins, alcohol, or combinations of these), successful control has not been achieved. In spite of the failures, it offers great promise of eventual success.

## CLASSIFICATION

### History

Five scolytid species were listed by Linnaeus (1758) in his tenth edition of Systema Naturae, in which the foundation of modern animal classification was established. All were treated in the composite genus *Dermestes* of the order Coleoptera. Geoffroy (1762) established the first genus (*Scolytus*) within the group. At that time family-group categories did not exist. Later, when family-group names were introduced, early writers placed scolytid genera in various groups of Coleoptera, such as Bostrichi or Bostrichidae (Latreille 1804, Erichson 1836), Curculionites or Curculionidae (Latreille 1807), or the non-Linnean Xylophaga (Ratzeburg 1837, Eichhoff 1864). The first valid family-group name involving these insects was Scolytarii (Latreille 1807:273), established as a subdivision of Curculionites and based on *Scolytus* Geoffroy, 1762. Subsequent authors have subdivided the group into a complex system of subfamilies and tribes (Wood 1978). At the present time approximately 6,000 species of Scolytidae in the world fauna are known; these are distributed among about 181 genera. About one-fourth of the named species occur in North and Central America.

### Taxonomic Position of Scolytidae

The Coleoptera are divided into four suborders, of which the largest and most specialized is the Polyphaga (Crowson 1967). The Polyphaga are subdivided into 18 superfamilies, of which Curculionoidea (formerly designated as the suborder Rhynchophora) is the largest and most highly evolved (Crowson 1967). Within the Curculionoidea the families may be classified by characters summarized in the following key (modified from Crowson 1967).

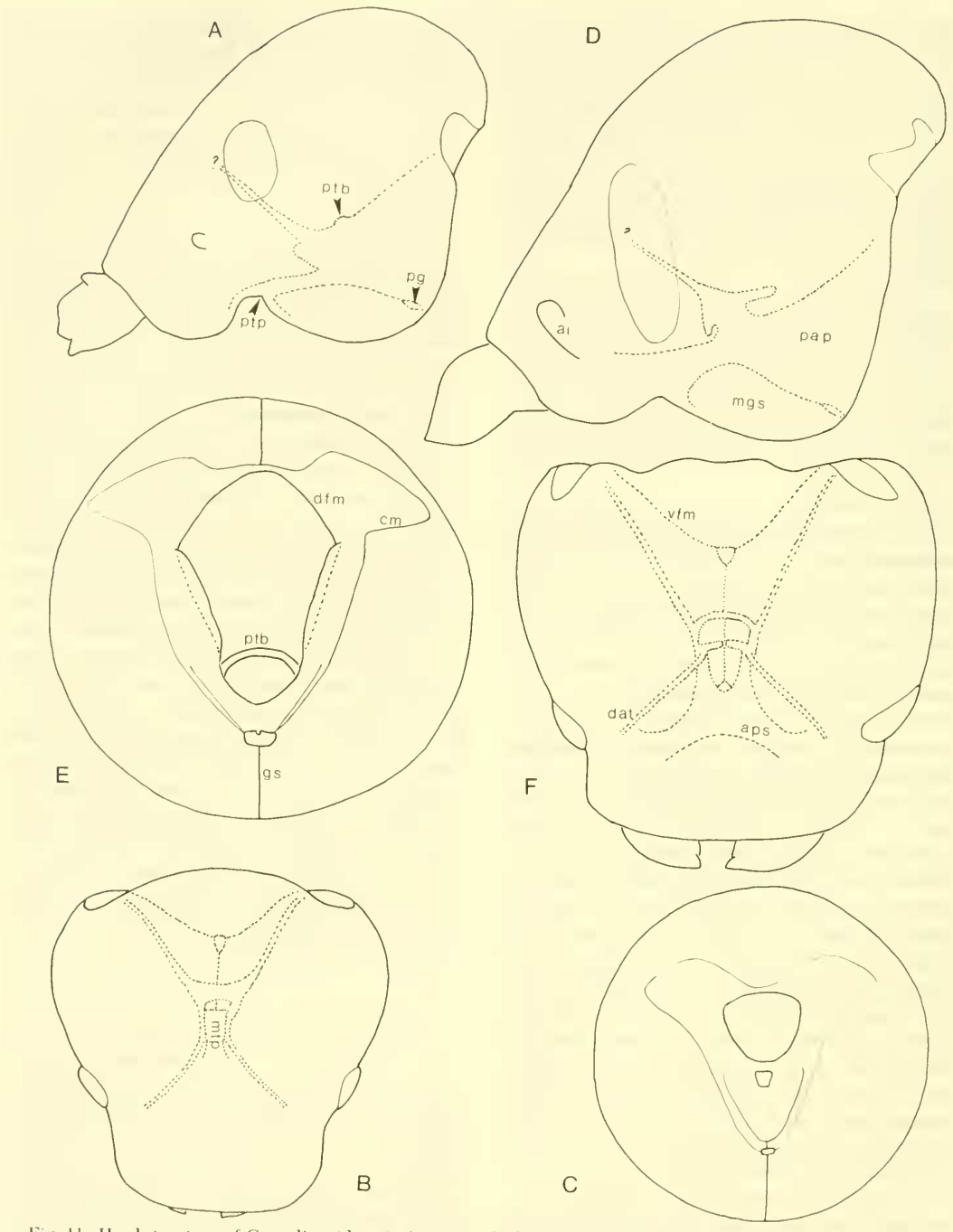



Fig. 11. Head structure of Curculionoidea: A–C, *Stenocelis brevis* (Curculionidae, Cossoninae), lateral, dorsal, and caudal aspects, respectively; D–F, *Hylurgops r. rugipennis* (Scolytidae), lateral, caudal, and dorsal aspects, respectively; G–H, *Ips mexicanus* (Scolytidae), ventral and lateral aspects; I, *Rhyncolus knowltoni* (Curculionidae), ventral aspect; J, *Cimberis attelaboides* (Nemonychidae), ventral aspect. Internal head structure is indicated by broken lines, externally visible features by solid lines. The anterior tentorial arms are not developed in species illustrated here. Abbreviations: ai, antennal insertion or scrobe; aps, apodemal inflection of pregular suture; cm, cervical membrane attachment; dat, dorsal arms of tentorium; dfm, dorsal margin of foramen magnum; gs, gular suture; hy, hypostomal arm; mgs, median apodeme formed by inflection of gular suture; mtp, median tentorial pillar; p, pregula; pap, paired apodemal plates of gular structure; pg, postgula; ps, pregular suture; ptb, posterior tentorial bridge; ptp, posterior tentorial pit; vfm, ventral margin of foramen magnum.

## KEY TO THE FAMILIES OF CURCULIONOIDEA

1. Gular sutures (or their rudiments on margin of foramen magnum) widely separated (Fig. 11J); maxillary palpi 4-segmented; antennae never geniculate; larval thoracic spiracle mesothoracic or intersegmental, mandibular mola sometimes present, 2-segmented thoracic legs sometimes present ..... 2

— Gular sutures confluent between small postgula (on margin of foramen magnum) and anterior limits of tentorium (at angle between ventral surface of head and rostrum) (Figs. 11–12); maxillary palpi 2- or 3-segmented (except *Austroplatypus* in Platypodidae and Attelabidae); antennae sometimes geniculate; larval thoracic spiracle on prothorax or intersegmental, mola never present, thoracic legs absent (except 1-segmented in some Brenthidae) ..... 6

2(1). Adult labrum distinct and separate; maxillary lacinia distinct, palpi flexible; larval mandible usually with a mola, thoracic legs present ..... 3

— Adult labrum fused to head, not free; maxilla without a true lacinia, palpi rigid; larval mandible without a mola, thoracic legs absent ..... 4

3(2). Tentorium and gular sutures largely to entirely obsolete; pronotum with lateral margins acutely raised; inner surface of elytra near costal margin with a flange; visible abdominal segments 1–4 connate; larval clypeus distinct from frons or head retracted ..... ANTHRIBIDAE

— Tentorium present, gular sutures distinct from margin of foramen magnum to posterior tentorial pits (Fig. 11J); lateral margins of pronotum rounded, not marked by an acutely elevated, longitudinal costa; inner surface of elytra near costal margin without a flange; visible abdominal segments freely movable; larval clypeus fused to frons, head never deeply retracted into prothorax ..... NEMONYCHIDAE

4(2). Inner surface of elytra near costal margin with a flange; gular sutures moderately long to very long; antennae filiform, inserted some distance from base of rostrum; lateral margins of pronotum rounded; coxae subcontiguous; tarsi pseudotetramerous ..... BELIDAE

— Inner surface of elytra near costa without a flange; gular sutures very short, not visible with head in normal position; antennae clubbed or if not, then tarsi pseudotrimerous ..... 5

5(4). Antennae clubbed; pronotum with lateral margins acute; tarsi pseudotetramerous, segments 2 and 3 broadly bilobed; rostrum long, antennae inserted at its base on posteroventral surface ..... OXYCORYNIDAE

— Antennae not clubbed; tarsi pseudotrimerous, only segment 2 bilobed; rostrum comparatively short, antennae inserted some distance from base on lateral surface ..... PROTERHINIDAE

6(1). Pregular sutures present, a distinct pregular sclerite between median gular suture and labial articulation (Fig. 11G, ps) rostrum primitively absent ..... 7

— Pregular sutures absent, pregular sclerite not evident (Fig. 11I); rostrum very long to secondarily short ..... 8

7(6). Tarsal segment 1 as long as 2–5 combined (except shorter in *Protoplatypus*, *Protohylastes*, *Coptonotus*) (Fig. 13); head as wide as pronotum; pronotum usually with a distinct lateral constriction near middle; antennal club without sutures (except obscure in *Coptonotus*); apical mucro on protibia formed primitively from middle apical process; lateral denticles on protibia never socketed ..... PLATYPODIDAE

— Tarsal segment 1 not longer than segment 2 or 3 (Fig. 23, etc.); head conspicuously narrower than pronotum, often concealed by pronotum when viewed from dorsal aspect; apical mucro on protibia formed primitively from mesal apical process; lateral denticles on protibia usually socketed ..... SCOLYTIDAE

8(6). Antennae straight, club usually not developed; labial palpi minute, inserted in deep, ventral pits; rostrum often strongly sexually dimorphic; trochanters normal; larval thoracic legs usually present, frontal sutures reaching articulating membrane of mandibles, abdominal segments with three or four tergal folds ..... BRENTHIDAE

— Antennae clubbed, usually geniculate (if not then trochanters elongate); rostral sexual dimorphism less conspicuous; larval thoracic legs indistinct or absent, if frontal suture reaches articulating membrane of mandible then abdominal segments with only two folds ..... 9

9(8) Antennae not geniculate, or trochanters long; larval frontal sutures reaching articulating membrane of mandible, abdominal terga with two dorsal folds ..... APIONIDAE

— Antennae usually geniculate, trochanters rarely long; larval frontal sutures not reaching articulating membrane of mandibles, abdominal terga with three to four transverse folds ..... CURCULIONIDAE

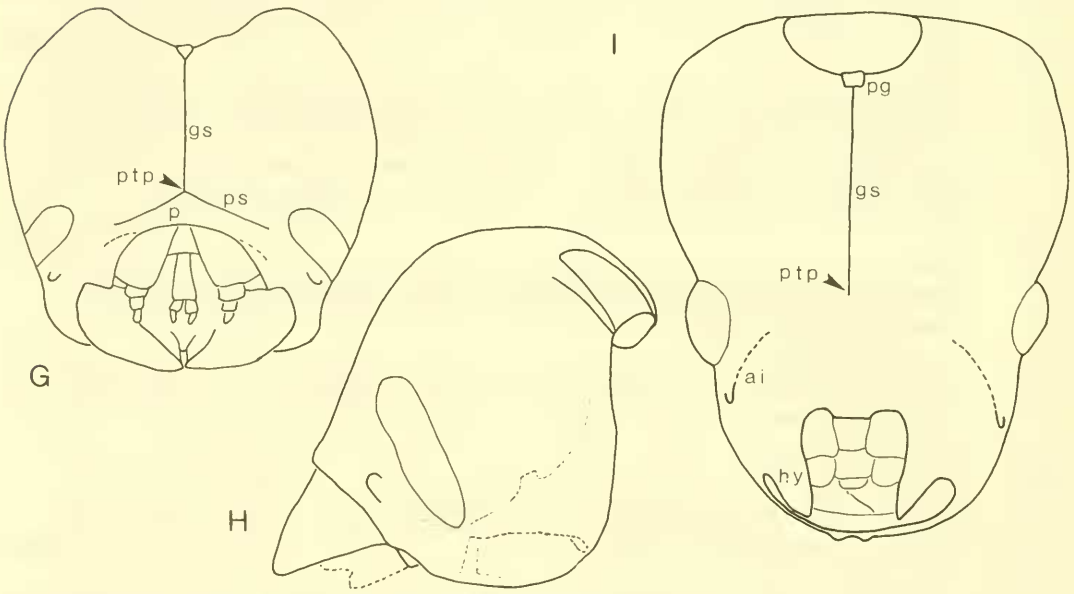



Fig. 11 continued, parts G–I (A–I redrawn from Wood 1973:79–80).

## FAMILY STATUS OF SCOLYTIDAE

The Platypodidae and Scolytidae are unique among those curculionoids with one median gular suture in having a pair of distinct pregular sutures that delimit a pregular sclerite immediately behind the oral area on the ventral surface of the head (Fig. 11G). These two families occupy a unique ecological niche as subcortical borers in unthrifty or dying woody plants in which paired (either monogamous or polygynous) parent adults excavate galleries within a host and together reproduce and defend their brood (at least temporarily) in those tunnels. Largely because larval characters were not found to distinguish these two families from Curculionidae, Crowson (1967) reduced the time-honored families Platypodidae and Scolytidae to subfamilies of Curculionidae. In view of the unique adult gular character and the limited and apparently superficial search for

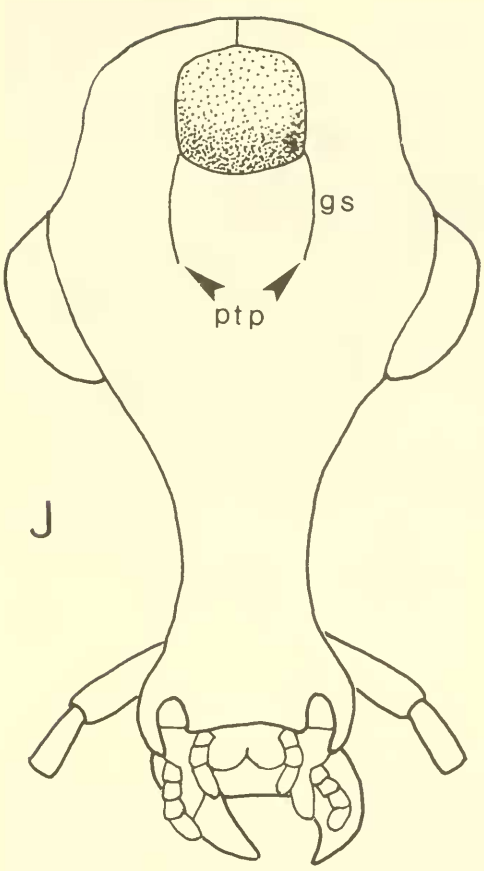



Fig. 11 continued, part J (Redrawn from Crowson 1967:157).

larval characters, his action is considered untenable. Both groups have been restored to family status (Wood 1973).

The Platypodidae and Scolytidae occupy the same basic ecological niche; the ambrosial habit that is almost universal in Platypodidae has arisen, apparently independently, in 3 of 11 tribes of Hylesininae and in 5 of 14 tribes of Scolytinae. The two groups intergrade anatomically, behaviorally, and ecologically. They are obviously very closely related to one another, but are retained as separate families until their status is more fully investigated.

Various classifications of subfamilies and tribes have been presented for Scolytidae (Wood 1978). Following a review of about 90 percent (412 of 472 nominate genera and subgenera) of the valid genera in the world fauna, 2 subfamilies containing 25 tribes were recognized (Wood 1978). The following key to subfamilies and tribes of Scolytidae summarizes the characters on which that classification is based.

## Fossil History

Comparatively few fossil Scolytidae are known. Walker (1938) attributed engravings in petrified Triassic wood from Arizona to scolytid beetles designated as *Paleoscolytus divergus* Walker, *Paleoipidus perforatus* Walker, and *Paleoipidus marginatus* Walker. The engravings of *Paleoscolytus* are too large (5 mm wide) and branch in a pattern unknown in modern Scolytidae. The *Paleoipidus* holes in the wood are not cylindrical; there is no evidence that they were formed by scolytids, but this possibility should not be discarded. However, engravings on Cretaceous coniferous bark from Europe, reported by Brongniart (1877), almost certainly were made by phloeophagous Scolytidae.

Scudder (1876, 1878, 1893) named three scolytids from American Eocene deposits as follows:

*Polygraphus wortheni* Scudder, Roan Mts., Colorado

*Dryocoetes carbonarius* Scudder, Green River, Wyoming

*Dryocoetes impressus* (Scudder), Green River, Wyoming

Schedl (1947) reviews the fossil Scolytidae found in Baltic amber from the Oligocene. The 22 species cited represent the genera *Hylastes* (1), *Hylurgops* (5), *Hylescierites* (2), *Xylechinites* (1), *Carphoborites* (2), *Phlocosinites* (8), *Taphramites* (2), and *Taphrorychus* (1). Specimens have been taken in American amber, but have not been reported.

Hopkins (1902a) indicates that *Dryocoetes impressus* probably is not a scolytid. In addition to the Eocene forms cited above, the following were named (Scudder 1893, Wickham 1913, 1916) from the Florissant Miocene deposits in Colorado:

*Phlocotribus zimmermanni* Wickham
*Leperisinus extractus* (Scudder)
*Hylurgops piger* Wickham
*Hylastes americanus* Wickham
*Pityophthoridea diluvialis* Wickham
*Adipocephalus hydropicus* Wickham
*Xyleborites longipennis* Wickham

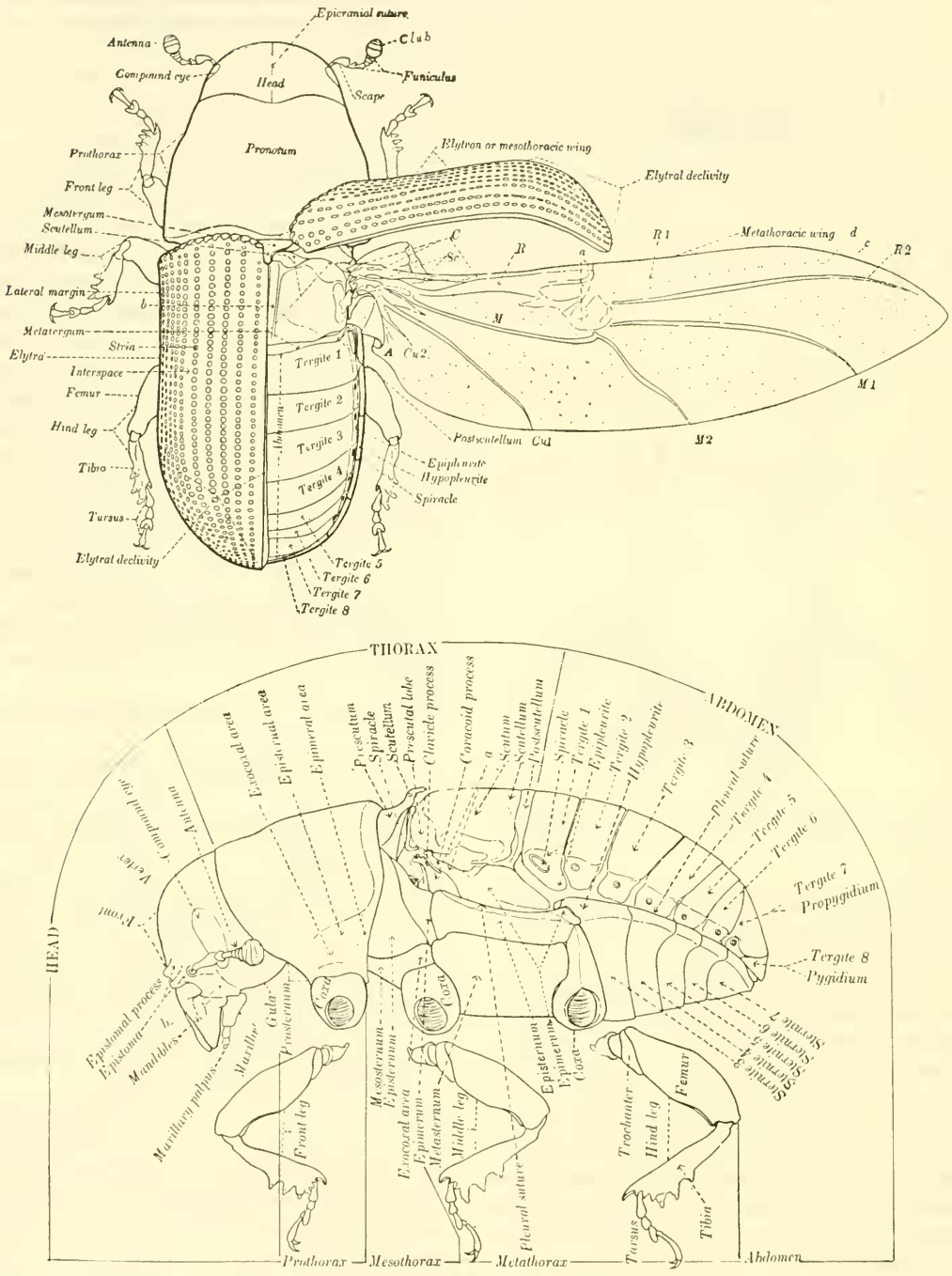



Fig. 12 A,B. *Dendroctonus valens*, (A) dorsal and (B) lateral aspects. Present usage of interstriae (= interspace in this figure), tergum and sternum (= tergite, sternite). (After Hopkins 1909:6, 9.)

Quaternary fossils of living North American species (age 10,000 years) are reported by Ashworth, Clayton, and Bickley (1972) and Ashworth and Brophy (1972) as follows:

*Phloeotribus piceae* Swaine
*Polygraphus rufipennis* (Kirby)
*Scolytus piceae* (Swaine)
*Orthotomicus caelatus* (Eichhoff)

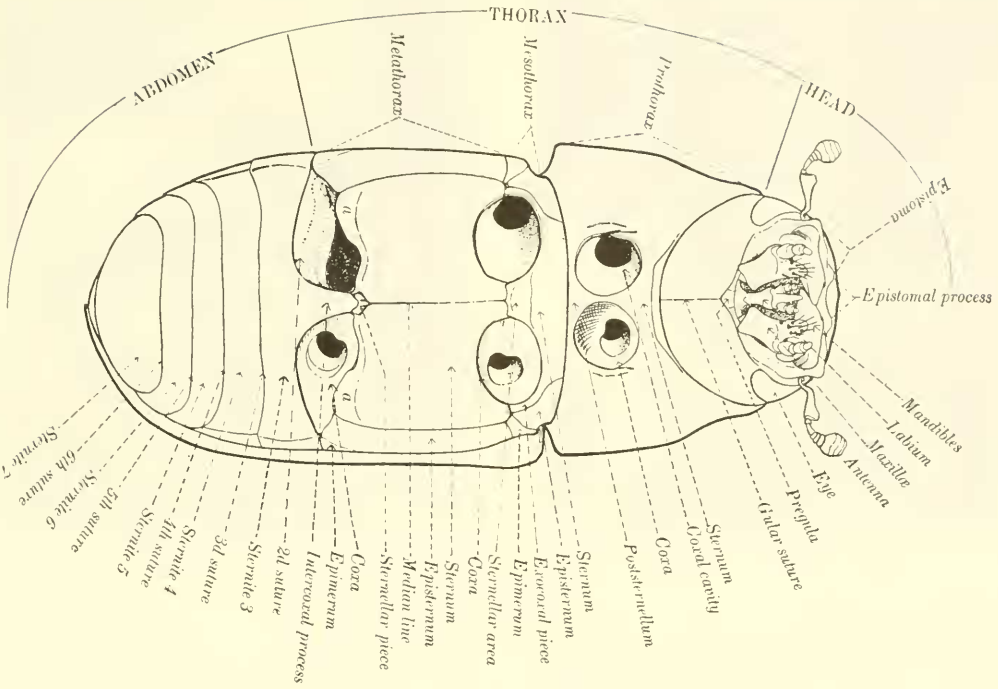



Fig. 12 C. *Dendroctonus valens*, ventral aspect. (After Hopkins 1909:8.)

*Ips* probably *perturbatus* (Eichhoff)

Older Quaternary fossils (age 70,000 years) were taken in Ontario by Drs. Alan and Anne Morgan (in prep.) as follows:

*Phloeosinus pini* Swaine
*Phloeotribus piceae* Swaine
*Carphoborus carri* Swaine
*Carphoborus andersoni* Swaine
*Polygraphus rufipennis* (Kirby)
*Scolytus piceae* (Swaine)
*Pityogenes* or *Pityokteines* sp.
*Pityophthorus* probably *puberulus* (LeConte)

The occurrence of representatives of modern genera of both subfamilies of Scolytidae in the Eocene suggests an earlier origin of the family than has been indicated previously. Fossil evidence coupled with that from biogeography indicates an origin at least as early as the early Cretaceous and perhaps as early as late Triassic.

## Discussion of Characters

Previous classifications of higher categories in the Scolytidae and a more complete discussion of potential characters and their significance appears in Wood (1978). A brief summary of that discussion is presented here. Characters of greatest use in determining phylogenetic relationships and the limits of the higher categories within the family include the following.

HEAD.— In curculionids, Hylesininae, and primitive Scolytinae (Scolytini, Ctenophorini, Scolytoplatypini, Carphodicticini) the posterior region of the head is essentially truncate (Fig. 14A). In the remaining Scolytinae, commencing with Micracini and progressing to the Xyleborini and Corthylini, the dorsal occipital area is produced caudad (Fig. 14B). This is an obvious specialization.

The subrostrate condition of Hylastini, Hylesinini (part), Hyorrhynchini (part), and Scolytini (part) is probably more closely correlated with habit than with phylogeny. The pregular sutures evidently prevented the development of a rostrum in Platypodidae and Scolytidae, since the anterior arms of the tentorium are intact (they are absent, or at least broken, in curculionids).

The eye varies from oval and entire to elongate and entire or emarginate to

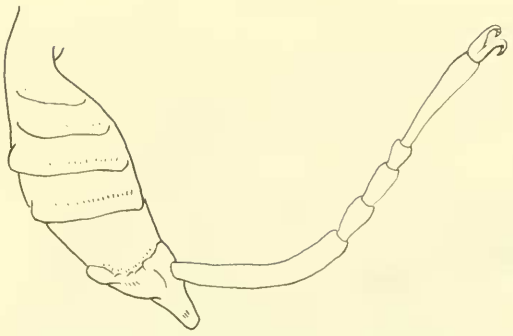


Fig. 13. Tibia and tarsus of *Platypus parallelus*, posterior face.

completely divided. While eye shape and position are very useful in the recognition of genera, it should be pointed out that some of the most aberrant eye shapes occur in some of the most primitive tribes. In general, however, the oval, entire eye is primitive; departures involving elongation or emargination are specializations.

The antennal funicle may have a maximum of seven segments as in other curculionoids. Within Scolytidae the segmentation may be reduced to as few as three segments in Hylesininae or one in Scolytinae. Reduction in the number of segments from seven is considered as specialization.

The antennal club is formed from three segments. In primitive scolytids, as in many other curculionoids, it is conical (Hylastini, some Hylesinini). Specializations may include compression (flat) or oblique truncation, either with or without the loss of sutures. The club may be symmetrical or asymmetrical, with the sutures equal on both sides or with the sutures on the posterior face strongly displaced toward the apex. In Phloeotribini the intersegmental lines are constricted, thereby forming a sublamellate club with independently movable segments.

PROTHORAX.— The primitive prothorax apparently was short and more or less cylindrical. Specializations include a substantial reduction in the sternal areas accompanied by a change from widely separated to contiguous coxae. A precoxal costa was associated with that change in some primitive groups. The dorsal area in specialized groups is declivitous on the anterior area, armed by asperities, and much narrower anteriorly. In Diamerini, Bothrosternini (part), Scolytini, and Ctenophorini the lateral margin of the pronotum is costate. This costa appears to be a strengthening device associated with a subconcave pleuron in these comparatively primitive tribes. An analogous raised line in Cryphalini and Corthylini apparently has a different origin and function.

MESOTHORAX, ELYTRA.— While numerous characters of specific and generic interest occur on the mesothorax, items of phylogenetic interest involve the basal margins, interstriae 10, and the mechanism for locking the elytra in position when at rest.

In all Hylesininae the basal margin of each elytron is procurved and armed by a series of crenulations. The curvature results from a sutural emargination formed to accommodate the depressed, rounded scutellum. The crenulations are shared by a few species of *Cnemonyx* (Scolytini), but otherwise are restricted to the Hylesininae. A few Diamerini and Bothrosternini have an elevated marginal costa in place of the crenulations. In Scolytinae the elytral bases form a straight transverse line across the body and the scutellum is large, flat, and flush with the surface.

Most primitive tribes contain at least some members having interstriae 10 continued to the apex. In more specialized groups striae 9 and 10 converge near the middle of the elytra, thus eliminating the posterior half of interstriae 10.

On the sutural and costal margins of the elytra near the base are grooves that interlock at the suture with the opposite elytron and on the costal margin with the metepisternum. The details of these structures are useful in determining phyletic relationships of major groups.

METATHORAX, TERGUM.— In some Hylesininae (Diamerini, Bothrosternini, Phloeotribini, Phloeosininae, Hypoborini, Polygraphini) the scutellar area of the metanotum fuses with the postnotum, thus eliminating the intersegmental suture. The intersegmental suture is present in the remaining Hylesininae and in all Scolytinae. In addition, the scutoscutellar suture follows a much shorter, more lateral route in those groups with a fused postnotum. These two characters make possible a major division of the Hylesininae.

METATHORAX, PLEURON.— In Curculionidae, primitive Hylesininae, and primitive

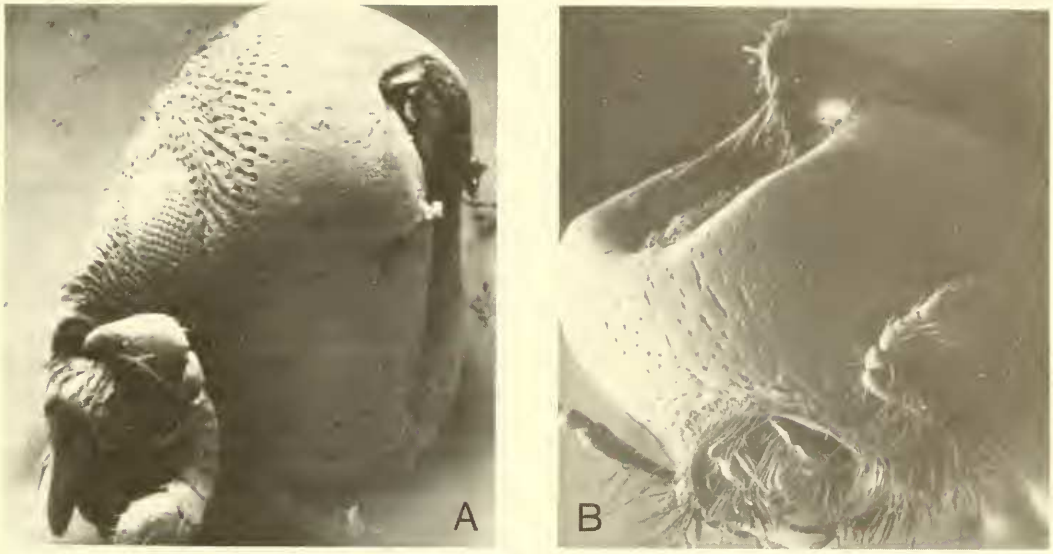



Fig. 14. A, *Hylastes nigrinus*, lateral aspect of head; note, eye, antenna, and undeveloped dorsal occupital area (Left side near middle of foramen magnum damaged in preparation). B, *Ips woodi*, ventrolateral aspect of head; note postgula, gular suture, pregula, and extended dorsal occipital area.

Scolytinae the pleural suture descends vertically from the pleural wing process to the groove on the episternum that receives the costal groove of the elytra. At that point the pleural suture turns abruptly and follows the groove caudad to near the pleural coxal process. The anterior end of the lower costa that forms the metepisternal groove is higher, often spinelike, and may persist when the remainder of the groove is lost. In the higher Hylesininae and higher Scolytinae the groove is lost, the episternal spine is displaced ventrad, and the pleural suture runs a much more direct route from wing process to coxal process, often quite remote from the position of the costal margin of the elytra. In Cryphalini the episternal spine is modified and in Corthylini it is lost and replaced by a small, transverse groove.

LEGS.— Tibial characters have been used extensively in scolytid classification. The primitive protibial form is thought to be similar to that of *Protohylastes* (Fig. 35), which has three apical spines (Wood 1973a). The small mesal spine apparently becomes the apical spine of Scolytidae; the larger, middle spine becomes the apical spine of Platypodidae and the major lateral spine of Scolytini, etc.; and the smaller, lateral spine becomes a minor lateral spine in all groups. These spines, and some supernumerary denticles, are not socketed (Fig. 29). All these lateral spines are replaced by socketed teeth (Fig. 34), presumed to be of setal origin, in all higher groups (Wood 1978).

In several of the more primitive groups tarsal segment 3 is broad or bilobed. In Diamerini (part), Xyleborini (part), and Xyloctonini the tarsi tend to be laterally compressed and retracile into tibial grooves. The tarsal characters are of some value in classifying genera of certain tribes.

ABDOMEN.— In Carphodicticini, Ipini, Dryocoetini, Xyleborini, and all Platypodidae female abdominal tergum 8 is visible, pubescent, and almost as large as in the male. In all other scolytids and most curculionids it is of reduced size, lacks pubescence, and is telescoped beneath and hidden by tergum 7 (Fig. 14C).

In Hylastini, many Hylesinini, and Phloeotribini the posterior margin of male tergum 7 bears a median, bituberculate, stridulatory device that scrapes against the adjacent inner surface of the elytra. The value of this character is uncertain, it is not always present in groups that normally possess it. It may be significant that a comparable character occurs in most Platypodidae.

## PHYLOGENY

The Scolytidae and Platypodidae apparently arose as a monophyletic unit from the

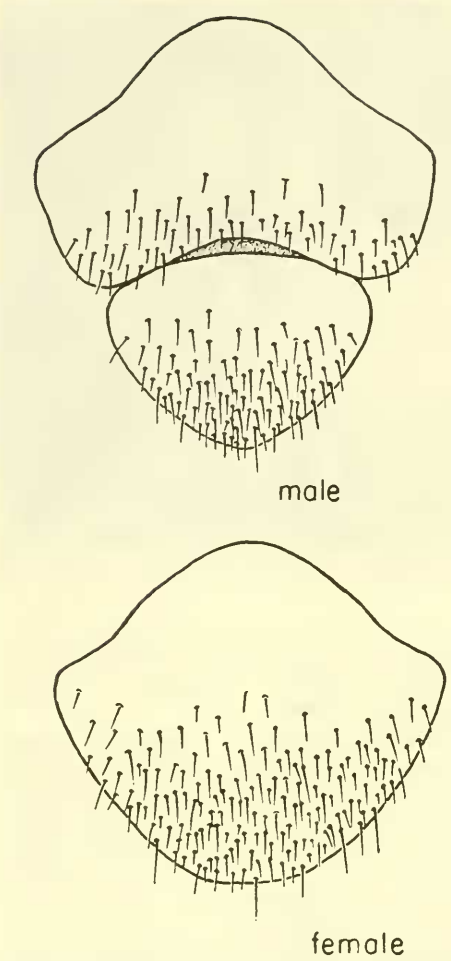



Fig. 14C. Abdominal terga of *Cryphalus pubescens*: Male, segments 7 and 8 (above); female, segment 7 (below). (After Wood 1954:1087.)

segment of the Curculionoidea having one gular suture before pregular sutures were lost in the remainder of the phyletic line that gave rise to the Brenthidae, Attelabidae, Apionidae, and Curculionidae, but well after the groups having two gular sutures, or remnants of them (Belidade, Nemonychidae, Anthribidae), had branched from the main stem of evolutionary development. Long after the basic scolytid-platypodid characters and habits had been fixed, this evolutionary line radiated into three groups at approximately the same geologic time (possibly late Triassic to early Cretaceous). These three groups presently include representatives among their primitive tribes having (1) a 7-segmented antennal funicle, (2) a fully formed, pubescent female tergum 8 basically similar to that of the male, (3) basically similar tibiae that lack socketed supernumerary spines on the lateral margins, (4) a fully developed interstriae 10, (5) the same general body habitus, and (6) the phloeophagous habit. The evidence is inconclusive as to which of these three groups branched from the main scolytoid evolutionary stem first; however, because of the somewhat larger number of primitive characters and the different appearance (probably related as much to distinctive habits as to genetics), coupled with unique specializations, the Platypodidae are regarded as the most primitive. For similar reasons the Hylesininae are considered to be more primitive than the Scolytinae, but the genetic relationship between primitive Platypodidae and primitive Scolytinae may be closer than either of these is to the Hylesininae. The Scolytinae are considered to represent the main line of scolytid evolution. The accompanying dendrogram (Fig. 15) illustrates possible phylogenetic relationships of major groups within these families.

The most primitive known representative having hylesinine characters is *Protohylastes*. It could equally well be placed as the most primitive representative of Platypodidae (Coptonotinae). It shares many characters with *Coptonotus*. Except for the antennal club and tibiae, it could be placed in the Hylastini with complete confidence. It is placed as an aberrant genus of Coptonotini until more can be learned about its structure and habits.

PLATYPODIDAE.— The pregular sutures, numerous other structural details, and the shared ecological niche suggest a close relationship to the Scolytidae. The 7-segmented funicle (*Protohylastes* and *Coptonotus*), strongly procurved antennal sutures (*Coptonotus*), fully developed female abdominal tergum 8, complete interstriae 10, route followed by the scutoscutellar suture, route followed by the metapleural suture, tibial characters, elytral locking mechanism, the polygynous habit in *Protoplatypus*, and other characters indicate a closer, but very primitive, connection to Scolytinae rather than to Hylesininae. The closest affinity of Platypo-

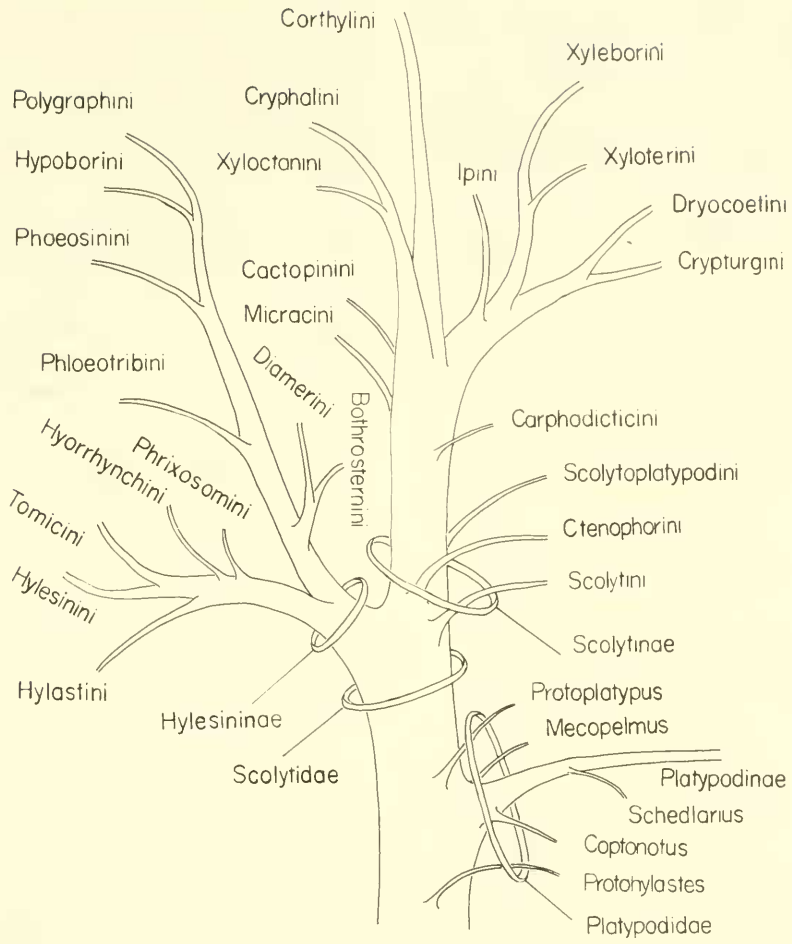



Fig. 15. Dendrogram illustrating possible phylogenetic relationships of major groups within the Scolytidae and Platypodidae.

didae (through *Protohylastes*) to Hylesininae appears to be through *Diamerus* (Diamerini), which possesses several very specialized features. The closest affinity (through *Protoplatypus*) to Scolytinae appears to be through *Cnemonyx* (Scolytini), *Scolytodes* (Ctenophorini), Carphodicticini, and Scolytoplatypodini.

HYLESININAE.— The fusion of the metanotum to its postnotum apparently took place very early in hylesinine evolution as evidenced by the occurrence of tibiae without socketed teeth in both divisions (Hyorrhychini, Diamerini, and Phloeotribini). More primitive characters, with fewer specialized ones, appear to be associated with Hylastini, Hylesinini, and Tomicini (listed in increasing order of specialization), with the Phrixosomini and Hyorrhychini representing specialized relicts of otherwise primitive groups.

In the more specialized hylesinine line are found the more primitive tibiae (*Diamerus*, *Aricerus*), pronotums (*Diamerus*), elytral bases (Bothrosternini, *Diamerus*), and other characters, but they also exhibit the greatest specializations (reduced funicular segmentation, aberrant antennal club with loss of sutures, etc.). The fusion of the postnotum obviously took place very early in hylesinine evolution, as evidenced in that group by the much greater structural and biological diversity. The Diamerini and Bothrosternini, which appear to be geographical replacements of one another, share the greatest number of primitive features; they also appear to

have diverged further than the other groups from the original ancestral line. The Phloeotribini also diverged rather early as evidenced by the protibia of *Aricerus* and by the very different, sublamellate, antennal club. The Hypoborini and Polygraphini appear to be specializations that diverged rather recently from the Phloeosinini.

SCOLYTINAE.— The basic structural relationship of most Scolytinae to Platypodidae is closer than to Hylesininae, although the biological affinity is closer to most Hylesininae. The strongly procurved antennal sutures of *Coptonotus* (and the obscure lines that suggest obsolete sutures in other Coptonotinae and a few Platypodinae) is a common character in Scolytinae (Scolytini, Ctenophorini, Micracini, Xyloctonini), but occurs only in Diamerini (*Diamerus*) and Bothrosternini (*Pagiocerus, Eupagiocerus*) in the Hylesininae. The Scolytini apparently diverged very early from the main evolutionary line in Scolytinae, as evidenced by antennal, tibial, metapleural, and other characters. The divergence of Scolytoplatypodini and Ctenophorini soon followed, as evidenced by a significant change in tibial characters, and these geographical replacements then diverged from one another. The remaining Scolytinae replace unsocketed lateral tibial spines with socketed teeth that apparently were derived from setae. Except for the socketed tibial teeth, Carphodicticini most nearly resembles my concept of a primitive platypodid in antennal, frontal, pronotal, coxal, metapleural, metatergal, and abdominal characters. However, the tibiae, and other characters, place it more nearly intermediate between *Protoplatypus* and Dryocoetini. The Crypturgini, Dryococtini, Ipini, Xyloterini, and Xyleborini represent a unit of closely related tribes. Micracini and Cactopinini appear somewhat related, as do Xyloctonini and Cryphalini. The relationship of Corthylini to other tribes is not clear; they exhibit some very primitive features as well as many of the most specialized ones in the family.

## BIOGEOGRAPHY

### EXTRATERRITORIAL AFFINITIES

To establish a basis for this discussion, it is assumed that the following hypotheses and theories are essentially correct: (1) the biological species concept (Mayr 1963) is valid, (2) biological speciation occurs through a process of geographical isolation, during which time isolated populations of a parent species differentiate and become reproductively isolated from one another (Mayr 1963), and (3) a process of continental drift has occurred that has had an effect on the geographical distribution of animal groups (Wegener 1924). It is also necessary to eliminate from this discussion those species and genera that are known to have been introduced to or exported from North and Central America through modern human commerce (Wood 1977). Most notable in this regard are the imported genera *Hylastinus*, *Hypocryphalus*, and *Premnobius*, and the exportation of *Gnathotrichus materiarius* (Fitch) to France and *Microborus boops* Blandford to Africa.

An analysis of the tribal groups of Scolytidae reveals the following relationships (Tables 1, 2). The Cactopinini are found only in southwestern North America. The Bothrosternini and Ctenophorini are restricted to the tropics of North and South America; Scolytini (except *Scolytus* extends to Eurasia) and Corthylini (except *Pityophthorus* extends to Eurasia; there are also a few aberrant African forms) are almost exclusively American. Phloeotribini are largely American, with a few species of *Phloeotribus* in Eurasia, except that the monotypic *Aricerus* appears to have reached Australia very early in the formation of the group. The Polygraphini, Crypturgini, and Xyloterini are of obvious Eurasian origin and reached northern North America rather recently. The Hylastini, Hylesinini (except *Phloeoborus* that was derived biogeographically from South America), and Ipini (except *Acanthotomicus*, which probably reached South America from Africa in pre-Tertiary time) are also of Eurasian origin, but the involvement appears much older and more complex. The Phrixosomini, Hypoborini, and Micracini apparently reached North and Central America rather recently from South America, but exhibit a strong, much earlier relationship to the African fauna. The Tomicini, Phloeosinini, Dryocoetini, Xyleborini, and Cryphalini are diverse and indicate more complex endemic origins and interrelationships with other areas. The Hyorrhynchini, Diamerini, Scolytoplatypodini,

Carphodicticini, and Xyloctonini do not occur in North America, although two of three genera of Carphodicticini occur in South America and Diamerini (Old World) appears to replace geographically Bothrosternini, and Scolytoplatypodini (Old World) replaces Ctenophorini.

The principle original centers of adaptive radiation in the family appear to be North America for Hylastini, Tomicini, and Cactopinini; South America for Phrixosomini (and Africa), Bothrosternini, Phloeotribini, Scolytini, Ctenophorini, Micracini (and Africa), and Corthylini; Eurasia for Hylesinini (and Africa, except South America for *Phloeoborus*), Phloeosinini (and Africa), Ipini (and Africa), Xyloterini, and Cryphalini (and Africa); Africa for Hypoborini, Polygraphini, Crypturgini, and Dryocoetini. The radiation of Xyleborini has progressed explosively from the Tropics, but the pattern is not yet clear.

Secondary radiations of each tribal group may also occur in newly occupied areas. For example, the Ipini apparently originated in tropical Africa as the precursors of *Acanthotomicus* then spread northward into Eurasia, giving rise to a new stock. The portion of the new stock that remained in Eurasia apparently gave rise to *Orthotomicus* and *Pityogenes*, and the portion that reached North America gave rise to *Ips* and *Pityokteines*. Later, elements of *Orthotomicus* and *Pityogenes* reached North America and elements of *Ips* and *Pityokteines* reached (or returned to) Eurasia to give rise to the present faunas. This is based on the fact that, of nine species groups of *Ips* in North America, six are shared with Eurasia; no unique group occurs in Eurasia. Similarly, in *Pityokteines* only one of three groups reached Eurasia, in *Orthotomicus* only one of several groups reached North America, and in *Pityogenes* only three of several groups reached North America.

Comparable multiple migrations appear to have affected several other groups with equal magnitude when faunal transfers were sufficiently early to permit secondary radiations. In some instances the migrations were so recent that speciation of the populations on different continental land masses may not yet be complete.

TABLE 3. A comparison of the number of genera of Scolytidae in North and Central America, listed by tribes, to the world fauna.

| | *North America* | *World Fauna* |
|---|---|---|
| Hylesininae | | |
| Hylastini | 3 | 3 |
| Hylesinini | 4 | 11 |
| Tomicini | 4 | 14 |
| Phrixosomini | 1 | 1 |
| Hyorrhynchini | 0 | 3 |
| Diamerini | 0 | 4 |
| Bothrosternini | 5 | 5 |
| Phloeotribini | 1 | 2 |
| Phloeosinini | 4 | 11 |
| Hypoborini | 2 | 4 |
| Polygraphini | 3 | 6 |
| Scolytinae | | |
| Scolytini | 4 | 4 |
| Ctenophorini | 4 | 4 |
| Scolytoplatypodini | 0 | 1 |
| Micracini | 7 | 11 |
| Cactopinini | 1 | 1 |
| Carphodicticini | 0 | 2 |
| Crypturgini | 2 | 6 |
| Dryocoetini | 4 | 15 |
| Ipini | 5 | 5 |
| Xyloterini | 2 | 3 |
| Xyleborini | 6 | 10 |
| Xyloctonini | 0 | 5 |
| Cryphalini | 9 | 23 |
| Corthylini | 23 | 27 |
| Totals | 94 | 181 |

TABLE 4. A comparison of the species of Scolytidae occurring in North and Central America by geographical area. Species occurring in more than one area may be listed more than once, but the total is of the actual numbers of species in the fauna.

| | Alaska and Canada | USA | Mexico | Central America | Total species in fauna |
|---|---|---|---|---|---|
| HYLESININAE | | | | | |
| Hylastini | | | | | |
| *Scierus* | 2 | 2 | 0 | 0 | 2 |
| *Hylurgops* | 4 | 6 | 5 | 3 | 7 |
| *Hylastes* | 6 | 13 | 6 | 1 | 15 |

Table 4 continued.

| | Alaska and Canada | USA | Mexico | Central America | Total species in fauna |
|---|---|---|---|---|---|
| Hylesinini | | | | | |
| *Hylastinus* | 1 | 1 | 0 | 0 | 1 |
| *Hylesinus* | 3 | 7 | 3 | 1 | 9 |
| *Alniphagus* | 2 | 2 | 0 | 0 | 2 |
| *Phloeoborus* | 0 | 0 | 3 | 5 | 5 |
| Tomicini | | | | | |
| *Xylechinus* | 2 | 2 | 2 | 6 | 9 |
| *Pseudohylesinus* | 7 | 9 | 3 | 0 | 11 |
| *Hylurgopinus* | 1 | 1 | 0 | 0 | 1 |
| *Dendroctonus* | 8 | 13 | 9 | 7 | 16 |
| Phrixosomini | | | | | |
| *Phrixosoma* | 0 | 0 | 0 | 4 | 4 |
| Bothrosternini | | | | | |
| *Cnesinus* | 0 | 2 | 19 | 26 | 41 |
| *Pagiocerus* | 0 | 1 | 1 | 1 | 1 |
| *Bothrosternus* | 0 | 0 | 1 | 2 | 2 |
| *Eupagiocerus* | 0 | 0 | 1 | 3 | 3 |
| *Sternobothrus* | 0 | 0 | 0 | 2 | 2 |
| Phloeotribini | | | | | |
| *Phloeotribus* | 3 | 7 | 14 | 16 | 27 |
| Phloeosinini | | | | | |
| *Dendrosinus* | 0 | 1 | 1 | 1 | 2 |
| *Phloeosinus* | 10 | 24 | 7 | 1 | 27 |
| *Carphotoreus* | 0 | 0 | 1 | 0 | 1 |
| *Chramesus* | 1 | 8 | 24 | 13 | 37 |
| Hypoborini | | | | | |
| *Chaetophloeus* | 1 | 9 | 9 | 1 | 15 |
| *Liparthrum* | 0 | 2 | 3 | 1 | 5 |
| Polygraphini | | | | | |
| *Carphobius* | 0 | 1 | 1 | 1 | 2 |
| *Carphoborus* | 7 | 18 | 2 | 0 | 20 |
| *Polygraphus* | 2 | 3 | 0 | 0 | 3 |
| SCOLYTINAE | | | | | |
| Scolytini | | | | | |
| *Cnemonyx* | 0 | 2 | 11 | 10 | 21 |
| *Camptocerus* | 0 | 0 | 0 | 5 | 5 |
| *Scolytopsis* | 0 | 0 | 2 | 1 | 2 |
| *Scolytus* | 12 | 20 | 12 | 7 | 34 |
| Ctenophorini | | | | | |
| *Microborus* | 0 | 0 | 2 | 2 | 4 |
| *Pycnarthrum* | 0 | 1 | 2 | 6 | 6 |
| *Gymnochilus* | 0 | 0 | 3 | 3 | 4 |
| *Scolytodes* | 0 | 1 | 17 | 56 | 67 |

Table 4 continued.

| | Alaska and Canada | USA | Mexico | Central America | Total species in fauna |
|---|---|---|---|---|---|
| Micracini | | | | | |
| *Pseudothysanoes* | 1 | 15 | 48 | 7 | 67 |
| *Stenocleptus* | 0 | 1 | 1 | 0 | 2 |
| *Thysanoes* | 0 | 7 | 12 | 1 | 15 |
| *Phlococleptus* | 0 | 0 | 10 | 1 | 11 |
| *Micracis* | 1 | 4 | 12 | 6 | 18 |
| *Micracisella* | 0 | 5 | 14 | 4 | 20 |
| *Hylocurus* | 0 | 13 | 15 | 9 | 35 |
| Cactopinini | | | | | |
| *Cactopinus* | 0 | 5 | 11 | 0 | 14 |
| Crypturgini | | | | | |
| *Dolurgus* | 1 | 1 | 0 | 0 | 1 |
| *Crypturgus* | 2 | 3 | 0 | 0 | 3 |
| Dryocoetini | | | | | |
| *Dendrocranulus* | 0 | 3 | 5 | 19 | 23 |
| *Lymantor* | 2 | 1 | 0 | 0 | 2 |
| *Dryocoetes* | 7 | 7 | 0 | 0 | 7 |
| *Coccotrypes* | 0 | 5 | 2 | 5 | 7 |
| Ipini | | | | | |
| *Pityogenes* | 5 | 6 | 2 | 0 | 7 |
| *Pityokteines* | 5 | 6 | 0 | 0 | 6 |
| *Acanthotomicus* | 0 | 0 | 1 | 3 | 3 |
| *Orthotomicus* | 1 | 1 | 0 | 0 | 1 |
| *Ips* | 15 | 24 | 8 | 5 | 24 |
| Xyloterini | | | | | |
| *Xyloterinus* | 1 | 1 | 0 | 0 | 1 |
| *Trypodendron* | 4 | 5 | 0 | 0 | 5 |
| Xyleborini | | | | | |
| *Premnobius* | 0 | 1 | 1 | 1 | 1 |
| *Sampsonius* | 0 | 0 | 2 | 3 | 4 |
| *Xylosandrus* | 0 | 4 | 3 | 3 | 6 |
| *Dryocoetoides* | 0 | 0 | 1 | 2 | 2 |
| *Xyleborus* | 3 | 19 | 20 | 66 | 87 |
| *Xyleborinus* | 1 | 2 | 4 | 7 | 10 |
| Cryphalini | | | | | |
| *Trypophloeus* | 3 | 4 | 0 | 0 | 4 |
| *Stegomerus* | 0 | 0 | 1 | 5 | 5 |
| *Emoporicus* | 0 | 1 | 0 | 0 | 1 |
| *Procryphalus* | 2 | 2 | 0 | 0 | 2 |
| *Scolytogenes* | 0 | 1 | 5 | 3 | 7 |
| *Cryphalus* | 2 | 3 | 0 | 0 | 3 |
| *Hypocryphalus* | 0 | 1 | 1 | 1 | 1 |
| *Trischidias* | 0 | 3 | 0 | 0 | 3 |
| *Hypothenemus* | 0 | 21 | 25 | 21 | 39 |
| *Cryptocarenus* | 0 | 2 | 4 | 5 | 5 |

Table 4 continued.

| | Alaska and Canada | USA | Mexico | Central America | Total species in fauna |
|---|---|---|---|---|---|
| Corthylini | | | | | |
| *Styphlosoma* | 0 | 0 | 0 | 1 | 1 |
| *Dendroterus* | 0 | 2 | 7 | 6 | 13 |
| *Araptus* | 0 | 1 | 25 | 38 | 54 |
| *Conophthocranulus* | 0 | 0 | 0 | 1 | 1 |
| *Spermophthorus* | 0 | 0 | 0 | 1 | 1 |
| *Pseudopityophthorus* | 0 | 12 | 14 | 3 | 23 |
| *Pityoborus* | 0 | 2 | 5 | 1 | 7 |
| *Pityotrichus* | 0 | 2 | 0 | 0 | 2 |
| *Gnatholeptus* | 0 | 0 | 0 | 4 | 4 |
| *Conophthorus* | 4 | 10 | 4 | 0 | 14 |
| *Pityophthorus* | 41 | 99 | 102 | 41 | 218 |
| *Dacnophthorus* | 0 | 0 | 1 | 2 | 2 |
| *Gnathotrichus* | 3 | 7 | 11 | 4 | 15 |
| *Gnathotrupes* | 0 | 0 | 0 | 5 | 5 |
| *Tricolus* | 0 | 0 | 6 | 21 | 24 |
| *Amphicranus* | 0 | 0 | 9 | 24 | 31 |
| *Glochinocerus* | 0 | 0 | 1 | 2 | 2 |
| *Metacorthylus* | 0 | 0 | 0 | 4 | 4 |
| *Monarthrum* | 2 | 5 | 22 | 43 | 60 |
| *Microcorthylus* | 0 | 0 | 4 | 12 | 14 |
| *Corthycyclon* | 0 | 0 | 1 | 6 | 6 |
| *Corthylocurus* | 0 | 0 | 4 | 5 | 6 |
| *Corthylus* | 1 | 4 | 17 | 46 | 58 |
| Total | 179 | 477 | 605 | 632 | 1430 |

The faunal connection (over the Bering land bridge) between North America (Alaska) and Asia (Chukchi Peninsula) appears to be recent. This is indicated by the occurrence in both areas of identical or very similar species of Scolytidae, particularly those that breed in *Picea*. For example, *Dryocoetes autographus* and *Trypodendron lineatum* occupy both areas and apparently have not speciated. In the following series of names speciation is evidently complete, although the members of each pair are so similar to one another that identification is difficult.

| *American species* | *Eurasian species* |
|---|---|
| *Hylurgops rugipennis* | *H. glabratus* |
| *Polygraphus rufipennis* | *P. poligraphus* |
| *Dendroctonus punctatus* | *D. micans* |
| *Hylastes nigrinus* | *H. cunicularius* |
| *Xylechinus americanus* | *X. pilosus* |
| *Polygraphus convexifrons* | *P. grandiclava* |
| *Phloeotribus piceae* | *P. spinulosus* |
| *Ips perturbatus* | *I. typographus* |
| *Crypturgus borealis* | *C. tuberosus* |
| *Dryocoetes affaber* | *D. pini* |
| Cryphalus ruficollis | C. asperatus |

Of the 24 American species occurring in *Picea* north of the 60th parallel, I have established a definite phenotypic relationship to Asian species for 13 of them. Adequate material for comparison was not available for 7 of the remaining 11; the other 4 have no Asian counterpart (*Scierus annectens* LeConte, *Dendroctonus rufipennis* Kirby, *Ips tridens* Mannerheim, and *I. borealis* Swaine). A comparison of species from other hosts and from more southern areas is somewhat less dramatic, but indicates a clear faunal relationship. Sixteen American genera contain species groups, all of which are represented in a more diverse Eurasian fauna; therefore, it is concluded that all species in these genera were derived directly or indirectly (through subsequent speciation) from Eurasia. These genera include:

*Phlocosinus* (extensive secondary speciation)
*Hylesinus*
*Polygraphus*
*Carphoborus*
*Trypophloeus*
*Ernoporus*
*Pityogenes*
*Orthotomicus*
*Procryphalus*
*Cryphalus*
*Dolurgus* (not now in Eurasia)
*Crypturgus*
*Lymantor*
*Dryocoetes*
*Trypodendron*
*Xyloterinus* (not now in Eurasia)

Both *Dolurgus* and *Xyloterinus* are monotypic and endemic to North America, but they were undoubtedly derived from a Eurasian source in that no potential ancestor or near relative exists in the Western Hemisphere. Nine genera are much more diverse in North America, and all Eurasian species groups in these genera are represented in America; consequently, it is concluded that all Eurasian species in these genera were derived directly or indirectly from North America. These genera include:

*Hylurgops*
*Hylastes*
*Xylechinus*
*Dendroctonus*
*Phlocotribus*
*Scolytus*
*Pityokteines*
*Ips*
*Pityophthorus*

A southern faunal association is more difficult to demonstrate, presumably because potential land connections occurred much earlier in geologic time and many more species are involved. However, several groups, represented only in tropical America and tropical Africa, suggest shared genetic traits. *Phrixosoma* and *Cladoctonus* appear to be very old, compact genera with no closely allied living relatives. Both are represented in both areas by several species that are so similar it is sometimes difficult to distinguish an American from an African species; yet potential hosts for these genera abound in other tropical areas where these beetles do not occur. Basically the same is true of *Acanthotomicus* and *Hypothenemus*, although they are also represented in the Indomalayan-Australian region. Paired, but different, genera also occur in tropical America and Africa in the Micracini and Hypoborini, and between *Dendrocranulus* and *Xylocleptes*. In addition, the Ctenophorini (American) and Scolytoplatypodini (African) replace one another, as do the Bothrosternini (American) and Diamerini (African, etc.) and a few species groups within the *Xyleborus*.

The above discussion calls attention to a faunal exchange between North America and Eurasia sufficiently recent that speciation apparently is either not complete or that permits easy recognition of species or species groups on both sides of the Bering Strait. This route of faunal interchange was open to arctic and subarctic species at several times during the Pleistocene until quite recently in geologic time. However, forests were climatically stratified much as at present and it is probable that the only species exposed to the Bering land bridges during Pleistocene interglacial periods were those associated with the northern coniferous forest, namely *Hylurgops*, Hylastes, Xylechinus, a few *Phloeotribus*, *Polygraphus*, a few *Scolytus*, *Trypophloeus*, *Procryphalus*, *Cryphalus*, *Crypturgus*, *Dryocoetes*, *Pityokteines*, *Pityogenes*, *Orthotomicus*, *Ips*, *Trypodendron*, and *Pityophthorus*. For the most part, the speciation that followed migration of these species has been comparatively minor and species groups on both sides of the Bering Strait are easily recognized. Because the temperate forests have not reached arctic regions since late in the Tertiary, it must be assumed that species dependent on such hosts must have crossed the Bering land bridge during the Tertiary. It is probable that most *Phloeosinus*, *Hylesinus*, most *Scolytus*, *Ernoporus*, *Dolurgus* (or its ancestor), *Lymantor*, *Xyloterinus* (or its ancestor), and others, are in this category.

Known fossils not only confirm part of the above speculation, but place several genera in invaded territory much earlier than had been supposed. These records include the following (asterisks are used to identify genera invading new territory distinct from the continent of probable ancestral origin; extinct genera were omitted):

| Baltic Amber (Oligocene) | North America |
|---|---|
| °*Hylurgops* | *Hylurgops* (Miocene) |
| °*Hylastes* | *Hylastes* (Miocene) |
| *Hylurgus* (endemic) | °*Hylesinus* (Eocene) |
| *Tomicus* (endemic) | °*Phlocosinus* (Pleistocene) |
| °*Xylechinus* | *Phlocotribus* (Miocene) |
| *Hylesinus* | °*Polygraphus* (Eocene) |
| *Phloeosinus* | °*Dryocoetes* (Miocene) |
| *Polygraphus* | *Xyleborus* (Miocene) |
| *Carphoborus* | *Pityophthorus* (Miocene) |
| *Cryphalus* | |
| *Taphrorychus* (endemic) | |

It is curious to note from the above that *Tomicus* was present in Europe in the Oligocene, but it has never become established in North America even though a route for migration has been open and breeding specimens have been intercepted here on several occasions during the past century (Chamberlin 1939:215–216). It is also curious that *Dendroctonus* is not represented in the fossil

record nor has it invaded Eurasia until very recently (*D. armandi* may be an exception). In addition, 11 of the existing 20 tribes of North American Scolytidae are represented in the fossil record by modern genera. Seven of the nine tribes not represented are of tropical distribution or were probably too rare in temperate North America for one to expect fossilization.

Because the apparent connection between southern South America and southern Africa was broken by continental drift no later than early Tertiary (most geologists place it 15–30 million years earlier), I had presumed that the availability of such a route for migration would not be reflected in the living scolytid fauna. This is not the case. The above fossil record lists 12 modern genera that are 30 million or more years old in five different tribes. Furthermore, it is noted that, among groups now restricted basically to the American tropics and Africa, the genera *Phrixosoma*, *Cladoctonus*, *Micracis*, *Acanthotomicus*, certain *Hypothenemus*, and certain *Xyleborus* groups, the paired but different genera in the Phloeosinini, Hypoborini, Micracini, and in the *Dendrocranulus* group of genera of Dryocoetini, the paired but different tribal groups Bothrosternini and Diamerini, and the Ctenophorini and Scolytoplatypodini suggest that such a connection did exist and that the basic patterns of scolytid phylogeny were established long before that land connection was severed.

Based partly on the above dates and diversity, one might speculate that the Scolytidae originated in conjunction with the origin of coniferous gymnosperms perhaps as early as the Triassic, when conifers were a dominant plant group. In fact, Walker (1938) named *Paleoscolytus* and *Paleoipidus* from holes and engravings in petrified *Arancarioxylon* wood from the Triassic (Chinle formation) of Arizona. Whether or not these were made by scolytids or their ancestors is open to question.

## American Biogeography

Pleistocene glaciation affected the distribution of Scolytidae in northern North America by causing extinction in some areas and providing refugia in others. For example, *Carphoborus andersoni* Swaine is common in interglacial lake deposits in Ontario (Morgan, pers. comm.), but presently does not occur south or east of the Northwest Territories. Similarly, *C. carri* Swaine was common in postglacial deposits in western New York; this species presently is known from Manitoba and New Brunswick, but not from the intervening area.

The present land bridge connecting North and South America has facilitated a faunal exchange between these areas. South America was an island during much of the Tertiary, but was connected to North America at the beginning and again at the end of that period (Darlington 1965). During the Pleistocene this land bridge formed and broke several times. In those periods when the land bridge was broken, a series of islands persisted and preserved much of the fauna that had migrated to them while the connection was complete. Many of these species had either migrated along mountain chains or adapted to the higher elevations on the islands, where they either preserved migrating populations or were modified through selection into new geographical races or distinct species. The groups most conspicuously restricted to high altitudes and affected by the "island" effect are the tropical *Xylechinus*, *Gymnochilus*, *Chramesus*, *Stegomerus*, *Dendroterus*, *Pseudopityophthorus*, the xylomycetophagous Corthylini, and some *Cnesinus*. The island effect also may have halted the southward migration of the conifers, and all scolytids utilizing them as hosts, in northwestern Nicaragua. The speciation that resulted from the island effect combined with the later migration of the Bothrosternini (except some *Cnesinus*), *Dendrosinus*, *Phrixosoma*, *Phloeoborus*, *Phloeotribus*, most Scolytini (except some *Scolytus*), most Ctenopherini, many *Hypothenemus*, and *Xyleborus* in the lowland areas produced a rich fauna that appears unequaled elsewhere in the world in an area of similar size. Considerably more collecting and study must precede a detailed analysis of the scolytid biogeography of this area.

The most distinctive faunal area in North America appears to be the desert plateau region from southern California, southern Arizona, and southwestern New Mexico to the Isthmus of Tehuantepec. A considerable

amount of endemism is evident here in the Micracini, Cactopinini, *Dendroterus*, *Pityophthorus*, and, perhaps, in several other phloeophagous Corthylini. Superimposed upon this desert plateau are those species that breed in conifers in the mountains that traverse the area and those that penetrate the moist lowland pockets of tropical forest on the margins of the desert region.

Because 39 percent of all North and Central American Scolytidae are known only from their type series, and because most of these species are from Mexico to Nicaragua, a useful analysis of the biogeography of this area is not possible at the present time.

In view of the faunal exchange that has taken place between North America and Asia, both geologically recent and ancient, it appears significant that only two species of *Dendroctonus* have reached Eurasia, and one of those in comparatively recent times. The high concentration of species and diversity in Mexico suggests a Mexican origin of *Dendroctonus*, with a comparatively recent invasion of north temperate areas. This possibility is supported by the fact that no endemic *Ips* species, which share the same hosts with *Dendroctonus*, have developed in Mexico. All Mexican *Ips* have distributions extending into the United States. Only four of 16 American species of *Dendroctonus* presently do not occur in the Mexican plateau area, and all four are of recent origin (one of these is in Guatemala). *Pityoborus*, *Gnathotrichus*, *Conophthorus*, and several *Pityophthorus* exhibited similar patterns of distribution; for the most part, all breed in *Pinus*.

The southeastern deciduous forest forms a distinctive faunal area. As evidenced by present relict refugia on the eastern margins of the Mexican plateau, this area formerly extended southwestward into Mexico. Several *Thysanoes*, *Cnesinus strigicollis* LeConte, and *Micracis swainei* Blackman have present distributions that follow this pattern. A few forms that apparently originated in this area, such as *Micracisella nanula* (LeConte), *M. opacithorax*, and *M. hondurensis* Wood, have been modified by speciation. If the pines of the southeastern United States are considered to be part of the deciduous forest, *Dendroctonus frontalis* Zimmermann and the *Ips* that infest those pines and extend into Mexico are another example of this faunal connection.

Southern Florida is distinctive and appears to be more nearly like Cuba or other Antilles Islands than like the southeastern United States in its scolytid fauna. A majority of the species appear to have reached the area recently by crossing over water naturally (flotation, wind, etc.) or through commerce. A high percentage of the imported species are first detected in North America in southern Florida.

The scolytid fauna of the northern coniferous forest is distinctive. For the most part, it is rather monotonous but exhibits some endemism due to apparent refugia of past glacial periods in Alaska and Nova Scotia. Elements of this fauna extend southward along the mountains of the eastern and western United States.

The Pacific Coast belt from Alaska to southern California contains a rich fauna with many endemic species particularly in *Phloeosinus*, *Carphoborus*, *Alniphagus*, and *Scolytus*. From this area many species appear to have migrated since the last period of glaciation into the mountains of Idaho, Wyoming, Utah, Colorado, New Mexico, and northern Arizona. Others, namely some *Phloeosinus*, *Pseudopityophthorus agrifoliae* Blackman, and *Monarthrum dentigerum* (LeConte) have spread into Arizona at a time when the level of precipitation was higher than at present.

## Origin of Tribes

In view of the above summary of data relating to the biogeography of American Scolytidae, perhaps some speculation as to the origin of major groups in the world fauna within the family is in order. This is based on the assumption that (1) a geologically recent Bering connection existed between Alaska and Siberia on more than one occasion, (2) Africa and South America were connected or at least were close enough to permit migration by flight until the early Tertiary, and (3) South America was an island during most of the Tertiary, but was connected to North America near the beginning and near the end of that period and at one or more subsequent times.

Phrixosomini, Hypoborini, Micracini, *Dendrocranulus* (Dryocoetini), *Acanthotomicus* (Ipini), and parts of Xyleborini and Cryphalini evidently originated in the African-South American land mass before separation. *Phrixosoma* was probably then a relict genus rigidly adapted to the Guttiferae and has remained virtually unchanged in both areas since the separation. Micracini had diversified and the basic structure of most genera was almost fixed, as evidenced by paired or identical genera in both areas; diversification of the American segment of this group has been more extensive since the separation. Ctenophorini apparently also had a preseparation origin, but the African segment became modified into modern Scolytoplatypodini largely through the adoption of the ambrosial habit and then dispersed as far as Japan and Australia. The Diamerini-Bothrosternini may have had a preseparation origin, but both diverged and diversified. Phloeotribini, Scolytini, and Corthylini appear to have a postseparation South American origin; all appear to have spread into North America at the beginning of the Tertiary and from there into Eurasia after the Tertiary. An early representative of Phloeotribini reached Australia, apparently from southern South America, possibly either by island hopping or flotation, resulting in the monotypic *Aricerus*. At a much later date *Phloeotribus* invaded North America and from there it reached Eurasia. The occurrence of *Pityophthorus* (including aberrant allied forms) in Africa may indicate a slightly earlier origin for Corthylini; this group probably reached North America by early Tertiary and Eurasia by late Tertiary. Phloeosinini may also have originated in the African-South American area but subsequent dispersion has obscured the pattern.

Because of repeated and recent connections to adjacent areas, the role of North America in the origin of tribal groups is uncertain, although it has played a significant role in the formation of generic groups within several tribes. A possible North American origin of Hylastini in the remote past is suggested but not clear.

The role of Eurasia, the Indian subcontinent, and Africa (in addition to that mentioned above) is also unclear. The Polygraphini, Xyloterini, and Crypturgini probably originated in this area after the separation of Africa and South America, or at least dispersal into South America did not occur if there was a connection. The dispersal of Hylesinini, Tomicini, and Hypoborini, and many Dryocoetini, Xyleborini, and Cryphalini is too complex to permit speculation as to origin.

The representation of Hylesinini in North America is largely restricted to *Hylesinus* and *Alniphagus*; both genera occur in adjacent Asia and are obvious rather recent additions to the North American fauna. Hylesinini is represented in Central and South America only by *Phloeoborus*, which is of ancient origin and may be allied to the African *Dactylipalpus*. *Hylastinus* was introduced through commerce from Europe within the past century.

Most of the Tomicini are restricted to hosts in the Pinaceae; consequently, their phyletic history is closely linked to that group. Exceptions include *Xylechinus* (part) (almost worldwide), *Hylurgopinus* (North American), and *Dendrotrupes* (New Zealand). This appears to be a declining group that has undergone at least two radiations and is difficult to interpret.

Except for *Phloeosinus*, the Phloeosinini consist of the essentially Neotropical *Carphotoreus*, *Dendrosinus*, *Chramesus*, and *Pseudochramesus*, the Ethiopian *Chilodendron*, *Hylesinopsis*, and *Trypographus*, with *Cladoctonus* occupying both Ethiopian and Neotropical areas, the Oriental *Phloeocranus*, and the Australian *Hyleops*. Little relationship is seen in the group of genera from one continent when compared to the group from another continent. *Phloeosinus*, however, appears to be of south Asian origin and to have invaded Eurasia, North America, and Australia perhaps as early as the early Tertiary.

Except for the almost pantropical *Acanthotomicus*, it appears that Ipini originated (from *Acanthotomicus*?) in southern Eurasia or Africa. The early stock invaded North America from the north, where *Pityokteines* and *Ips* formed while *Pityogenes* and *Orthotomicus* formed in Eurasia. One or more recent connections between the land masses enabled elements of each of these four genera to invade the territory of the other. In each case

the invaded area contains only a minor fraction of the species-groups, all of which are found in the area of origin (see also Extraterritorial Affinities, above).

The Dryocoetini consist of several elements, most of which are of south Asian origin. Exceptions include *Dryocoetes* (sensu strictu) and *Lymantor*, which invaded northern North America recently, and *Dendrocranulus*, which recently invaded southern North America from South America, and *Thamnurgus*, *Xylocleptes*, *Triotemnus*, and possibly *Tiarophorus* of Eurasia and Africa. The origin of these latter groups evidently predates the separation of Africa and South America sufficiently that ancestral *Dendrocranulus*, which is almost congeneric with *Xylocleptes*, could disperse into South America.

The Cryphalini appear to have subdivided early into the *Cryphalus* group of genera that radiated out from southern Asia and reached northern North America rather recently and the *Hypothenemus* group of genera that radiated out from the African-South American land mass. A large number of genera and species are involved and cannot be adequately analyzed without a thorough taxonomic study.

## METHODS

Several departures from normal procedure were followed in this study. Those relating to the examination of specimens include: (1) Early in this study it was learned that the published records of distribution and host could not be relied upon as being authentic. Consequently, virtually every record cited in this work was based upon my personal examination of voucher specimens and types. Exceptions are clearly indicated. Almost all existing primary types, including the types of genera, have been examined by me and compared directly in detail to material from the same or a nearby locality. All type comparisons are cited. Due to misidentification, numerous published distribution and host records are not cited because they do not pertain to the species mentioned in the literature. Numerous collections were visited during the course of this study to obtain data and to examine type and other material. These included the National Museum of Natural History (Smithsonian Institution), American Museum of Natural History, Museum of Comparative Zoology, Illinois Natural History Survey Collection, Ohio State University Collection, State University of New York, Syracuse, Oregon State University, University of California at Berkeley, Colorado State University, California Academy of Sciences, the USDA Forest Service Collections (at Corvallis, Oregon; Berkeley, California; Albuquerque, New Mexico; and Fort Collins, Colorado), Canadian National Collection of Insects at Ottawa, British Museum (Natural History) at London, Museum National d'Histoire Naturelle at Paris, Universitates Zoologiska Museum at Helsinki, Zoological Institute of the USSR at Moscow, Forest Research Institute at Dehra Dun (India), and the Karl E. Schedl Collection at Lienz, Austria. Type and other material was sent by mail for my examination from numerous institutions and private individuals. Because many of these asked to remain anonymous, none are mentioned here. In all, more than 187,000 North and Central American specimens were examined during the course of the study.

(2) Measurements of the length of specimens depart from the usual method in that the head was not included for any species (other workers have included the head for Hylesininae and Scolytini). In general, measurements of the body, pronotum, and elytra were made from a position perpendicular to the dorsal (discal) surface at a position near the middle of the object being measured.

(3) All proportions were standardized; that is, the width was always divided into the length of the body, pronotum, or elytra (others have divided the shorter into the longer measurement regardless of the result).

(4) Insofar as practical, the descriptions were standardized to make comparisons easier and to avoid the illusion of describing differences when, in fact, none exist.

(5) Distributions are presented just in a brief summary that outlines the most distantly separated limits of range. This is then followed by a listing of political subdivisions from north to south beginning with Alaska (listed as though it were a separate country, due to its geographical position) to Panama.

Subdivisions of these political areas are listed alphabetically. When 10 or fewer collection records are known the full data are given; when 10 to 100 collection sites are known the towns or other localities are listed by states, estados, or provinces; when more than 100 sites are known only the names of the states, estados, or provinces are listed.

(6) The authenticity of the data depends on the accuracy of locality, host identification, and labeling by the original collector; on the correctness of labeling in the laboratory; and on the absence of remounting errors and other accidents that can happen in the curation of collections. Many errors have been published in the literature; a few of these were detected and eliminated or pointed out in this study.

All my studies were made with a stereoscopic American Optical Company microscope at magnifications of 10, 40, 80, and 160X, equipped with an ocular grid, using an American Optical Company illuminator Model 350, except at Moscow and Helsinki, where local museum equipment was used. Measurements were made in millimeters using the ocular grid, only at 10X magnification, because distortion affected measurements at higher magnifications. Measurements of proportions not requiring conversion to millimeters were made at other magnifications also.

When this study commenced it was intended that a complete listing of all known references to each species would be included. However, midway through the project financial support for this activity was withdrawn and the literature review was discontinued. It is hoped that future events will permit the publication of this important omission. Only the original validation of each nominate species and the citation of new synonymy were included.

My usage of the terms "interspace" and "interstriae" are not synonymous, as is the case with many coleopterists. Interspace here is a generic (general) term referring to a space between two objects, such as the space between any two punctures on the frons, pronotum, or elytra. Interstriae is restricted to the space on the elytra between two strial rows. Because the space referred to can exist only between *two* striae, only the plural form of this term is valid. An interstriae is an interspace, but only one restricted usage of interspace is an interstriae. To avoid confusion in this work, an interstriae is never referred to as an interspace.

## SYSTEMATIC SECTION

### Family Scolytidae

Scolytarii Latreille, 1807, Genera crustaceorum et insectorum ... 2:273 (Type-genus: *Scolytus* Geoffroy, 1762, see China 1962).

The first noteworthy attempt to summarize the known information about the Scolytidae of North America was that of LeConte (1868), who treated 17 genera and 94 species. In a later summary he (LeConte 1876) included 26 genera and 123 species. Both reviews treated only the fauna of Canada and the United States. In his treatment of the fauna of Mexico and Central America, Blandford (1895–1906) recognized 4 tribes, 45 genera, and 270 species. Swaine (1918) treated the fauna of Canada and part of the United States, listing 4 subfamilies, 52 genera, and 226 species. In an uncritical summary of previous work, Chamberlin (1939) listed 5 subfamilies, 71 genera, and 571 species from Alaska, Canada, and the United States. Bright (1976) recognized 3 subfamilies, 45 genera, and 214 species in Alaska and Canada. The present study is the first attempt to treat the Scolytidae of all of North America, including Central America; 2 subfamilies, 20 tribes, 94 genera, and about 1430 species are listed. This represents an estimated 23 percent of the known world fauna.

Speculation as to the apparent degree of completeness of our knowledge of the scolytid fauna of this area might be of interest in view of the experience that has resulted from the preparation of this work. It is supposed that 95–97 percent of the species in Alaska, Canada, and the United States are known. Those awaiting discovery will probably be sibling (cryptic) species that can be detected only through intensive biological studies or host specific species that breed in rare or unstudied hosts. Perhaps no more than 80–85 percent of the Mexican fauna is known; most undiscovered species there should be found in nonconiferous hosts. It is doubtful that as

much as 70 percent of the Central American fauna is known; unfortunately, the rapid rate at which natural habitats are being destroyed there may cause the extinction of many species before they are discovered by science. Since 37 foreign species have already been introduced into the area, additional species should be expected from this source and may already be established (Wood 1977).

While I was engaged in a review of the various classifications of subfamilies and tribes for the Scolytidae by previous workers, it became apparent that they were based on only a minor segment of the family and could not adequately be used for the entire world fauna. In an effort to alleviate this deficiency, a new classification was proposed (Wood 1978) that was based on representatives of about 90 percent of known genera in the world fauna and that utilized characters not previously employed in scolytid classification. In addition, that contribution contains the first attempt, since priority at the family-group level became mandatory, to list subfamily and tribal names according to their priority. For these reasons the subfamily and tribal divisions may be somewhat different and the names selected less familiar than those presented by earlier works.

The various groups are presented in the following key in as nearly a phylogenetic sequence as present knowledge permits. Obviously, there is much opportunity for improvement.

## Key to Subfamilies, Tribes, and Genera[2]

1. Each basal margin of elytra procurved and armed (Fig. 16) by a series of marginal crenulations (or less commonly by a continuous elevated costa in some Bothrosternini and Diamerini), usually with a scutellar emargination between them; scutellum usually small and rounded or depressed, absent in some groups; pronotum weakly if at all declivous on anterior half, usually unarmed but crenulations sometimes present on anterolateral areas; head usually visible from above, somewhat wider; protibiae usually wider; scales or deeply divided setae a common feature; subfamily HYLESININAE ..... 2

— Basal margins of elytra forming a straight transverse line across body, unarmed, rarely (some Scolytini, Ctenophorini, Cryphalini) with a weakly elevated continuous line (Fig. 17); scutellum usually large, flat (rarely absent or highly modified in some Xyleborini); pronotum weakly to strongly declivous on anterior half and usually armed by many asperate crenulations particularly on median half; head usually partly or entirely concealed from dorsal aspect, somewhat narrower; protibiae usually narrower; scales or deeply divided setae an uncommon feature; subfamily SCOLYTINAE ..... 31

2(1). Scutellar area of metanotum and its postnotum separated by a suturelike intersegmental membrane (Figs. 18, 33 No. 43); posterior part of scutoscutellar suture strongly curved mesad to a point near costa or crest of scutellar groove then continuing cephalad parallel to this costa for about two-thirds length of metanotum (Fig. 18) (except much less in Phrixosomini and Hyorrhynchini); metapleural suture descending subvertically from pleural wing process to metepisternal groove formed to receive corresponding costal groove and flage of elytron then abruptly angled and continued caudad along this groove to a point near pleural coxal process (Figs. 19, 33 No. 46); scutellum visible; funicle 6–7-segmented or if 5-segmented (*Sueus*, Oriental) then male frons not impressed and antennal club symmetrical ..... 3

— Scutellar area of metanotum and its postnotum fused on at least median third, intersegmental suture obsolete (Figs. 21, 33 No. 42); scutoscutellar suture less strongly curved, approaching costa of scutellar groove more gradually and continuing cephalad parallel to it for less than half length of metanotum (it never reaches margin of this groove in some groups) (Fig. 20); metapleural suture sometimes as described above, but more commonly running a more direct route from pleural wing process to pleural coxal process, often remote from locked position of costal margin of elytra for most or all of its course; scutellum either not visible or if visible then funicle 5-segmented and male frons impressed (except Bothrosternini with 6-segmented funicle but with a distinctive protibia) ..... 15

[2]Included in the key are all subfamilies and tribes in the world fauna. The descriptions and distributions of genera apply only to the North and Central American fauna. Adapted from Wood (1978).

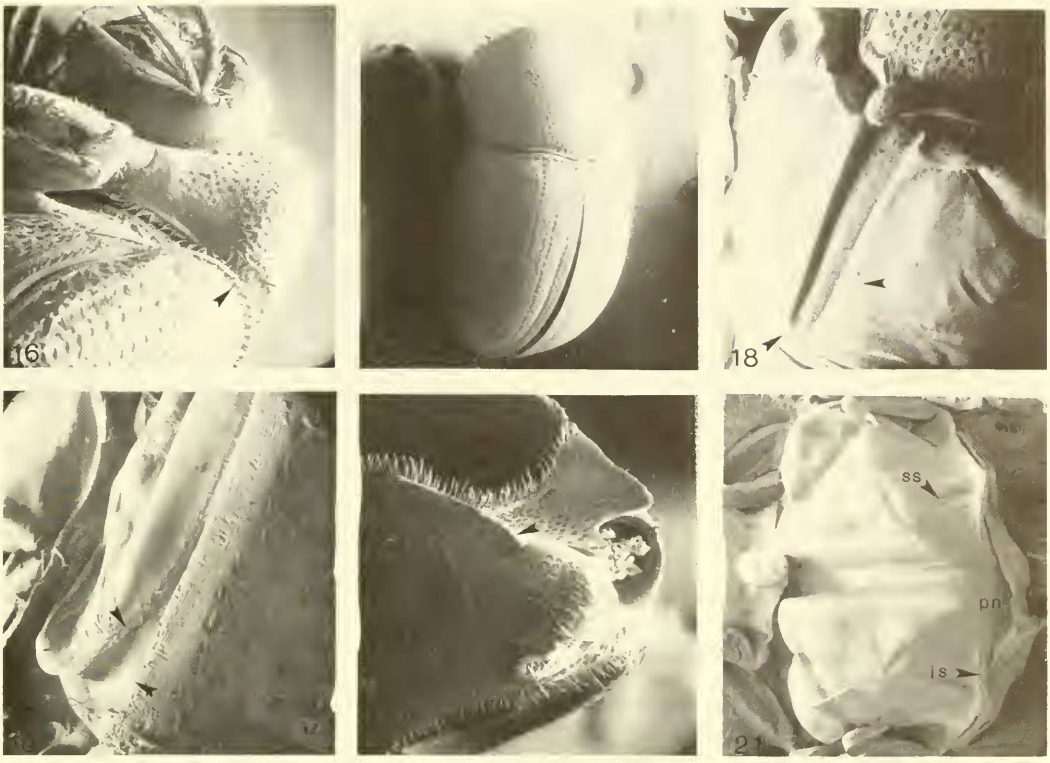



Fig. 16. *Phloeotribus setulosus*: Posterolateral aspect of male, note crenulations on basal margins of elytra, visible metepisternum, and pseudolamellate antennal club.

Fig. 17. *Scolytodes plumeriae*: Dorsolateral aspect of female.

Fig. 18. *Hylastes nigrinus*: Dorsolateral aspect of meso- and metatergum with wings removed; note intersegmental and scutoscutellar sutures (arrows).

Fig. 19. *Hylastes nigrinus*: Lateral aspect of metapleuron (dorsal area at upper left), note pleural sutures and groove on metepisternum that locks costal margin of elytron in place (arrows).

Fig. 20. *Hylastes nigrinus*: Ventrolateral aspect of prothorax; note the costate precoxal ridge (arrow).

Fig. 21. *Eupagiocerus dentipes*: Dorsal aspect of metatergum; note incomplete intersegmental suture (is), the completely fused postnotum (pn), and the divergent scutocutellar suture (ss).

3(2). Eye entire to feebly emarginate; scutoscutellar suture parallel to costa of scutellar groove for two-thirds length of notum (Fig. 33 No. 43); precoxal ridge on prothorax present or absent; antennal funicle 5–7-segmented ..... 4

— Eye completely divided by an emargination, halves widely separated; scutoscutellar suture remote from costa of scutellar groove (Fig. 33 No. 41); crenulations on basal margin of elytra low, often poorly formed; precoxal ridge on prothorax never present; antennal funicle usually 6-segmented (5-segmented in Oriental *Sueus*) ..... 14

4(3). Prothoracic precoxal area rather large, its lateral margins strongly, sharply elevated from anterior margin to coxae (Fig. 20); crenulations on elytral bases usually poorly developed; antennal funicle 7-segmented, club conical, segment 1 about as long as others combined; head somewhat prolonged, subrostrate, frons never sexually dimorphic (Fig. 14A); eye entire, rather short; Northern Hemisphere except introduced elsewhere; in Pinaceae (Tribe HYLASTINI) ..... 5

— Prothoracic precoxal piece small, short, its lateral areas elevated or not; crenulations on elytral bases more conspicuously elevated, forming a definite row (except confused in *Dactylopalpus*, African); antennal funicle variable, 5–7-segmented, club weakly to moderately flattened; head less distinctly rostrate, male frons usually impressed; eye oval to elongate, entire to feebly emarginate ..... 7

5(4). Anterior coxae rather widely separated by an intercoxal piece, its width at least equal to half width of a coxa (as in Fig. 26); striae 9 and 10 both independently continued at least to level of abdominal sternum 4; elytral vestiture sparse, recumbent, yellow, hair- or bristlelike, never including scales; general surface of elytra and pronotum rather dull; body color reddish brown ..... ***Scierus***

— Anterior coxae contiguous or at most with intercoxal piece narrower than one-fourth width of a coxa (as in Fig. 20 or 28); striae 10 obsolete behind level of posterior coxae, only striae 9 continues caudad; elytral vestiture longer, more abundant, usually including at least some small scales ..... 6

6(5). Third tarsal segments broad, bilobed; pronotum usually constricted anteriorly, usually about equal numbers of small and large punctures intermixed on disc. ..... ***Hylurgops***

— Third tarsal segments narrower, emarginate; pronotum not noticeably constricted anteriorly, punctures uniformly large or small, rarely intermixed with a few small ones ..... ***Hylastes***

7(4). Pronotum asperate on anterolateral areas (except *Hylastinus*); prothorax with strongly elevated costate ridge from coxa to anterior margin; antennal funicle 6–7-segmented; mesal surface of elytra at base of suture immediately behind scutellum with an interlocking series of nodules and cavities (as in Fig. 22A–B), this lock interrupts groove and flange of suture (not visible when elytra in locked position); worldwide (Tribe HYLESININI) ..... 8

— Anterolateral areas of pronotum unarmed; precoxal costa on prothorax absent; funicle 5–7-segmented; mesal surface of elytra at suture with interlocking groove and flange continued to base without a series of nodules or cavities immediately behind scutellum (Fig. 22C); worldwide (Tribe TOMICINI) ..... 11

8(7). Anterolateral areas of pronotum unarmed by asperities; precoxal prosternum longer, its lateral margins from coxa to anterior margin strongly, acutely elevated, coxae more widely separated, intercoxal piece at least equal to half width of a coxa; eye entire; antennal club conical; breed in roots of clover .... ..... ***Hylastinus***

— Anterolateral areas of pronotum usually armed by a few asperities; prosternum very short, its lateral margins obtusely, if at all, elevated, coxae more narrowly separated, intercoxal piece equal to less than one-fourth width of a coxa; breed in bark and wood of trees ..... 9

9(8). Dorsal vestiture scalelike; eye rather short, entire; costal margin of elytra ascending toward apex; in *Fraxinus* ..... ***Hylesinus***

— Vestiture hairlike; eye moderately long and shallowly emarginate to exceedingly elongate; costal margin of elytra descending toward apex ..... 10

10(9). Antennal scape long, its apex attaining posterior margin of eye; eye comparatively short, shallowly emarginate; length usually less than 4.0 mm; western USA and Canada; in *Alnus* ..... ***Alniphagus***

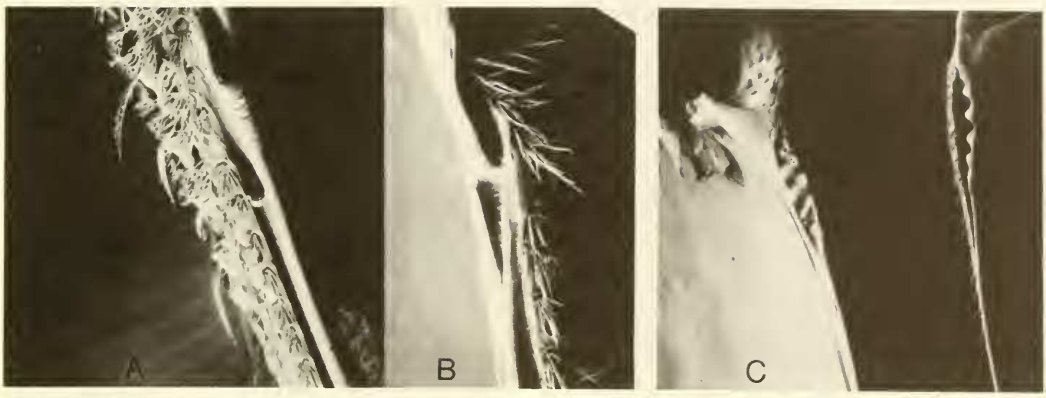



Fig. 22 A–B. *Pseudohylesinus n. nebulosus*: Mesal aspect of sutural margin at base of elytra; note that the sutural grooves continue to the base without interruption.

Fig. 22C. *Phlocosinus cristatus*: Mesal aspect of sutural margin at base of elytra; note the interlocking cavities and nodules at the anterior end of the sutural grooves.

— Antennal scape short, not attaining posterior margin of eye; eye exceedingly elongate, often subcontiguous both dorsally and ventrally; usually larger than 8 mm; tropical species ..... ***Phloeoborus***

11(7). Antennal funicle 7-segmented, club conical, feebly flattened in a few species ..... 12

— Antennal funicle 5-segmented, club moderately to rather strongly flattened ..... 13

12(11). Vestiture scalelike; antennal club with segment 1 longer, usually about one-third of its total length; epistomal margin (and premandibular lobe, when present) with a small, median sulcus, sulcus usually ornamented by a few setae; western North America; in coniferous hosts ..... ***Pseudohylesinus***

— Vestiture more slender; antennal club with segment 1 shorter, about one-fourth of its total length; epistomal margin continuous, without a median sulcus or setae; anterolateral area of pronotum with a few fine asperities; eastern North America; in *Ulmus* ..... ***Hylurgopinus***

13(11). Vestiture scalelike; area immediately above epistomal margin without an elevated epistomal process; smaller species ..... ***Xylechinus***

— Vestiture hairlike; epistomal process well-developed; larger species ..... ***Dendroctonus***

14(3). Protibia armed on outer apical margin by several socketed denticles of approximately equal size (as in Fig. 34); procoxae contiguous; frons convex, not sexually dimorphic; antennal scape elongate, suture 1 of club partly septate; pronotum never armed by asperities; America, Africa (Tribe PHRIXOSOMINI) ..... ***Phrixosoma***

— Protibia with outer apical angle produced into one conspicuous spine reaching level of tarsal insertion, outer margin without any socketed teeth (as in Figs. 27 or 29); procoxae rather widely separated; male frons broadly impressed, female frons convex; antennal scape either long or short, club aseptate; pronotum either with or without asperities in anterolateral areas; southeast Asia ..... HYORRHYNCHINI




Fig. 23 A–B. *Eupagiocerus dentipes*: Posterior face of protibia: A, note the bifid outer apical process and B, the socketed lateral tooth.

15(2). Lateral margins of pronotum usually subacutely elevated, costate; mesepimeron moderately to very large, its dorsal portion usually grooved for reception of elytral base; scutellar shield under base of elytra large, extending posteriorly beyond visible scutellum; scutoscutellar suture remote from costa of scutellar groove to its base; outer apical angle of protibia often with only one major, recurved spine; Africa, southeast Asia to Australia ..... DIAMERINI

— Lateral margins of pronotum usually rounded (subcostate in some neotropical Bothrosternini); mesepimeron not enlarged or grooved (feebly grooved in *Aricerus*, Australia); scutellar shield beneath elytra small if present, not extended caudad beyond visible scutellum; scutoscutellar suture near and parallel to costa of scutellar groove on at least anterior fourth of metanotum ..... 16

16(15). Outer apical angle of protibia with a curved bifid process (Fig. 23), meso- and metatibiae with one or two (usually smaller) curved spines on outer apical angle extending beyond level of spine on inner apical angle; pronotum smooth or longitudinally strigose; funicle 6-segmented; lateral prosternal area usually subacutely elevated from coxa to anterior margin; anterior coxae widely separated; crenulations on elytral bases rather small or (rarely) replaced by a continuously elevated costa; eye entire; America (Tribe BOTHROSTERNINI) ..... 17

— Outer apical margin of protibia armed by several teeth of about equal size (except *Aricerus* in Phloeotribini, Australia), none of them extending beyond tarsal insertion; funicle 4–7-segmented; prosternal area with margins rounded, costa obsolete; eye varying from entire to emarginate to divided ..... 21

17(16). Lateral margins of pronotum rounded ..... 18

— Lateral margins of pronotum marked by a sharply elevated, costate to subcostate line (Fig. 24) ..... 19

18(17). Sutures of antennal club transverse, straight; rostrum distinctly wider than distance between eyes; pronotum either longitudinally strigose or punctured; pith borers of twigs and woody vines ..... ***Cnesinus***

— Sutures of antennal club strongly procurved; rostrum width at tip equal to distance between eyes; frons excavated, with a median tubercle just above epistoma; body oval; seed borers ..... ***Pagiocerus***

19(17). Sutures of antennal club strongly procurved; pith borers in twigs and woody vines ..... ***Eupagiocerus***

— Sutures of antennal club transverse, straight ..... 20

20(19). Proepisternal area partly excavated, with cavity densely filled by yellow pubescence; prothoracic intercoxal piece with a transverse, subcarinate ridge; elytral interstriae usually not strongly carinate; ambrosia beetles in axial tunnels of woody vines ..... ***Bothrosternus***

— Proepisternal area normal, not densely pubescent; prothoracic intercoxal ridge absent; elytral interstriae narrowly carinate from posterior part of disc to apex; pith borers in branches and twigs ..... ***Sternobothrus***

21(16). Scutellum visible, elytral bases notched for its reception; tarsal segment 3 stout, usually somewhat bilobed (except slender in *Chramesus*); mesal surface of elytra at suture immediately behind scutellum with a series on interlocking nodules and cavities ..... 22

— Scutellum obsolete, elytral bases only slightly if at all emarginate at suture; tarsal segment 3 slender; mesal surface of elytra at suture usually without a special lock, groove and flange extend to base at position of scutellum ..... 27

22(21). Antennal club pseudolamellate, strongly constructed at sutures and movable at intersegmental lines (Fig. 15); North and South America, Eurasia, Australia (Tribe PHLOEOTRIBINI) ..... ***Phloeotribus***

— Antennal club immovable, broadly fused at sutures, sutures often partly or entirely obsolete; worldwide (Tribe PHLOEOSININI) ..... 23

23(22). Antennal funicle 6- or 7-segmented, club symmetrical, sutures transverse ..... 24

— Antennal funicle 5-segmented, club moderately to very strongly asymmetrical, sutures oblique or absent ..... 26

24(23). Antennal funicle 7-segmented, sutures on club procurved; body stout, black; basal area of pronotum strongly, rather extensively grooved for reception of elytral bases; abdomen ascending to meet elytra; larger species; tropical ..... ***Dendrosinus***

— Antennal funicle 6-segmented; body more slender; basal area of pronotum not conspicuously grooved for reception of elytra; abdomen horizontal; smaller species ..... 25

25(24). Eye entire; antennal club flattened, elongate, about equally divided by two strongly constricted, straight sutures; elytral ground vestiture rather abundant, subplumose ..... ***Carphotoreus***

— Eye deeply emarginate; antennal club subglobular, recurved sutures indicated only by rows of fine setae; elytral ground vestiture sparse, mostly obsolete, hairlike when present ..... ***Cladoctonus***

26(23). Eye emarginate (completely divided in a few Indo-Australian species); antennal club marked by at least two oblique sutures, moderately asymmetrical; tarsal segment 3 broad, somewhat bilobed; pronotum never armed by asperities; in coniferous hosts (mostly Cupressineae) ..... ***Phloeosinus***

— Eye entire; antennal club large, strongly asymmetrical, sutures obsolete; tarsal segment 3 slender; pronotum commonly with asperities in anterolateral areas; never in coniferous hosts ..... ***Chramesus***

27(21). Eye sinuate or entire; pronotum armed by a few scattered or clustered asperities; crenulations at bases of elytra restricted to area between suture and interstriae 5; funicle 3–5-segmented; scutoscutellar suture remote from costa of scutellar groove on anterior fourth of metanotum; almost worldwide (Tribe HYPOBORINI) ..... 28

— Eye emarginate or entirely divided; pronotum never armed by asperities; crenulations at bases of elytra more widely distributed, extending laterad beyond interstriae 5; funicle 5- or 6-segmented; scutoscutellar suture passing near and parallel to costa of scutellar groove on anterior fourth of metanotum; Northern Hemisphere, Africa (Tribe POLYGRAPHINI) ..... 29

28(27). Antennal funicle 5-segmented, sutures of club transverse, distinct; elytral vestiture without conspicuous recumbent hair; pronotum armed by two or three widely separated, paired clusters of teeth ..... ***Chaetophloeus***

— Antennal funicle 4-segmented, sutures of club indicated only by marginal notches; elytra with uniseriate rows of erect, broad interstrial scales and recumbent strial hair of equal length; pronotum armed by three or four pairs of median tubercles ..... ***Liparthrum***

29(27). Eye divided; elytral punctures very small, confused, strial rows not evident; antennal club without sutures; antennal funicle 5- or 6-segmented ..... ***Polygraphus***

— Eye emarginate; strial rows clearly indicated by rows of coarse punctures; antennal club with sutures clearly marked ..... 30

30(29). Antennal funicle 6-segmented; elytral ground vestiture hairlike; on Cupressinae ..... ***Carphobius***

— Antennal funicle 5-segmented; elytral ground vestiture scalelike; on Abietineae ..... ***Carphoborus***

31(1). Lateral margin of pro- and metatibiae unarmed except for a single, apical, spinelike process that curves toward and extends beyond process of inner apical angle; lateral margin of pronotum subacutely elevated, costate (Fig. 25); pleural suture descending subvertically from pleural wing process to groove receiving groove and flange on costal margin of elytra, at this point suture turns abruptly and follows groove caudad to metapleural coxal process (Fig. 25); funicle 7-segmented, sutures of antennal club strongly procurved or obsolete; Holarctic and Neotropical (Tribe SCOLYTINI) ..... 32

— Lateral margin of protibia armed by more than one denticle, none of which exceed or curve toward inner apical process; pleural suture less strongly angulate, groove receiving flange of costal margin of elytra displaced ventrad from course followed by pleural suture; lateral margin of pronotum subacutely raised or not, antenna variable ..... 35

32(31). Scutellar area of interstriae 1 not depressed, scutellum even (flush) with elytral bases; basal margins of elytra with a fine raised line (broken into minute crenulations in some *Cnemonyx*), outline of anterior margins form a continuous, straight, transverse line with scutellum; ventral profile of abdomen ascending gradually ..... 33

— Scutellum depressed, subtriangular, apically (posteriorly) pointed; elytral bases depressed in scutellar area, appearing emarginate in median area; ventral profile of abdomen usually ascending abruptly at segment 2 ..... 34

33(32). Antennal club usually with two or three sutures clearly marked by setae; scutellum small, longer than wide, often convex; apical margin of meso- and metathoracic tibiae commonly bearing tubercles on anterior edge in addition to inner and outer processes; usually more coarsely sculptured, smaller species, less than 2.5 mm; phloeophagous ..... *Cnemonyx*

— Antennal club with only suture 1 marked internally by a partial septum; scutellum flat, 1.5 or more times as wide as long; meso- and metathoracic tibiae acutely margined on apical anterior edge, without supplemental denticles; usually very finely sculptured; 2.2–8.5 mm; xylophagous ambrosia beetles ..... *Camptocerus*

34(32). Humeral margin of elytra deeply, broadly excised, metepisternum conspicuously expanded into this notch; abdomen abruptly flexed upward at posterior margin of segment 2; phloeophagous; tropical ..... *Scolytopsis*

— Humeral margin of elytra normal (straight) and overlapping metepisternum; abdomen flexed upward from anterior margin of segment 2; phloeophagous ..... *Scolytus*

35(31). Metepisternum visible throughout its length, slightly more than its dorsal half covered by elytra when in locked position, either with a conspicuous groove for reception of costal flange throughout its length or else groove represented at its anterior end by a denticulation or costate remnant near anterior end of metepisternum; antennal club varying from flat to obliquely truncate ..... 36

— Metepisternum largely covered by elytra, its groove for reception of costal flange obsolete, a small, transverse callus (Cryphalini) (Fig. 31) or a small transverse groove (Corthylini) (Figs. 32 or 33:47) at anterior end of metepisternum; antennal club strongly flattened; antennal club never obliquely truncate ..... 70

36(35). Lateral margins of pronotum subacutely elevated, basal margin of elytra usually finely elevated (Fig. 16); procoxae rather widely separated (Fig. 26) except contiguous in Xyloctonini (Africa to SE Asia); protibia with prominent outer apical process recurved, usually extending beyond tarsal insertion (Fig. 27), posterior tibia tapered on apical third and armed by several small socketed denticles; funicle 6–7-segmented; tarsi often retractile into tibial grooves ..... 37

— Lateral and basal margins of pronotum rounded; procoxae subcontiguous (Fig. 28) (except most Micracini and a few Xyleborini); protibia with outer apical angle inconspicuous, armed by several small socketed denticles; funicle 2–6-segmented; tarsi not retractile (except *Xyleborini*) ..... 42

37(36). Eye divided or nearly so by a very deep emargination; antennal club flat, usually enlarged, with sutures strongly procurved; abdomen conspicuously ascending toward apex (not always clear in *Ctonoxylon*, Africa); tarsi always retractile into tibial grooves; Africa, SE Asia ..... XYLOCTONINI

— Eyes entire to shallowly sinuate on anterior margin; antennal club flat, usually smaller, more slender, sutures variable if present; abdomen horizontal; tarsi retractile or not ..... 38

38(37). Antennal club unmarked by sutures; pronotum with sides strongly constricted on posterior half; scutellum absent (a small scutellum present in one species); Africa to Asia, New Guinea (Fig. 30); mycetophagous ..... SCOLYTOPLATYPODINI



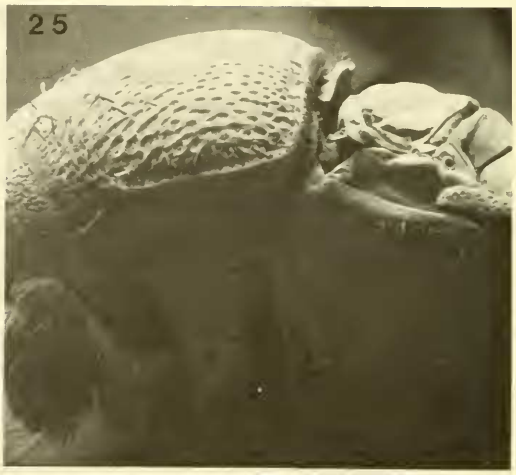










Fig. 24. *Eupagiocerus dentipes*: Lateral aspect; note the costate lateral margin of the pronotum.

Fig. 25. *Cnemonyx panamensis*: Lateral aspect, wings removed; note the costate lateral margin of the pronotum, pleural suture, and groove for reception of elytra.

Fig. 26. *Scolytodes plumeriae*: Ventrolateral aspect: note costate lateral margin of pronotum, visible metepisternum, and interstriae 10 (arrow) that extends to posterior third of elytra.

Fig. 27. *Scolytodes schwarzi*: Posterior face of protibia; note lateral unsocketed spine extending beyond inner (mesal) apical spine (arrow).

— Antennal club with one or more sutures indicated by grooves, setae, or septae; scutellum large, flat; America; not mycetophagous (Tribe CTENOPHORINI) ..... 39

39(38). Eyes elongate, approximate above and below, coarsely faceted, shallowly emarginate; entire surface of pronotum smooth and punctured, not armed ..... 40

— Eye oval, entire, finely faceted; pronotum asperate anteriorly or if smooth then anterior margin of elytra bearing a fine raised line ..... 41

40(39). Antennal club subglobular, about as long as wide, sutures not clearly indicated; pronotum longer than wide, its lateral margins straight or feebly constricted; vestiture hairlike, usually sparse; small, slender species ..... ***Microborus***

— Antennal club asymmetrically flattened, pointed, at least 1.5 times as long as wide, sutures 1 and 2 clearly marked by setae; pronotum wider than long, its lateral margins arcuate; vestiture of abundant, short, bristlelike scales; larger, stouter species ..... *Pycnarthrum*

41(39). Antennal funicle 7-segmented, club large, broad, usually with procurved sutures or sutures obsolete; elytral vestiture consisting of abundant, minute hair and sparse interstrial rows of long, erect, scalelike bristles; summit of pronotum on basal third, asperities on anterior area coarse; elytral base without a fine raised line ..... *Gymnochilus*

— Antennal funicle 6-segmented, club small, sutures present or not; elytral vestiture sparse, hairlike; asperities fine, if present; summit at middle or indefinite; basal margins of elytra marked by a fine raised line (Fig. 16) ..... *Scolytodes*

42(36). Procoxae moderately separated; protobiae with sides parallel, armed by denticles only on apical margin or posterior face; funicle 6-segmented; female frons often concave, male frons rarely concave (two *Pseudothysanoes*); Africa, America (Tribe MICRACINI) ..... 43

— Procoxae contiguous (except Carphodicticini, some Xyleborini); protibia much wider apically, armed on lateral margin by several denticles; female frons rarely concave (a few Dryocoetini), male frons often concave; funicle 2–5-segmented ..... 49

43(42). Elytra broadly rounded behind (subacuminate in *Pseudothysanoes mucronatus*); lateral margins of antennal club constricted at sutures 1 and (usually) 2, except when sutures totally obsolete ..... 44

— Elytral apices acuminate (partly lost in some *Micracisella*), usually mucronate; antennal club without sutural constrictions, sutures always indicated on anterior face ..... 46

44(43). Pronotum longer than wide, summit less strongly developed; protibia rather broadly flattened, sides parallel, subtruncate apically ..... *Thysanoes*

— Pronotum as wide or wider than long, summit well developed; protibia slender, weakly or not at all flattened ..... 45

45(44). Elytral declivity in both sexes variously sculptured but never sulcate; antennal scape long or short, club with or without sutures; mostly phloeophagous, a few xylophagous ..... *Pseudothysanoes*

— Elytral declivity bisulcate, subvertical; antennal scape short, flattened, little if any longer than pedicel, club small, widest through basal half, sutures 1 and 2 straight, indicated by rows of setae; phloeophagous ..... *Stenocleptus*

46(43). Eye short, oval, not more than 1.5 times as long as wide, finely faceted; antennal club small, sutures straight to weakly procurved or bisinuate; protibia slender ..... 47

— Eye elongate, 2.0 or more times as long as wide, coarsely faceted; antennal club rather large, sutures very strongly procurved; anterior tibiae rather strongly flattened ..... 48

47(46). Sutures 1 and 2 on antennal club straight, visible only at margins, obsolete in central area, club small; protibia entirely unarmed on posterior face, smooth; phloeophagous ..... *Phloeocleptus*

— Sutures 1 and 2 on antennal club weakly procurved to bisinuate, clearly visible in central area of anterior face, club larger; protibia armed on posterior face by many tubercles or rugae; xylophagous ..... *Hylocurus*

48(46). Eye shallowly emarginate, often approximate below; anterior tibiae less strongly flattened, at least one of five distal teeth on outer margin; scape usually less strongly expanded; antennal club rather broad, sutures more broadly procurved; monogamous, pith beetles ..... ***Micracisella***

— Eye entire, always widely separated below; anterior tibia more strongly flattened, all five teeth on distal margin; scape usually very strongly expanded; antennal club more elongate, sutures usually much more strongly, narrowly arcuate; bigamous, xylophagus ..... ***Micracis***

49(42). Male frons strongly excavated, epistoma armed by a pair of (usually) fused spinelike horns of enormous size; funicle 5-segmented, club often small and feebly flattened; eye small, entire; pronotum with summit near basal margin, projecting back over scutellum in some species; western United States and Mexico (Tribe CACTOPININI) ..... ***Cactopinus***

— Not fitting above combination of characters ..... 50

50(49). Meso- and metathoracic tibiae more slender, more abruptly narrowed on apical fourth, lateral and apical margins armed by fewer, coarser teeth; eye sinuate to shallowly emarginate (divided in *Tiarophorus,* Dryocoetini, Africa); pronotum sometimes with a raised line on basal or lateral margin; pregular area not depressed; sexes of similar size and body form (except male dwarfed and deformed in *Coccotrypes* and *Ozopemon*); habits varied but never woodboring or mycetophagous ..... 51

— If eye completely divided into two parts and antennal funicle 4-segmented then male frons deeply excavated and male equal in size to female; if eye emarginate (or if divided and funicle 5-segmented) then male dwarfed, deformed, and flightless and female meso- and metathoracic tibiae expanded to just beyond middle then arcuately tapered to apex, its apical two-thirds on outer margin armed by a row of numerous small, closely set teeth of equal size, these usually supplemented in same row by submarginal hair on posterior face; male pronotum highly modified; pregular area depressed (except *Premnobius*); woodboring, mycetophagous ..... 62

51(50). Pronotum rather strongly, laterally constricted on posterior half, anterior half not declivous and unarmed by asperities; anterior coxae moderately separated; antennal club strongly flattened, marked by two sutures, sutures on posterior face almost equal to those on anterior face; South America, India to Ceylon ..... CARPHODICTICINI

— Pronotum not constricted, sides straight to arcuate, anterior half declivous, usually armed; anterior coxae contiguous; antennal club obliquely truncate (Fig. 29) or with sutures on posterior face strongly displaced toward apex (rarely with sutures obsolete) ..... 52

52(51). Elytral declivity moderately sulcate to elaborately excavated, with lateral margins usually armed by tubercles or spines; pronotum more strongly declivous on anterior third, asperities usually larger; worldwide (Tribe IPINI) .... 53

— Elytral declivity slightly flattened to convex, unarmed by tubercles, spines, or unusual sculpture; pronotum usually evenly arched from base to anterior margin; asperities fine and abundant when present ..... 57

53(52). Elytral declivity rather narrowly bisulcate, lateral margins rather broadly elevated, rounded, and armed by not more than three pairs of denticles; lower margin of declivity rounded; usually smaller than 3 mm ..... 54

— Elytral declivity broadly, rather deeply excavated, margins acutely elevated and armed by three or more pairs of denticles (except one to six in tropical *Acanthotomicus*); lower margin of declivity with an acutely elevated transverse ridge separating declivital excavation from apical margin; usually larger than 3 mm ..... 55

54(53). Prosternal intercoxal piece short, obtuse; female frons deeply, rather narrowly excavated (except *meridianus* and *mexicanus*); male declivity with two or three pairs of enlarged denticles; antennal club compressed, two sutures visible on distal third of posterior face ..... ***Pityogenes***

— Prosternal intercoxal piece long and acutely tapered; female frons convex; male declivity more narrowly impressed ..... ***Pityokteines***

55(53). Antennal club obliquely truncate, sutures recurved; third (lowest) major denticle not on lateral margin of elytral declivity, displaced mesad from margin; eye of normal size; in coniferous hosts ..... ***Orthotomicus***

— Antennal club flattened, sutures either procurved or strongly bisinuate; lateral margin of elytral declivity armed by one to six major denticles, third (if present) on or incorporated into crest of lateral margin; eye usually abnormally large or else very small ..... 56

56(55). Sutures of antennal club (when present) moderately to very strongly procurved; eye large, very coarsely faceted, its width about equal to length of scape, its length more than twice length of scape; in angiosperm hosts from Mexico to South America ..... ***Acanthotomicus***

— Sutures of antennal club moderately to strongly bisinuate (except procurved in *concinnus*, *mexicanus*); eye small, finely faceted, its width equal to much less than length of scape, its length equal to much less than twice length of scape; in coniferous hosts from Canada to Nicaragua ..... ***Ips***

57(52). Antennal funicle 4–6-segmented, club either obliquely truncate or with sutures on posterior face strongly displaced toward apex; anterior half of pronotum more strongly declivous and rather coarsely asperate (unarmed in *Tiarophorus*, Africa); worldwide (Tribe DRYOCOETINI) ..... 58

— Antennal funicle 2–3-segmented, club with sutures on posterior face about equal to those on anterior face; pronotum feebly declivous on anterior half and unarmed (minutely granulate in some *Aphanarthrum*, Africa, etc.), reticulate in many species; size small; Northern Hemisphere, Africa (Tribe CRYPTURGINI) ..... 61

58(57). Pronotum distinctly longer than wide, widest at middle; antennal club compressed or with membranous apical portion extending beyond corneous portion, sutures procurved; scutellum very small ..... 59

— Prothorax about as wide as long, widest on posterior third, sides converging rather strongly on anterior half; antennal club obliquely subtruncate, sutures transverse or recurved; scutellum moderate to large ..... 60

59(58). Antennal funicle 4-segmented; club compressed, sutures strongly arcuate; pronotum granulate on anterior half, punctured behind; host *Acer* ..... ***Lymantor***

— Antennal funicle 5-segmented; club less strongly compressed, sutures narrowly to rather broadly procurved; pronotum usually granulate to base; host Cucurbitaceae ..... ***Dendrocranulus***

60(58). Antennal club with basal corneous portion reaching beyond middle; declivity steep, abrupt, confined to posterior fourth of elytra; northern North America; in coniferous hosts ..... ***Dryocoetes***

— Corneous portion not reaching middle of antennal club in central area; declivity gradual, extending over at least posterior third of elytra; frons convergently aciculate; southern USA to South America; in nonconiferous hosts ..... ***Coccotrypes***

61(57). Antennal funicle 2-segmented, club with one suture near apex; northern and eastern North America ..... ***Crypturgus***

— Antennal funicle 3-segmented, club with three sutures; northwestern North America ..... ***Dolurgus***

62(50). Eye always completely divided into two parts; antennal funicle 4-segmented, base of club feebly to moderately corneous, usually pubescent to base; male subequal in size to female, his frons flattened or excavated and anterior margin of his pronotum more broadly rounded; male joins female in parental gallery, reproduction always bisexual; Europe, Asia, North America (Tribe XYLOTERINI) ..... 63

— Eye emarginate except divided in some *Pseudoxyleborus* (SE Asia); funicle 5-segmented (3- or 4-segmented in a few Asiatic forms); males flightless, dwarfed, deformed, anterior slope of pronotum variously excavated; male head convex; male absent from parental gallery except as progeny; partly parthenogenetic, males haploid; worldwide (Tribe XYLEBORINI) ..... 64

63(62). Subcorneous basal area of antennal club broadly, feebly procurved; anterior tibiae flattened, devoid of tubercles on posterior face in both sexes; male frons somewhat flattened; male distinctly smaller than female; long axis of female proepimeral excavation transverse ..... ***Xyloterinus***

— Subcorneous basal area of antennal club strongly, narrowly procurved; female protibiae inflated and tuberculate on posterior face, flattened and tuberculate in male; male frons deeply, extensively, concavely excavated, convex in female; male pronotum subquadrate, its anterior margin unarmed and straight to weakly recurved, in female serrate and procurved; long axis of female proepimeral excavation longitudinal, very narrow ..... ***Trypodendron***

64(62). Pregular area not depressed below surrounding ventral area of head; labial palpi cylindrical, comparatively slender; antennal club thickened at base, margin of thickened area procurved, not corneous, pubescent almost to base; lateral margin of pronotum subacute from base almost to anterior margin; posterior face of protibia minutely tuberculate; anterior margin of pronotum unarmed ..... ***Premnobius***

— Pregular area depressed inward below ventral contour of head; labial palpi broad, segment 1 greatly enlarged; antennal club usually obliquely truncate, basally corneous, sutures if present recurved (except *Sampsonius*); lateral margins of pronotum more broadly rounded; protibiae usually smooth on posterior face (except *Dryocoetoides*); anterior margin of pronotum armed or not ..... 65

65(64). Antennal club often more strongly flattened, with two transverse or procurved sutures not attaining margins laterally but continuing separately, suture 1 continuing to and clearly visible on posterior face, suture 2 continuing to apex of club or more rarely to posterior face near apex, basal area more weakly corneous, both sutures equally elevated; anterior margin of pronotum always serrate ..... 66

— Antennal club clearly, obliquely truncate, basal area strongly corneous, its distal margin on anterior face recurved, usually acutely marked, continuing to apex of club, a second suture sometimes indicated but entirely confined to anterior face, usually obsolete before apex and never acutely elevated; anterior margin of pronotum serrate or not ..... 68

66(65). Antennal club rather strongly flattened, both sutures moderately to rather strongly procurved; pronotum very slender, at least 1.4 times as long as wide, its anterior margin armed by two very coarse serrations; elytra very elongate, declivity gradual and as long as disc, ordinarily with unusual sculpture and ornamentation; eyes very large, very coarsely faceted; tropical ..... ***Sampsonius***

— Antennal club with sutures straight, feebly procurved to weakly recurved; pronotum stout, less than 1.1 times as long as wide, its anterior margin usually armed by four or more moderately coarse serrations; elytra variously sculptured, moderately elongate ..... 67

67(66). Anterior tibia inflated and armed on posterior face by several conspicuous, confused granules or denticles in addition to socketed teeth on outer margin; eyes averaging larger and more coarsely faceted ..... ***Dryocoetoides***

— Anterior tibia flattened, its posterior face smooth, entirely devoid of granules; eyes averaging smaller and more finely faceted ..... ***Theoborus***

68(65). Anterior coxae widely separated by an intercoxal piece; body very stout, 1.9–2.3 times as long as wide; anterior margin of pronotum serrate; elytral disc occupying less than half of elytral length, declivity convex, devoid of major tubercles or processes ..... ***Xylosandrus***

— Anterior coxae contiguous; body stout to slender, elytra variously sculptured .... 69

69(68). Basal margins of elytra rounded, forming an almost straight, transverse line across body; scutellar notch entirely filled by scutellum; scutellum flat, attaining level of elytral surface ..... ***Xyleborus***

— Basal margins of elytra abrupt, precipitous in median area; scutellum conical, not filling scutellar notch, adjacent vertical sides of scutellar notch pubescent; posterolateral margin of elytral declivity often dentate, never carinate ..... ***Xyleborinus***

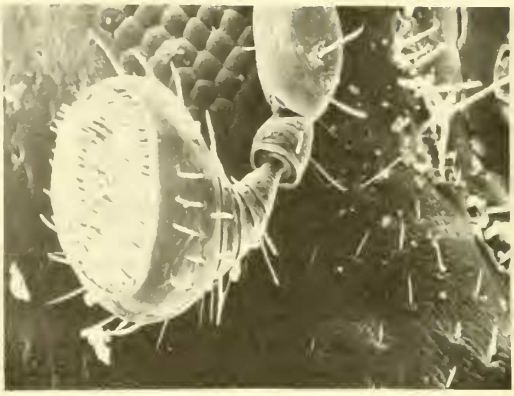
70(35). Costal margin of elytra slightly to moderately ascending from base of declivity to apex; basal end of metepisternum armed by a callus or partial groove of degenerating metepisternal spine (Fig. 31); sutures on posterior face of antennal club more strongly displaced toward apex; funicle 3–5-segmented; tibiae more strongly flattened, usually armed by more than four denticles; vestiture commonly includes scales; eye usually entire, less commonly emarginate; worldwide (Tribe CRYPHALINI) ..... 71

— Costal margin of elytra descending toward apex (except *Brachyspartus*, South America); basal end of metepisternum with a small, transverse groove (Fig. 32) (concealed when elytra in locked position), elytra in locked position more completely cover metepisternum; sutures on posterior face of antennal club only slightly displaced toward apex; funicle 1–5-segmented; tibiae more slender, rarely armed by more than four socketed denticles; vestiture rarely includes scales (in tropical forms only); eye emarginate; almost worldwide except Australia (Tribe CORTHYLINI) ..... 80

71(70). Lateral margins of pronotum without a fine, raised line (indistinct in *Scolytodes*); eye sometimes sinuate, emarginate only in *Stegomerus*; costal margins ascending only slightly posteriorly ..... 72

— Lateral margins of pronotum acute, at least basally, and with a fine raised line on basal third; eye emarginate (except *Trischidias*); costal margins of elytra ascending distinctly posteriorly ..... 76











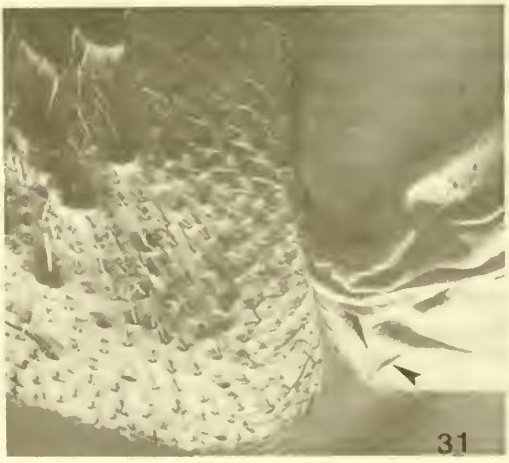





Fig. 28. *Ips woodi*: Ventral aspect of prothorax; note contiguous coxae (right coxa removed) and the absence of a precoxal ridge. (Plant fiber between coxae is an artifact.)

Fig. 29. *Dryocoetes confusus*: Anterior aspect of antenna; note the obliquely truncate apical face of club.

Fig. 30 A–B. *Scolytoplatypus papuanus*: A, Posterior aspect of protibia; B, note that lateral denticles are not socketed.

Fig. 31. *Cryphalus ruficollis ruficollis*: Dorsal aspect of parts of thorax with wings removed; note pronotal asperities and the degenerate episternal spine (arrow) that locks costal margin of elytra in position.

Fig. 32. *Corthylus panamensis*: Lateral aspect of metathorax with elytra removed; note loss of episternal groove and spine and its replacement by a small, oblique, anterior groove (arrow) and the very different position of the pleural suture (arrow).

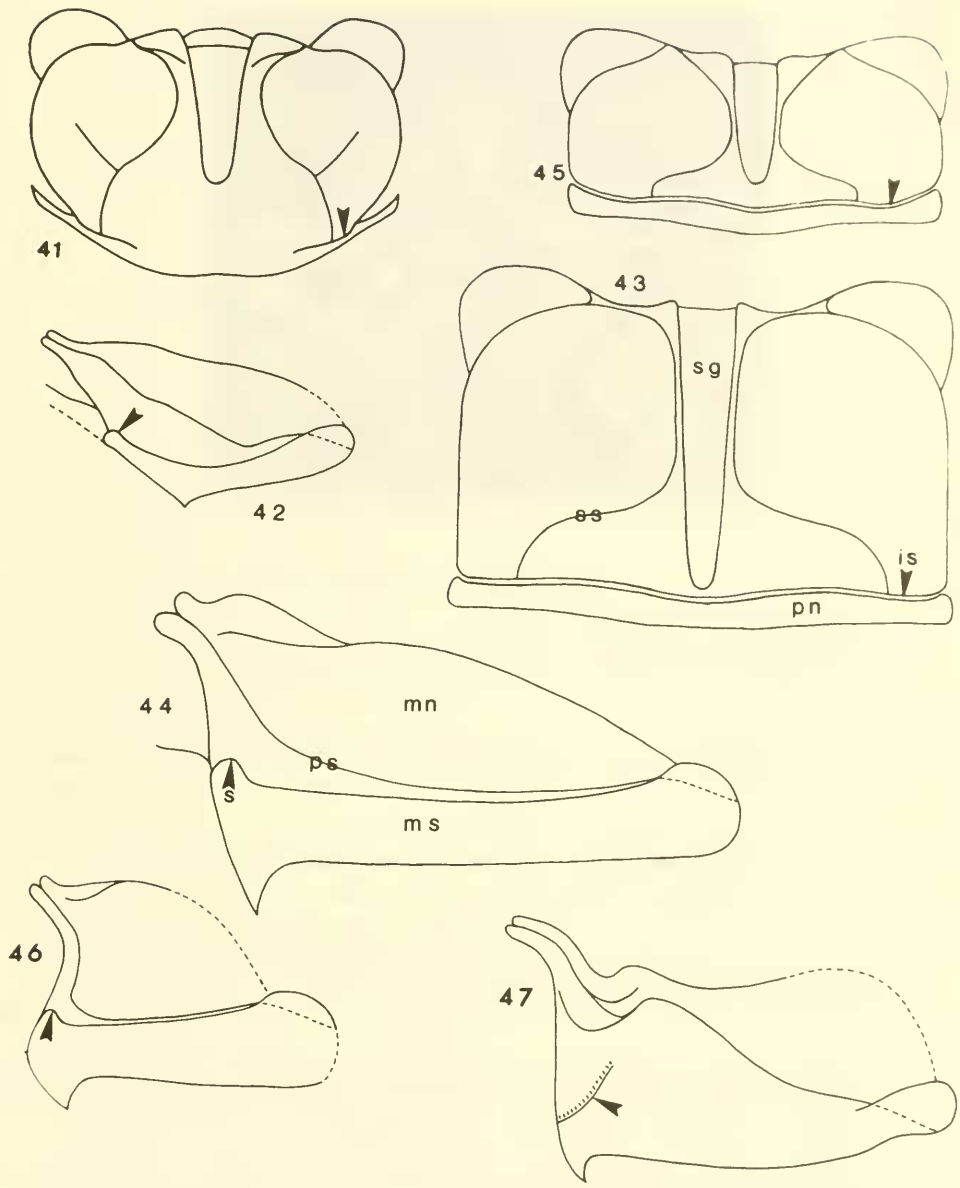



Fig. 33. Diagrams of Scolytidae metanota: 41, *Chramesus hickoriae* dorsal aspect (arrow points to remnant of intersegmental suture; 42, same, pleuron (arrow at metepisternal spine; 43, *Hylastes nigrinus* dorsal aspect, with labels indicating intersegmental suture (is), postnotum (pn), scutellar groove (sg), and scutoscutellar suture (ss); 44, same, lateral aspect, with labels at metepimeron (mn), metepisternum (ms), pleural suture (ps), and metepisternal spine (s, marked by arrow); 45, *Cnemonyx panamensis*, dorsal aspect (arrow points to intersegmental suture); 46, same, lateral aspect (arrow points to metepisternal spine); 47, *Pityophthorus crotonis*, lateral aspect (arrow points to metepisternal groove that has replaced the spine of other tribes). (After Wood 1978.)

72(71). Antennal club slender, 1.7–2.2 times as long as wide, apically pointed, sutures aseptate, straight; antennal funicle 5-segmented; basal half of pronotum without scalelike setae; on *Alnus*, *Populus*, *Salix* ..... ***Trypophloeus***

— Antennal club wider, less than 1.6 times as long as wide, apically rounded, sutures almost straight or procurved, often septate; funicle 4- or 5-segmented; basal half of pronotum with some scalelike setae ..... 73

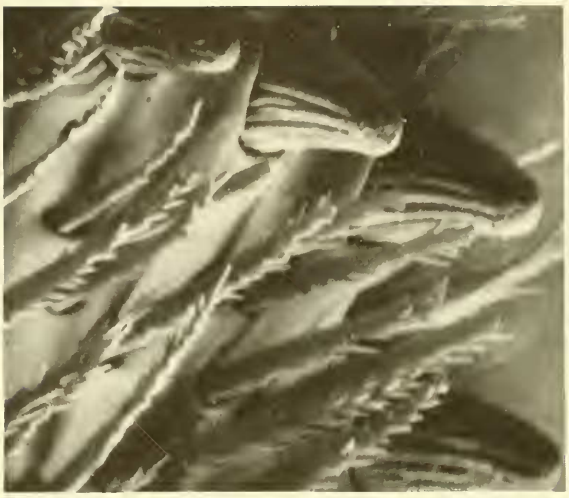


Fig. 34. Apex of posterior face of prothoracic tibia of *Polygraphus rufipennis* showing socketed denticles at margin.

73(72). Antennal club with three moderately to strongly procurved, aseptate sutures marked by rows of setae ..... 74

— Antennal club with suture 1 at least partly septate, sutures either straight or else not marked by rows of setae ..... 75

74(73). Antennal funicle 5-segmented; eye shallowly, broadly emarginate; tropical ... ..... ***Stegomerus***

— Antennal funicle 4-segmented; eye entire; eastern USA ..... ***Ernoporicus***

75(73). Sutures of antennal club straight, suture 1 septate; anterior margin of pronotum slightly produced; lateral areas of pronotum with no indication of a raised line; northern North America ..... ***Procryphalus***

— Suture 1 indicated only on lateral half of antennal club by a strongly angulate septum, other sutures and median half of 1 obsolete; anterior margin of pronotum broadly rounded; lateral margins of pronotum rounded and marked by a fine, raised line; tropical ..... ***Scolytogenes***

76(71). Antennal club with sutures recurved, suture 1 aseptate; tarsal segment 3 broad and emarginate; American species only in coniferous hosts ..... ***Cryphalus***

— Antennal club with sutures straight or procurved; tarsal segment 3 cylindrical; rarely in coniferous hosts ..... 77

77(76). Antennal funicle 5-segmented, club large, with three aseptate, procurved sutures; strial punctures obsolete; male and female equal in size and appearance; vestiture abundant; monogamous and phloeophagous ..... ..... ***Hypocryphalus***

— Antennal club smaller, suture 1 often septate, funicle often with reduced segmentation, male dwarfed, much smaller than female, with eyes abnormally small, flightless, rare; pith beetles, some phloeophagous ..... 78

78(77). Eye entire; club rather large, aseptate, funicle normally 3-segmented, rarely 4-segmented; body very stout, less than 2.3 times as long as wide, smaller than 1.1 mm; SE USA ..... ***Trischidias***

— Eye emarginate; funicle 5-segmented, less commonly 4-segmented (sometimes 3-segmented in *Hypothenemus birmanus* or males of any species); usually larger and more slender ..... 79

79(78). Antennal club with suture 1 partly septate; raised lateral line extending only one-third pronotum length from base; elytra clothed with rows of rather abundant strial and interstrial setae; mature color usually dark brown to black ..... ***Hypothenemus***

— Antennal club aseptate; raised lateral line extending two-thirds pronotum length from base; subglabrous, a few subspatulate interstrial bristles on declivity; mature body color usually rather pale yellowish or reddish brown ..... ***Cryptocarenus***

80(70). Antennal funicle usually 5-segmented (3- or 4-segemented in *Dendroterus, Dacnophthorus*), club usually smaller, symmetrical; prosternal intercoxal piece acutely pointed (except *Dacnophthorus*); pubescence usually more abundant, usually in rows on elytra; elytral declivity convex to bisulcate, armature conservative; bark and twig beetles (Subtribe Pityophthorina) ..... 81

— Antennal funicle 1- to 5-segmented, club usually much larger, commonly asymmetrical prosternal intercoxal piece absent (except obtuse in *Gnathotrichus, Gnathotrupes*); pubescence usually greatly reduced to obsolete or minute and strongly confused; elytral declivity convex to truncate to deeply excavated (weakly bisulcate in some *Gnathotrichus*), commonly with spinose processes; ambrosia beetles (Subtribe Corthylina) ..... 92

81(80). Basal and lateral margins of pronotum rounded, devoid of a fine, raised line; elytra rather coarsely punctured, unarmed declivity steep, usually subvertical and somewhat flattened on lower half, almost never bisulcate; discal vestiture abundant ..... 82

— Basal and lateral margins of pronotum marked by a finely raised line; elytral declivity more gradual, convex to bisulcate, often ornamented by granules ..... 83

82(81). Antennal funicle 5-segmented, club with aseptate sutures strongly procurved; interstrial setae scalelike; male frons strongly, transversely carinate at upper level of eyes, female epistoma deeply emarginate to accommodate a pair of mandibular spines ..... ***Styphlosoma***

— Antennal funicle 3- or 4-segmented, club with sutures at least slightly recurved, aseptate; elytral vestiture hairlike; female epistoma not emarginate, mandible never with projecting spines ..... ***Dendroterus***

83(81). Sutures of antennal club moderately to very strongly procurved, only suture 1 septate, or if all external sutures obsolete then mesal half of suture 1 marked by an internal septum ..... ***Araptus***

— Sutures 1 and 2 clearly, equally marked by rows of setae and grooves, straight to moderately procurved, if procurved then both sutures at least partly septate (sutures straight when both almost obsolete) ..... 84

84(83). Sutures 1 and 2 of antennal club aseptate and clearly marked by grooves and rows of setae; pronotal asperities continuing in lateral areas to base; larger species; in cones of *Pinus* (except *banksianae* in twigs) ..... ***Conophthorus***

— Sutures 1 and 2 both partly to completely septate or if aseptate then either antennal club largely glabrous or body size much smaller; pronotal asperities not extending to basal margin except in some tropical species not found in coniferous hosts; mostly smaller species; never in cones of conifers ..... 85

85(84). Pronotum without a transverse impression behind summit, transition from asperate to punctured areas gradual or asperities continuous to base; rare tropical species ..... 86

— Pronotum with a distinct transverse impression behind summit (a few exceptions in *Pityophthorus*), transition from asperate to punctured area more abrupt ..... 87

86(85). Elytral vestiture hairlike; elytral declivity broadly, subconcavely impressed; larger species ..... ***Conophthocranulus***

— Interstrial setae scalelike (spatulate), in rows; elytral declivity convex; male frons armed ..... ***Spermophthorus***

87(85). Sutures of antennal club moderately procurved, segment 1 shorter than 2 or 3; greater frontal pubescence a male character; elytral punctures fine, usually confused, short pubescence abundant, often scalelike, striae usually obsolete; mostly confined to *Quercus*; bigamous ..... ***Pseudopityophthorus***

— Sutures of antennal club straight to weakly procurved, segments 1 and 2 subequal in length; pubescence never scalelike, less abundant, striae clearly evident or if confused than punctures rather coarse; almost never in *Quercus* (exceptions are tropical) ..... 88

88(87). Antennal club rather large, 2.5 or more times as long as funicle; monogamous ..... 89

— Antennal club proportionately smaller, usually less than 1.5 times as long as funicle; polygamous (except a few *Pityophthorus*) ..... 90

89(88). Body stouter, 2.5–2.8 times as long as wide; elytral declivity convex; female pronotum with a pair of large, densely pilose areas in anterolateral areas; antennal club with only two sutures; in *Pinus* ..... ***Pityoborus***

— Body very slender, 3.7–3.8 times as long as wide; elytral declivity strongly impressed; female pronotum without pilose areas; antennal club with suture 3 indicated by a row of setae; in *Clematus* and other vines; tropical ..... ***Dacnophthorus***

90(88). Female head normal, pregula and mandibles not disproportionately enlarged; antennal funicle usually 5-segmented ..... ***Pityophthorus***

— Either female pregula greatly enlarged and bearing a tuft of hair or else female oral region abnormally broad and with mandibles greatly enlarged ..... 91

91(90). Female pregula greatly enlarged and bearing a tuft of long hair, male pregula only slightly enlarged; Arizona and New Mexico; in *Pinus* ..... ***Pityotrichus***

— Female oral region abnormally broad and with mandibles greatly enlarged; Costa Rica to Brazil; in broadleaf trees ..... ***Gnatholeptus***

92(80). Antennal funicle 5-segmented, club always symmetrical, with two or three clearly marked sutures; anterior tibia widest near apex, its posterior face usually flat, unarmed (a few minute granules in *Gnathotrupes*); elytral declivity conservatively sculptured ..... 93

— Antennal funicle 1- to 3-segmented, club commonly asymmetrical, sutures often reduced or absent; tibiae variously sculptured; declivity frequently armed ..... 94

93(92). Sutures of antennal club straight to moderately procurved, segment 1 not noticeably reduced in size; elytral declivity convex to narrowly sulcate, subapical margin near apex acutely elevated, sutural apex entire, rather narrowly rounded behind; Canada to Costa Rica ..... ***Gnathotrichus***

— Sutures of antennal club moderately to strongly procurved, segment 1 distinctly smaller; elytral declivity moderately to strongly flattened; elytral apex at least weakly divaricate, very broadly rounded to shallowly emarginate behind, without a submarginal costa near apex; Guatemala to South America ..... ***Gnathotrupes***

94(92). Antennal funicle 2- to 3-segmented, club with two sutures clearly marked; elytral apex divaricate (except *Metacorthylus*, *Glochinocerus*), commonly explanate, declivity often elaborately excavated and armed by spines; protibia always slender, with posterior face inflated and tuberculate; body usually slender ..... 95

— Antennal funicle 1-segmented, club with one, two or no sutures; elytral apex entire, declivity convex to rather weakly excavated, never explanate; prothoracic precoxal piece transverse, straight, not extended between coxae; protibiae variable; body comparatively stout ..... 99

95(94). Procoxae contiguous, anterior wall of combined coxal cavities and precoxal piece transversely straight; protibiae similar in male and female, with marginal row of tubercles, posterior face either unarmed or with a longitudinal row of up to about four tubercles; posterior face of female antennal club with long hair sparse to absent; antennal funicle usually 3-segmented, less commonly 2-segmented; frons commonly with a sharply defined granulate area ..... 96

— Prothoracic precoxal piece moderately large, posteriorly angulate, occupying anterior portion of area between coxae; male protibia armed by coarse marginal serrations and a row of equally coarse serrations on posterior face, female protibia with posterior face moderately inflated and armed by numerous, confused, small tubercles in addition to coarser marginal row; posterior face of female antennal club ornamented by more abundant, long hair; frons never ornamented by a sharply defined granulate area ..... 97

96(95). Elytra broadly rounded behind, posterior margin of declivity feebly if at all explanate, weakly if at all divaricate; lateral margins of declivity armed by three pairs of spines; antennal club oval to subtriangular, little if any longer than wide; anteroventral (sternal) margin of prothorax flanged, bent or folded posteriorly away from head, usually bearing a tuft of hair; pronotum usually stouter, anterior margin usually serrate; antennal funicle 3-segmented .... ..... ***Tricolus***

— Posterior margin of elytral declivity strongly to profoundly explanate, weakly to profoundly divaricate; declivital armature variable, antennal club oval to very elongate; anteroventral margin of prothorax fitting snuggly against head, sparsely pubescent; pronotum usually much more elongate, anterior margin variously sculptured, rarely serrate; antennal funicle usually 3-segmented, occasionally 2-segmented ..... ***Amphicranus***

97(95). Elytral apex divaricate, often also explanate; antennal club oval to broadly triangular; lateral margins of pronotum usually with a fine, raised line; body moderately to very slender ..... ***Monarthrum***

— Elytral apex entire, never explanate; lateral margins of pronotum rounded; antennal club more than twice as long as wide (except 1.6 times in male *Metacorthylus*), its apex narrowly rounded; body comparatively stout ..... 98

98(97). Antennal funicle 3-segmented; female frons excavated and elaborately ornamented by long hair; antennal club not sexually dimorphic, elongate, slightly asymmetrical; pronotum and elytral disc glabrous ..... ***Glochinocerus***

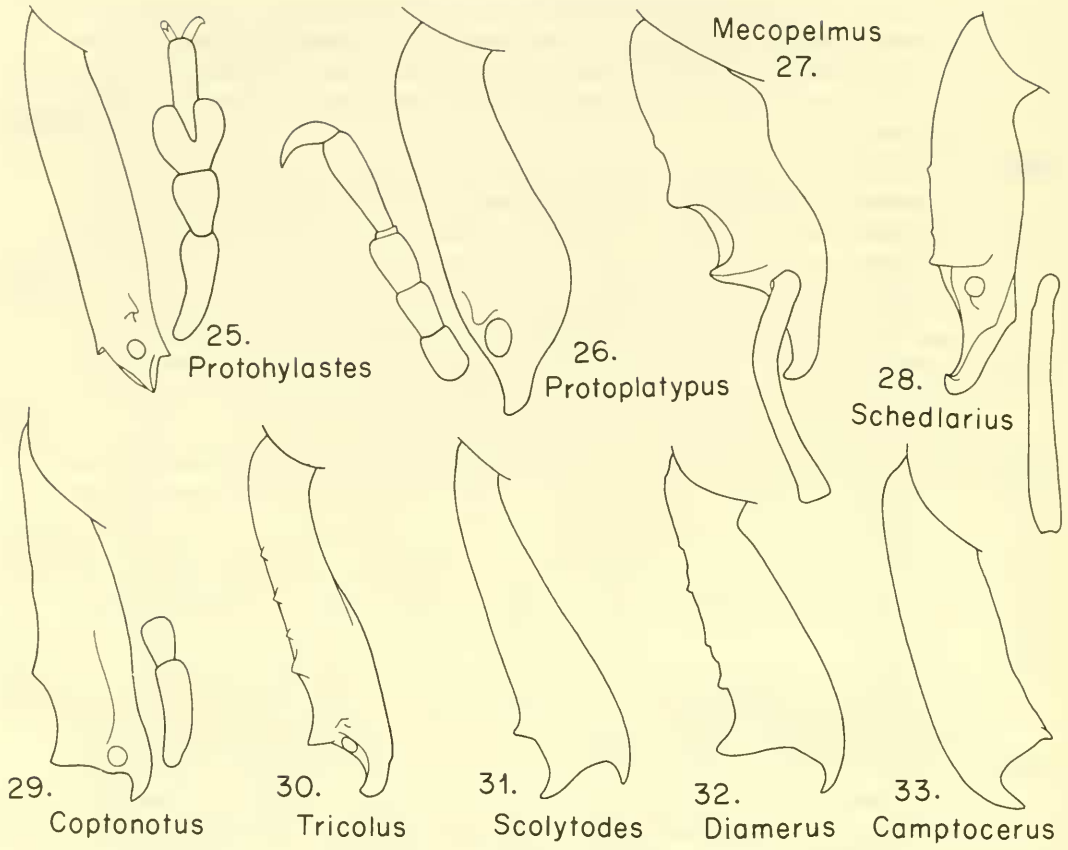



Fig. 35. Posterior face of prothoracic tibiae: 25, *Protohylastes annosus*, with tarsus (Platypodidae); 26, *Protoplatypus vetulus*, with tarsus (Platypodidae); 27, *Mecopelmus zeteki*, with first segment of tarsus (Platypodidae); 28, *Schedlarius mexicanus*, with first segment of tarsus (Platypodidae); 29, *Coptonotus cyclops*, with first two tarsal segments (Platypodidae); 30, *Tricolus peltatus* (Corthylini); 31, *Scolytodes* sp. (Ctenophorini); 32, *Diamerus impar* (Diamerini); 33, *Camptocerus auricomus* (Scolytini). (After Wood 1973:86.)

— Antennal funicle 2-segmented; frons convex and subglabrous in both sexes; antennal club asymmetrically very elongate in female, elongate-oval in male; pronotum and elytra minutely, closely pubescent ..... ***Metacorthylus***

99(94). Lateral margins of pronotum rounded; elytral disc usually impunctate, declivity short, very steep, narrowly sulcate above, triangularly impressed below, costal margins near apex ascending slightly; antennal club subcircular, symmetrical, with two aseptate sutures marked by rows of setae; female frons convex, pubescence inconspicuous ..... ***Microcorthylus***

— Lateral margins of pronotum marked by a fine raised line (except some *Corthycyclon*), elytral disc usually with clearly marked, confused punctures, declivity convex, truncate, or variously sculptured (but not as above); female frons usually moderately to strongly convex, often ornamented by hair; antennal club symmetrical to strongly asymmetrical, sutures present or not ..... 100

100(99). Antennal club aseptate, without sutures (some species with weak transverse grooves, without rows of setae), usually very elongate; lateral margins of pronotum either with or without a fine, raised line; posterior face of protibia inflated and tuberculate; female frons broadly, evenly concave and ornamented by fine hair ..... ***Corthycyclon***

— Antennal club with one or two sutures, its outline subcircular to strongly asymmetrical (if sutures absent then posterior face of protibia flat, smooth); female frons variable ..... 101

101(100). Elytral declivity narrowly, weakly sulcate (except convex in one species), lateral margins armed by two or three pairs of pointed granules; antennal scape elongate, clubshaped; female frons variously impressed, with a pair of median carinae narrowly separated by a sulcus over part or all of median line; color pale yellow to yellowish brown; antennal club symmetrical, broadly oval, with two finely marked sutures; protibia inflated, tuberculate .. ..... *Corthylocurus*

— Elytral declivity convex, truncately concave, or variously impressed (but never narrowly sulcate); antennal scape subquadrate, stout; female frons never with pair of median carinae; antennal club slightly to profoundly asymmetrical, sutures (when present) rather strongly marked; posterior face of protibia smooth or tuberculate ..... *Corthylus*

## Subfamily HYLESININAE

Hylesinen Erichson, 1836, Archiv Naturgesch. 2:46 (Type-genus: *Hylesinus* Fabricius, 1801)

Anatomical features.— The subfamily Hylesininae is distinguished from the Scolytinae by the separately arcuate basal margins of the elytra, with this basal margin slightly elevated and armed by a series of crenulations or in primitive tropical forms by a continuous costa, by the rather broad, deep sutural emargination, with the rounded or reduced scutellum slightly displaced posteriorly. In addition the head is usually visible from above, the pronotum is either unarmed or with most asperities confined to the anterolateral areas (a few exceptions), the body form tends to be stouter, and the anterior coxae more commonly are separated. The anterior tibiae are never as in *Scolytus*.

A few South American species in one section of *Cnemonyx* have basal crenulations on the elytra as well developed as in many Hylesininae. However, the character is not consistent nor present in all species of the group. The presence of this character in *Cnemonyx* indicates the primitiveness of the genus and suggests a possible point at which the two subfamilies might have diverged. The Hylesininae apparently arose after the Platypodidae had diverged from the main line of scolytid evolution and after the Scolytini had diversified, from a group perhaps not very unlike the more highly evolved *Cnemonyx*. The superficial resemblance of some genera, *Hylastes* and *Hylurgops*, to certain weevil genera can be attributed as much to evolutionary convergence to meet certain conditions in the environment as to genetics.

Biological features.— Almost all North and Central American genera of Hylesininae are phloeophagus. The pith feeding Bothrosternini clearly were derived from phloeophagous types (*Cnesinus annectens* Wood), including the mycetophagous *Bothrosternus*. *Dendrosinus*, *Phloeoborus*, and two or three species of *Chramesus* are xylophagous. The primitive type of parental gallery in the Hylesininae was a transverse, biramous system as in *Cnemonyx*; longitudinal, pith, and radiate systems apparently were derived later as specializations appeared. All American species are monogamous except for the polygynous *Polygraphus* and *Carphoborus*, and for the apparent partial parthenogensis in some Bothrosternini. At least two tropical species of *Phloeosinus* (papuanus Schedl and a similar sympatric species) are also polygynous.

Taxonomy.— A complete absence of agreement in published literature on the classification of the Hylesininae led to a search for new characters that might make possible a more nearly phylogenetic classification of tribes and genera (Wood 1978). The (1) presence or absence of an intersegmental suture between the scutellar area of the metanotum and its postnotum, (2) the course followed by the scutoscutellar suture on the metanotum, and (3) the structural arrangement of details in the locking mechanism at the base of the elytra were found to have significance in the characterization of tribes and in the grouping of genera. The result of these discoveries was a classification of this subfamily that is quite different from that seen in previous works (Wood 1978). The genera are now arranged in more meaningful groups that reflect true structural and, it is hoped, genetic relationships.

## Tribe HYLASTINI

Hylastes LeConte, 1876, Proc. Amer. Philos. Soc. 15:387 (Type-genus: *Hylastes* Erichson, 1836)

Anatomical features.— The head is distinctly subrostrate, scrobes are present, the frons is not sexually dimorphic, the eye is comparatively small and entire, the antennal funicle is 7-segmented, the antennal club is conical with distinct sutures, the basal crenulations on the elytra are poorly developed, the ridges extending from the anterior margin of the coxae to the anterior margin of the prothorax are well developed, the tibiae are broadly expanded, and the tarsal segments are broad and pubescent.

Biology.— All American Hylastini occur north from Honduras in coniferous hosts. They breed at or below the ground level in roots or in logs resting on the ground. The biramose adult tunnels are usually almost entirely in the phloem and evidently are not oriented with the grain of the wood. Larval mines wander irregularly in the phloem.

Taxonomy.— Interstriae 10 extends to the declivity in *Scierus* and the front coxae are rather widely separated, suggesting that this genus is much more primitive than *Hylastes* or *Hylurgops*. The Hylastini are a rather highly specialized group of primitive Hylesininae.

### Genus *SCIERUS* LeConte

Scierus LeConte, 1876, Proc. American Philos. Soc. 15:390 (Type-species: Scierus annectens LeConte, monobasic)

Diagnosis.— This genus is very closely allied to *Hylurgops* LeConte, with which some European writers placed it in synonymy; however, it is distinguished from that genus by the much more widely separated anterior coxae, by the continuation of elytral interstriae 10 to the level of abdominal sternum 5, by the complete absence of scalelike vestiture, and by the uniformly large pronotal punctures.

Description.— Length 2.7–4.3 mm, 2.2 times as long as wide; secondary sexual differences obscure except for male stridulating device on abdominal tergum 7; head subrostrate, frons convex above, a pronounced transverse impression at level half way between antennal bases and upper level of eyes, subinflated between impression and level of antennal insertion, flattened below; epistomal process not evident, premandibular epistomal lobe well developed. Eye elongate oval; entire. Antennal scape elongate, almost equal in length to 7-segmented funicle; club conical, with three distinct sutures. Pronotum narrower than elytra, narrowed and constricted anteriorly, unarmed, surface dull, with uniformly large punctures. Scutellum small, oval, convex. Crenulations on elytral bases small, distinct; striae weakly impressed, punctures moderately large, deep; interstriae irregular dull, reticulate, obscurely punctured. Declivity convex, steep; more strongly sculptured than on disc, interstriae tuberculate. Vestiture consisting of sparse, yellow hair or bristlelike setae; never with scales on pronotum or elytra.

Distribution.— New Mexico to British Columbia and eastward in the spruce forests to Quebec.

Biology.— Usually found in the lower bole or roots of fallen trees or logs where they construct simple galleries in the cambium region. The larvae feed primarily on the phloem tissues.

#### Key to the Species of *Scierus*

1. Pronotal surface granulose, setae not longer than diameter of a puncture; elytral interstriae irregular, subcrenulate to crenulate on middle half of disc, length of setae not equal to more than half width of an interstriae; declivital

tubercles larger and more abundant; Alaska, British Columbia, and New Mexico to Newfoundland; *Picea*, rarely in *Pinus*; 2.7–3.7 mm ..... 1. ***annectens*** **LeConte**

— Pronotal surface reticulate, setae about twice as long as diameter of a puncture; elytral interstriae only slightly irregular, not at all, or minutely crenulate on middle half of disc, length of interstrial setae about equal to width of interstriae; declivital tubercles small, not always easily seen; Alaska to Colorado; *Abies lasiocarpa*, *Picea*; 3.8–4.3 mm ..... 2. ***pubescens*** **Swaine**

### 1. *Scierus annectens* LeConte
Figs. 36–37

*Scierus annectens* LeConte, 1876, Proc. Amer. Philos. Soc. 15:390 (Lectotype, sex?; Anticosta Island in Quebec; Mus. Comp. Zool., present designation)

DIAGNOSIS.— Distinguished, often with some difficulty, from *pubescens* Swaine by characters summarized in the above key.

MALE.— Length 2.7–3.7 mm, 2.2 times as long as wide; color yellowish to reddish brown with yellowish pubescence.

Frons convex above, transversely impressed at level half way between upper level of eyes and level of antennal insertion, subinflated between this impression and level of antennal insertion, flattened toward epistoma; premandibular epistomal lobe rather large; surface granulose, punctures indistinct; vestiture rather abundant, coarse, very short and inconspicuous.

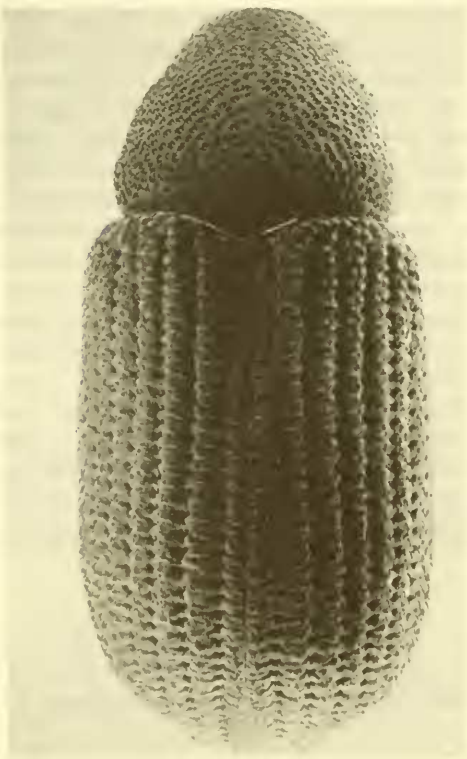


Fig. 36. *Scierus annectens*. (After Bright 1976:205.)

Pronotum 0.83 times as long as wide; widest just behind middle, sides strongly arcuate on basal two-thirds, narrowed anteriorly and distinctly constricted just before broadly rounded anterior margin; surface minutely granulose, punctures distinctly impressed on disc, rather large, close, of almost uniform size; vestiture short, coarse, usually not longer than distance equal to diameter of a puncture.

Elytra 1.5 times as long as wide, 2.3 times as long as pronotum; sides almost straight and diverging very slightly on basal two-thirds to declivital base, somewhat narrowly rounded behind, posterior profile interrupted by declivital tubercles; crenulations on elytral bases small, distinct, not in a continuous row; striae distinctly impressed, punctures rather large, deep, poorly formed; interstriae about one and one-half times as wide as striae, irregularly convex, surface minutely granulate, obscure punctures confused, with their anterior margins elevated, mostly finely crenulate at least toward base and near declivity. Declivity steep, convex; sculpture much as on disc except striae proportionately wider; interstriae 1 and 3 weakly elevated, 2 impressed and terminated below by a ridge extending from junction of 3 and 9 to 1; interstrial crenulations more nearly tuberculate, uniseriate, moderately large except on lower half of 2. Vestiture consisting of short, stout, recumbent interstrial setae; each seta about equal in length to diameter of strial puncture.

FEMALE.— Virtually identical to male.

DISTRIBUTION.— Alaska and Arizona to Newfoundland and Maine.

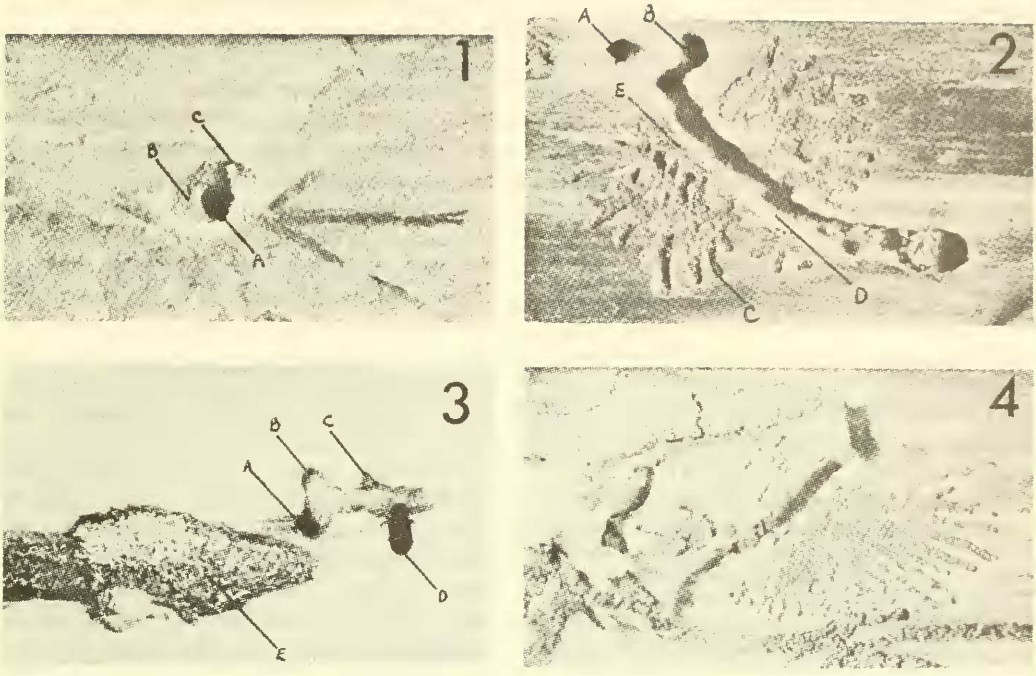



Fig. 37. *Scierus annectens*: A, entrance hole; B, turning niche; C, larval mine; D, egg gallery. (After Stewart 1965:926.)

ALASKA: Kenai. CANADA: **Alberta**: Banff, Jaspar Park, Lesser Slave Lake. **British Columbia**: Creighton Valley (Lumby), Glacier, Lorna, Pine Pass. **Newfoundland**: Pasadena, Sandy Lake (Badger). **Ontario**: Frater. **Quebec**: Cascapiedia, Gaspé Peninsula (Burnt Jam Creek, St. John River), Laniel, Trinity Bay. USA: **Arizona**: Chiricahua Mountains, San Francisco Mountains. **California**: Big Bear Lake. **Colorado**: Boulder, Durango, Meeker, Montezuma N. F., New Castle. **Idaho**: Coeur d'Alene. **Maine**: Brunswick, Camp Caribou. **Montana**: Glacier, Pray. **New Hampshire**: Crooks, W. Stuartstown. **New Mexico**: Sante Fe Ski Basin. **Oregon**: Ashland, Gold Lake (Willamette N. F.). **Utah**: Ashley N. F., Fish Lake N. F., La Sal Mountains, Logan Canyon, Wolf Creek Pass.

HOSTS.— *Picea engelmannii*, *P.* spp., rarely in *Pinus contorta*.

BIOLOGY.— Stumps, the lower bole, and roots of rather large, prostrate trees, or the lower side of logs are usually selected for attack. The adult galleries are in the cambium region mostly in the phloem and are of a simple monoramous type. The larvae feed primarily upon phloem tissues.

NOTES.— The above treatment was based upon 352 specimens. Variation in the series examined appeared to be as great between individuals as between series from different areas. The first specimen in LeConte's syntypic series, cited above, has been regarded as the type and is here designated as the lectotype of *annectens*. The fourth and last specimen in his series (Vancouver) is of *Aniphagus aspericollis*.

### 2. *Scierus pubescens* Swaine

*Scierus pubescens* Swaine, 1924, Canadian Ent. 56:287 (Holotype, female; Jasper Park, Alberta: Canadian Nat., Coll., 728)

DIAGNOSIS.— In addition to characters mentioned in the above key, this species is distinguished by the larger punctures on the pronotum and the elytral striae, by the finer, longer vestiture, by the finer sculpture, and by the more nearly shining, reticulate surfaces.

MALE.— Length 3.8–4.3 mm, 2.26 times as long as wide; color reddish brown, with pale yellow vestiture.

Frons as in *annectens* but surfaces less granulose, vestiture slightly longer; frontal area somewhat more slender, transverse impression evidently deeper.

Pronotum 0.96 times as long as wide; as in *annectens* except sides much less strongly

arcuate, surface reticulate, not at all granulate, punctures larger, more sharply impressed, and vestiture finer, distinctly longer.

Elytra 1.7 times as long as wide; as in *annectens* except posterior profile more finely serrate, interstriae proportionately narrower, about as wide as striae, anterior margins of interstrial punctures much more finely crenulate, general surface coarsely reticulate, declivital interstriae less strongly convex, 2 much less strongly impressed, with all tubercles much smaller, and vestiture longer, each seta up to twice as long as width of a strial puncture.

FEMALE.— Sexual differences not readily apparent except those involving abdominal terga.

DISTRIBUTION.— Alaska to Colorado.

ALASKA: Kenai Peninsula, 8-VI-74, trap, M. M. Furniss. CANADA: **Alberta**: Jasper Park, VIII-15, no. 2232a, *Picea*, J. M. Swaine. **British Columbia**: Haines Road, 10-VIII-52; London Hill Mine, Bear Lake, 7000 ft, on snow; Lorna, 22-VI-25, no. 163 lot 3807, *Abies lasiocarpa*. USA: **Colorado**: Argentine Road, 1938, Wickham; New Castle, VII-VIII, Hopk. US 31408B, *Picea engelmannii*, C. L. Massey. **Idaho**: McCall, 23-VI to 12-VIII-72 Hopk. 58402, D. R. Oakes.

HOSTS.— *Abies lasiocarpa*, *Picea engelmannii*.

BIOLOGY.— Presumably similar to *annectens*.

NOTES.— The above treatment was based on the holotype and on 81 other specimens.

## GENUS *HYLURGOPS* LECONTE

*Hylurgops* LeConte, 1876, Proc. American Philos. Soc. 15:389 (Type-species: *Hylastes pinifex* Fitch, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:123)

DIAGNOSIS.— Within the tribe Hylastini this genus is very closely related to *Hylastes*, from which some species are distinguished with difficulty. In addition to characters mentioned in the above key, *Hylurgops* species normally have rows of fine, long, hairlike, interstrial setae on the declivity (sometimes abraded); hairlike setae in *Hylastes*, if present, are not longer than the ground vestiture.

DESCRIPTION.— Length 3.1–5.7 mm, 2.4–2.8 times as long as wide; secondary sexual characters clearly evident only on abdominal terga.

Frons with a transverse impression midway between level of antennal insertion and upper level of eyes, convex above, flattened to weakly convex below this point; lower area usually with a median carina. Eye subovate, entire. Antennal funicle 7-segmented; club conical, basal segment much longer than others, at least two sutures indicated. Pronotum usually strongly constricted just behind anterior margin, surface unarmed, punctured. Scutellum small, oval. Crenulations on elytral bases poorly developed, bases usually not elevated; striae impressed or not, punctures distinct; interstriae variously sculptured. Declivity convex, steep. Vestiture including both hairlike and scalelike setae.

DISTRIBUTION.— The Holarctic realm; seven species including two with subspecies occur throughout the coniferous forests of North and Central America south to Guatemala (and probably Honduras) wherever representatives of the Pinaceae are native. Thirteen additional species occur in the Palaearctic realm.

BIOLOGY.—All species construct hylesinine simple or biramous egg tunnels in phloem tissues and may engrave the wood slightly. Eggs are placed in niches and are packed in frass. The larvae mine phloem tissues in an aimless pattern; the larval tunnel usually is visible on the inner surface of peeled bark. The stump and roots are selected for attack by some species, others attack the bole or even limbs of fallen trees or they may invade logs. Some species breed primarily in injured or weakened green bark, others prefer logs with souring bark.

### Key to the Species of *Hylurgops*

1. Declivital interstriae equally convex, their tubercles small; pronotal vestiture hairlike; crenulations on basal margins of elytra rather poorly developed ..... 2

— Alternate declivital interstriae strongly elevated and armed by rather large tubercles; pronotal ground vestiture consisting of abundant, small scales, some hairlike setae usually intermixed; crenulations on elytral bases rather well developed ..... 8

2(1). Posterior half of lateral margins on pronotum acutely elevated; lateral margins of pronotum straight on more than basal half, very feebly convergent; pronotal vestiture erect, rather abundant, long, many setae at least equal in length to those on declivity; longest declivital setae abundant, confused, not in rows; Arizona, New Mexico to Guatemala; 4.6–5.7 mm ..... 1. ***incomptus*** (Blandford)

— Lateral margins of pronotum transversely rounded, moderately to strongly arcuate in outline from base to constriction on anterior fourth; pronotal vestiture recumbent, very short or absent; longest hairlike setae on elytral declivity in sparse, uniseriate rows ..... 3

3(2). Body more slender, at least 2.5 times as long as wide; pronotum longer than wide; normal body color black; basal angles of pronotum rather abruptly rounded; transverse constriction on pronotum obscure ..... 4

— Body stouter, less than 2.3 times as long as wide; pronotum wider than long; normal body color dark reddish brown; basal angles of pronotum rather broadly rounded; pronotum with a distinct transverse constriction on anterior fourth ..... 7

4(3). Small and large pronotal punctures only slightly different in size, most interspaces less than half as wide as diameter of a puncture; body stouter, 2.6 times as long as wide; Arizona and New Mexico to Honduras; 3.8–5.3 mm ..... 2. ***planirostris*** (Chapuis)

— Largest punctures on pronotal disc about twice as large as smallest, most interspaces between punctures at least equal in width to smallest punctures; body more slender, 2.7 times as long as wide ..... 5

5(4). Hairlike setae on pronotum and elytra very fine and exceedingly long, at least twice as long as distance between interstrial rows of long hair on elytra; high altitudes of Puebla and Mexico; 3.8–4.6 mm ..... 4. ***longipennis*** (Blandford)

— Hairlike setae on pronotum and elytra shorter, length not exceeding distance between rows of interstrial hair ..... 6

6(5). Elytral surface smooth, shining; submarginal crenulations at base of elytra acute, marginal crenulations rather well developed; median frontal carina acutely elevated, extending a short distance above transverse impression near epistoma; pronotal punctures usually much coarser, deeper; British Columbia and Alberta to California and New Mexico; 3.3–4.6 mm ..... 3. ***porosus*** (LeConte)

— Elytral surface minutely reticulate; elytral bases without acute crenulations, marginal crenulations rather poorly developed; frontal carina indistinct, visible only in transverse impression immediately above epistoma; pronotal punctures smaller, closer, usually not as deep; Northwest Territories to California and New Mexico; 3.7–5.0 mm ..... 5. ***reticulatus*** Wood

7(3). Scalelike elytral vestiture confined to declivity; elytral disc with only a few crenulations in uniseriate rows, these usually narrow and more nearly tuberculate, most interstrial punctures on middle half almost normal (not crenulate); setae on lateral and basal margins of pronotum very fine; pronotum reticulate; California to Coastal British Columbia and Alaska; 3.6–4.8 mm ..... 6. ***rugipennis rugipennis*** (Mannerheim)

— Scalelike vestiture extending anteriorly to middle of elytral disc; elytral disc with most interstrial punctures crenulate or subcrenulate, confused; setae on lateral and basal margins of pronotum coarse; pronotum smooth, shining (intermediate in zone of intergradation); Utah and Colorado to inland British Columbia and east through the coniferous forest to Nova Scotia and Alabama; 3.7–5.2 mm ..... 7. ***rugipennis pinifex*** (Fitch)

8(1). Odd-numbered declivital interstriae rather strongly, more uniformly elevated and armed by moderately large tubercles; strial punctures smaller, interstrial bristles finger; N Arizona and N New Mexico to Alaska; 3.1–4.2 mm ..... 8. ***subcostulatus subcostulatus*** **(Mannerheim)**

— Odd-numbered declivital interstriae very strongly elevated, conspicuously constricted laterally and in height between much coarser tubercles; strial punctures distinctly larger, interstrial bristles coarser; S Arizona and S New Mexico to Honduras; 3.3–4.4 mm ..... 9. ***subcostulatus alternans*** **(Chapuis)**

### 1. *Hylurgops incomptus* (Blandford)

*Hylastes incomptus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):145 (Syntypes; Andrés Chalchicomula, now Ciudad Serdán, Puebla, Mexico; British Mus. Nat. Hist)

*Hylurgops grandicollis* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Bull. 14:17 (Lectotype, sex?; Cloudcroft, New Mexico; Canadian Nat. Coll, designated by Bright, 1967, Canadian Ent. 99:675); Wood, 1957, Canadian Ent. 89:397. *Synonymy*

DIAGNOSIS.— In addition to characters mentioned in the above key this species is distinguished by the deeply impressed centers of the pronotal punctures.

FEMALE.— Length 4.6–5.9 mm, 2.6 times as long as wide; color black.

Frons with a moderately strong, transverse impression near middle about midway between upper level of eyes and level of antennal insertion, rather strongly convex above and weakly convex below except weakly impressed laterally just above epistomal margin; epistomal lobe broad, not very strongly produced; surface smooth and shining, with close, deep, rather coarse punctures; vestiture consisting of fine, long and short, rather sparse, hairlike setae.

Pronotum 1.1 times as long as wide; widest at base, sides very weakly arcuate and feebly converging on basal two-thirds, rather broadly rounded in front; lateral margins sharply, subacutely elevated on at least basal half; surface smooth and shining, with abundant, close, deep, medium and small punctures except on median line; an elevated median line visible on about three-fourths of pronotum length; vestiture consisting of rather abundant, erect, hairlike setae of variable length, many of them about as long as those on elytral declivity.

Elytra 1.7 times as long as wide, 1.8 times as long as pronotum; sides straight and parallel on basal two-thirds to declivital base, then rather broadly rounded behind; striae not at all impressed, punctures small, rather deep, obscure; interstriae at least twice as wide as striae, shining, interrupted by numerous deeply impressed, irregular, transverse lines, tubercles or crenulate elevations entirely absent. Declivity steep, convex; striae weakly impressed, punctures more nearly evident; interstriae 1 and 3 weakly, 9 moderately elevated, each bearing a row of fine granules; interstriae with moderately abundant, fine punctures. Vestiture consisting of short, rather sparse scales, and fine, long, rather abundant confused, hairlike setae on declivity and sides.

MALE.— Evidently identical to female except on abdominal terga.

DISTRIBUTION.— Arizona and New Mexico to Guatemala.

USA: **Arizona**: Chiricahua Mts., Flagstaff, Huachuca Mts., Oak Creek Canyon, Paradise, Santa Catalina Mts., Williams. **New Mexico**: Beulah, Capitan Mts., Cloudcroft, Coolidge, Las Vegas, Lincoln N. F., Peloncillo N. F., Santa Fe Canyon, White Mts. MEXICO: **Chiapas**: Mesa del Huracan, 24-VII-64, *Pinus engelmannii*, J. B. Thomas; San Cristóbal, 8-VII-69. **Distrito Federal**: 24 km S El Guarda, 14-XI-46. **Durango**: 60 km, SW El Salto, 23-VII-53 *Pinus*, S. L. Wood. **Hidalgo**: 7 km E Zacatlán, 12-VI-67, 2900 m, No. 20, *Pinus*, S. L. Wood. **Mexico**: 70 km W Toluca, 15-VII-53, *Pinus*, S. L. Wood; Tlalmonalco, *P. leiophylla*, P. J. Perry. **Puebla**: 8 km SW Teziutlán, 18-VIII-58, *Pinus*, H. F. Howden. **Tlaxcala**: 20 km N Tlaxco, 9-VII-67, *Pinus*, No. 181, S. L. Wood. **Veracruz**: 5 km E Perote, 15-VI-53, 2400 m, *Pinus*, S. L. Wood; Las Vigas, 18-XII-48, H. B. Leech. GUATEMALA: Cerro Calel, Quezaltenango, 26-V-64, 3100 m, No. 620, *Pinus pseudostrobus*, S. L. Wood; San Cristobal, Huehuetenango, 28-V-64, 2300 m, *Pinus pseudostrobus*, S. L. Wood; Tecpam, 11-X-32, 600 m, *Pinus*.

HOSTS.— Probably any species of *Pinus* within the distribution.

BIOLOGY.— This species breeds in stumps of dead or dying pines near or below ground level. Egg galleries are constructed primarily in the phloem tissues and lightly score or at least stain the surface of the wood. The irregular larval mines wander through the

phloem tissues and are usually visible on the inner surface of the bark through at least part of their length.

NOTES.— The types of both *incomptus* and *grandicollis* were examined. The above treatment was based on my female homotype of *incomptus* from Cerro Calel and on 151 additional specimens.

### 2. *Hylurgops planirostris* (Chapuis)

Fig. 41

*Hylastes planirostris* Chapuis, 1869, Synopsis des Scolytides, p. 21 (Lectotype, female; Suapan, Mexico; Mus. d'Hist. Nat., Brussels, subsequent designation by Wood, 1971, Great Basin Nat. 31:146)

*Hylurgops knausi* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):17 (Lectotype, sex?; Cloudcroft, New Mexico; Canadian Nat. Coll., subsequent designation by Bright, 1967, Canadian Ent. 99:675); Wood, 1971, Great Basin Nat. 31:146. *Synonymy*

DIAGNOSIS.— This species is closely related to *porosus*, but it may be distinguished by characters summarized in the above key.

MALE.— Length 3.8–5.3 mm, 2.6 times as long as wide; color black.

Frons as in *incomptus*, but perhaps more coarsely punctured; median carina variable. Vestiture short.

Pronotum 0.9 times as long as wide (rarely 1.0); widest near middle, sides rather strongly arcuate from base to feeble constriction just before rather broadly rounded anterior margin; surface shining, densely punctured by rather deep punctures of almost uniform size, interspaces almost never as wide as diameter of a small puncture; glabrous except for a few setae on lateral margins.

Elytra 1.7 times as long as wide; as in *porosus* except striae tending to be less deeply impressed, punctures narrower, and interstriae perhaps less irregular and wider.

FEMALE.— Differences not apparent except on abdominal terga.

DISTRIBUTION.— Arizona and New Mexico to Honduras.

USA: **Arizona**: Alpine, Chiricahua Mts., Flagstaff, Globe, Graham Mts., Hanagan Camp (Greenlee Co.), Paradise, Patagonia, Pinaleno Mts., Santa Catalina Mts., White Mts. **New Mexico**: Alto, Buelah, Capitan, Cloudcroft, Las Vegas, Lincoln N. F., Magdalena (Socorro Co.), Pecos N. F., Sacramento Mts., Silver City. MEXICO: **Chiapas**: El Bosque; 8 km S San Carlos, 6-III-63, R. C. Bechtel; 8 km E San Cristóbal, 8-VII-69, *Pinus ayacahuite*, D. E. Bright. **Chihuahua**: Creel, 18-VII-60, and La Laja, 16-VII-60, S. L. Wood. **Distrito Federal**: Mexico. **Durango**: 16 km W El Salto, VII-64, J. B. Thomas. **Hidalgo**: 6 km E Zacatlán, 12-VI-67, S. L. Wood. **Mexico**: 70 km W Toluca, 15-VII-53, S. L. Wood. **Michoacán**: 55 km E Morelia, 14-VI-65, *Pinus*, S. L. Wood. **Tlaxcala**: 17 km N Tlaxco, 9-VII-67, *Pinus*, S. L. Wood. **Veracruz**: 26 km NW Jalapa, 29-VI-53, *Pinus* S. L. Wood; 11 km SE Las Vigas, 18-XII-48, H. B. Leech. GUATEMALA; Cerro Calel, 26-V-64, *P. pseudostrobus*, S. L. Wood; Tecpan, 24-IV-56, *Pinus*, R. L. Furniss; Totonicipán.

HOSTS.— Evidently all species of *Pinus* within its range.

BIOLOGY.— This species tends to infest logs or the bole of fallen trees and, when abundant, may completely replace *Ips* in a given log. The tunnels appear to be similar to those of *incomptus*.

NOTES.— The above treatment is based on the lectotypes of *planirostris* and *knausi* and on 481 other specimens.

One specimen in a long series of this species, from Cloudcroft, New Mexico, and a unique specimen from the Chiricahua Mountains, Arizona, exhibit characters almost exactly intermediate between this species and *porosus*. Several specimens of both species from central Arizona and New Mexico suggest slight intergradation of characters between these two species. While the two intermediate specimens suggest hybridization or intergradation of species, the material presently at hand does not warrant reducing them to subspecies of one another.

### 3. *Hylurgops porosus* (LeConte)

Figs. 38, 41

*Hylastes porosus* LeConte, 1868, Trans. American Ent. Soc. 2:175 (Lectotype, female?; California; Mus. Comp. Zool., designated by Wood, 1971, Great Basin Nat. 31: 147)

*Hylurgops lecontei* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):16 (Holotype, sex?; Colorado; Canadian Nat. Coll., 9242); Wood, 1971, Great Basin Nat. 31:147. *Synonymy*

DIAGNOSIS.— This variable species is closely allied to *planirostrus* (Chapuis) and occasional specimens from the zone of overlapping distributions can be distinguished only by the relative size and density of pronotal punctures.

FEMALE.— Length 3.6–5.3 mm, 2.7 times as long as wide; color black.

Frons as in *incomptus* but perhaps more coarsely punctured; a median carina on

lower third sometimes more definite. Vestiture short.

Pronotum 1.1 times as long as wide (rarely to 1.0); sides usually widest one-third from base, moderately arcuate to a feeble constriction just before broadly rounded anterior margin, some specimens with sides on basal half almost straight and parallel; surface shining, with large and small punctures intermixed in variable proportions (most commonly in about equal numbers), largest punctures about twice as large as smallest, some of interspaces on disc at least equal in width to diameter of a small puncture; median line usually visible on middle third; glabrous except at margins, setae short.

Elytra 1.8 times as long as wide, 1.9 times as long as pronotum; profile as in *incomptus*; striae usually slightly impressed toward declivity, punctures large, deep; interstriae slightly narrower than striae, punctures small, abundant, confused, surface usually

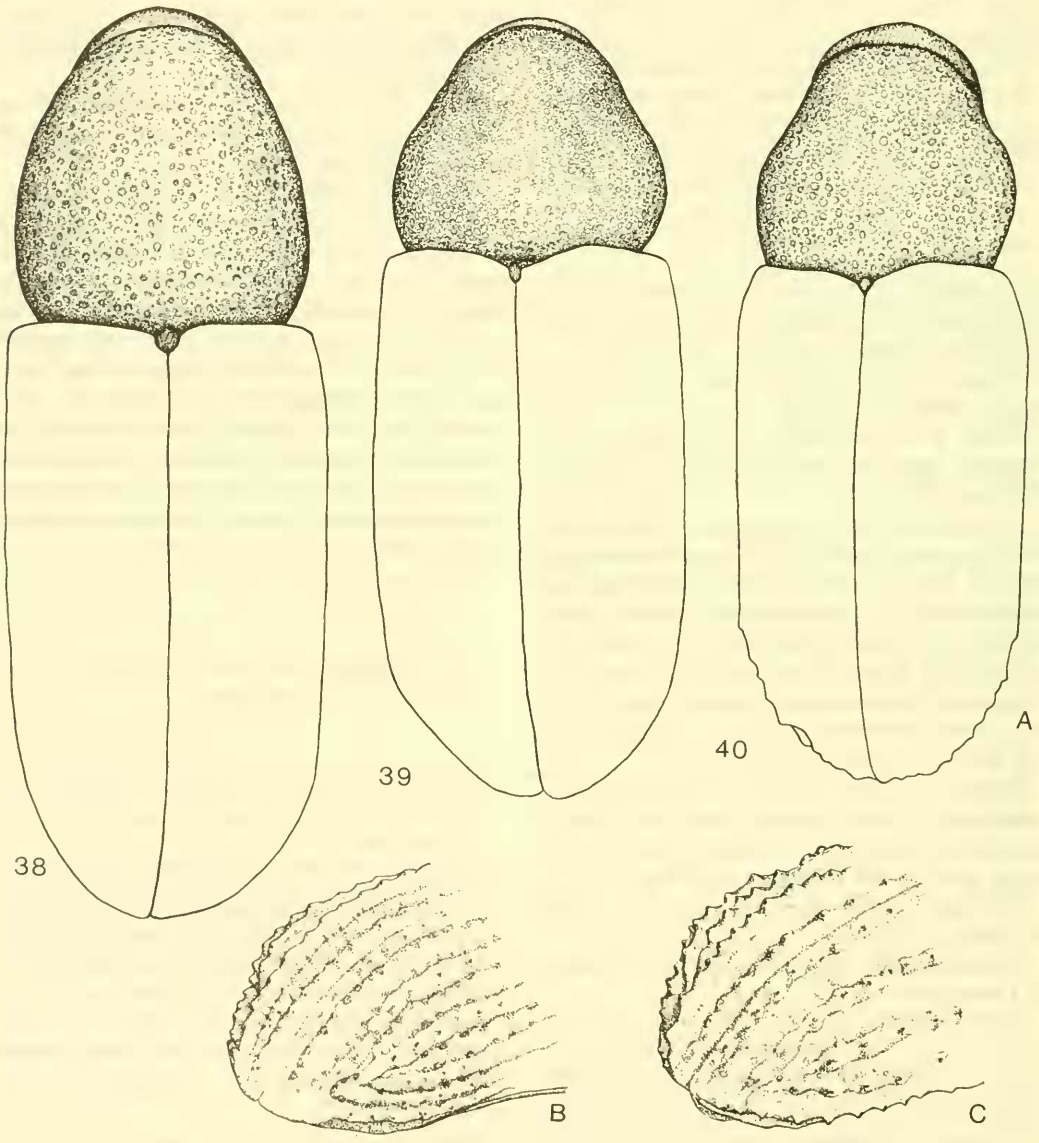



Fig. 38. *Hylurgops porosus*: Outline from dorsal aspect, with sculpture of pronotum indicated.
Fig. 39. *Hylurgops rugipennis pinifex*: Outline from dorsal aspect, with sculpture of pronotum indicated.
Fig. 40. *Hylurgops subcostulatus* subspecies: A, *s. subcostulatus*, outline from dorsal aspect; B, same, declivity; C, *s. alternans*, declivity.

shining, slightly irregular especially toward declivity. Declivity steep convex; striae and interstriae somewhat narrower; interstriae 1 (usually) and 9 weakly elevated; all interstriae with a row of uniseriate, widely spaced, fine granules. Vestiture consisting of small, moderately abundant scales on declivity and usually on posterior area of disc, and uniseriate rows of long, fine, erect, interstrial hair on declivity, usually abraded on disc, each seta about as long as distance between rows or less, spaced within a row by about once or twice this distance.

MALE.— Evidently identical to female except on abdominal terga.

DISTRIBUTION.— British Columbia and Saskatchewan to Arizona and New Mexico.

CANADA: **Alberta**: Banff, Cypress Hills, Laggen, Lake Louise. **British Columbia**: Ashcroft, Aspen Grove, Atlin, Chilcotin, Cranberry Brook, Kingsvale, Lac Le Jeune, Lorna, Midday Valley, Sidney, Summerland, Trepan Creek, Trinity Valley, Vancouver, Vermillion Summit, Vernon, Yoho Park. **Saskatchewan**: Cypress Hills. USA: **Arizona**: Flagstaff, Kaibab N. F., Prescott, **California**: Berkeley, Burney, Chester, Inverness, Lassen N. F., Northfork, Norval Flats, Oakland, Orinda, Pinecrest, Placerville, Plantation (Sonoma Co.), San Francisco, Sequoia N. P., Silver Lake, Summit Lake (Shasta Co.), Truckee, Tulare Co., Yosemite. **Colorado**: Byers R. S., Colorado N. F., Estes Park, Evergreen, Ft. Collins, Ft. Garland, Glenhaven, Leadville, Pingree Park, San Juan N. F., Tercio, Uncompahgre N. F., Whitman. **Idaho**: Centerville, Ellis, McCall, Moscow, Salmon, Sandpoint, Winchester. **Montana**: Cabinet N. F., Columbia Falls, Flathead Lake, Helena, Niger Hill (Powell Co.), Rocky Boy Indian Reservation (Hill Co.), Seeky Lake. **Nevada**: Minden in Douglas Co. **New Mexico**: Hermit Peak near Sante Fe. **Oregon**: Beatty, Bly, Corvallis, Crater Lake, Gold Lake (Willamette N. F.), Grant Co., Klamath Falls, McMinnville, Medford, Pineville, Rankin, Santiam Pass. **South Dakota**: Black Hills, Custer, Pine Ridge. **Utah**: Beaver, Elk Park (Ashley N. F.), Kamas, Logan Canyon, Long Hollow (Dixie N. F.), Panguitch, Soapstone (Uinta N. F.), Wolf Creek Pass. **Washington**: Buckeye, Cheney, Chewelah, Glenswood, Kooskookie, Thorton. **Wyoming**: Afton, Mountain View, Saratoga, Yellowstone N. P.

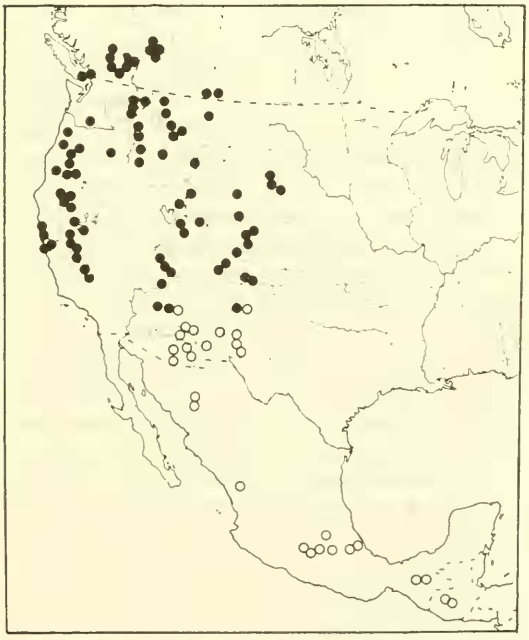


Fig. 41. *Hylurgops* spp., distribution map; *porosus*, solid circles; *planirostris*, open circles.

HOSTS.— *Pinus attenuata*, *P. contorta*, *P. flexilis*, *P. jeffreyi*, *P. ponderosa*, *P. radiata*, less common in *Picea*.

BIOLOGY.— Essentially as in *incomptus*.

NOTES.— This abundant and variable species is probably misidentified more commonly than any other North American scolytid. Within a series from any given locality the pronotal punctures and the impression of the elytral striae may vary considerably, but, contrary to Swaine's (1918:82) note, I fail to associate this variation with geography.

The above treatment was based on the lectotype of *porosus*, on the holotype of *lecontei*, and on more than 2000 other specimens. See the note above under *planirostris* concerning possible intergradation between these species.

### 4. *Hylurgops longipennis* (Blandford)

*Hylastes longipennis* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):143 (Lectotype, female; Rancho de Popocatepetl, Mexico; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished from *porosus* (LeConte) by the slightly smaller average size, by the more slender body form, by the more finely punctured frons, by the much steeper elytral declivity, and by the different declivital vestiture as described below.

FEMALE.— Length 3.8–4.6 mm, 2.8 times as long as wide; color black.

Frons as in *porosus* except punctures averaging slightly smaller, median carina usually indicated but less well developed.

Pronotum as in *porosus*, punctures averaging slightly smaller.

Elytra 2.1 times as long as wide, 2.3 times as long as pronotum; similar to *porosus* except strial punctures slightly smaller, deeper, interstrial punctures slightly smaller, not at all subcrenulate, declivity much steeper, particularly on lower half, scales confined to declivity, much less abundant (concealing less than one-third of surface area, interstrial setae very fine, in rows, each seta one to three times as long as distance between rows, spaced within a row by about half distance between rows.

MALE.— Similar to female except median frontal carina less distinct.

DISTRIBUTION.— Mexico.

MEXICO: **Mexico**: Rancho de Popocatepetl, h(eight)t 3800 met(res), Septr., E. Truqui; Popocatepetl, VII-VIII-78, pheromone trap, Hopk. 61847, M. M. Furniss; 11 miles (17 km) E Amecameca, 31-V-74, 3200, C. W. and L. O'Brien; Parque Zoquiapan, 15-XII-79, T. H. Atkinson.

NOTES.— Blandford named *longipennis* from a syntypic series of five specimens labeled "Truqui, Mexico" from the Frey collection. One of the specimens bears the number 23337 and, according to Dr. R. T. Thompson, is listed in the Frey collection register with the note "Rancho de Popocatepetl, h(eight)t 3800 met(res) Septr."; it was collected by Eugen Truqui some time prior to 1860. Included in the entry is "*Tomolips asperatus* Woll(aston) Type." Since *Tomolips bicalcaratus* Wollaston (=*asperatus* Wollaston) (family Curculionidae) is a relatively common species in the stumps and roots of *Pinus leiophylla*, and perhaps other pines in the Estado de Mexico, it is assumed that *longipennis* occurs in this habitat.

Since a type has not been selected from Blandford's syntypic series, I here designate the second specimen in the series, a female, as the lectotype for *Hylastes longipennis* Blandford. In addition to the five syntypes, 10 specimens were examined.

### 5. *Hylurgops reticulatus* Wood

*Hylurgops reticulatus* Wood, 1971, Great Basin Nat. 31:71 (Holotype, male; Summit Lake, Shasta Co., California; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *porosus* (LeConte) by the larger average size, by the minutely reticulate elytra, and by other characters included in the above key.

MALE.— Length 3.7–5.0 mm, 2.8 times as long as wide; color black, with whitish vestiture.

Frons as in *porosus* except lower half less deeply, less closely, less finely punctured; median carina almost obsolete, visible only in impression immediately above epistoma.

Pronotum as in *porosus* except usually widest near middle, converging anteriorly more abruptly; surface often partly or entirely reticulate, punctures about as on some *porosus* but finer than on most; largest punctures about twice as large as smallest, spaced by distances equal to or smaller than diameter of smallest punctures.

Elytra as in *porosus* except basal crenulations more poorly developed, submarginal crenulations absent; entire surface minutely reticulate (visible at 80 diameters magnification, not at 40 diameters); interstrial punctures smaller, more numerous; interstriae very slightly wider, surface less irregular; interstrial crenulations near declivity narrower, very slightly higher; declivital scales more abundant, extending to or slightly anterior to base of declivity; setae in interstrial rows very slightly longer, distinctly coarser.

Last visible abdominal sternum never grooved or pubescent as in males of most other *Hylurgops* species.

FEMALE.— Similar to male except anterior tibiae with five (male with six) socketed teeth; terminal, concealed segments of abdomen only reliable indicator of sex, as in many other species of this subfamily.

DISTRIBUTION.— Northwest Territories and Montana to California and New Mexico.

CANADA: **British Columbia**: Aspen Grove, Indian Meadows, Lake Cowichan, Merritt (Midday Valley), Pender Harbor, Princeton, Robson, Spious Creek, Summerland, Trinity Valley, Vancouver, Voght Valley. **Northwest Territories**: Norman Wells. USA: **Arizona**: Chiricahua Mts., Coconino N. F., Flagstaff, Jerome, Williams. **California**: Anderson Valley, Baldwin Lake, Big Bear Lake, Big Pines (Los Angeles Co.), Burney, Carmel, Camp Greeley, Carrville (Trinity Co.), Coffee Creek (Trinity Co.), Del Monte, Facht (Lassen Co.), Hayfork (Trinity Co.), Horse Creek, Huckleberry Meadows (Freeman Co.), Lassen N. F., Mammoth, Manzanita Lake (Lassen Co.), Miami R. S. (Mariposa Co.), Monterey, Norval Flats (Lassen Co.), Pacific Grove, Pinecrest, Redstone Station (Tulare Co.), Salt R. S. (Glen Co.), Stevenson Creek (Fresno Co.), Summit Lake (Shasta Co.), Summerdale, Ventura, Willow Ranch,

Yosemite N. P. **Colorado**: Badger, Boulder, Ft. Collins, Glenhaven, Woodland Park. **Idaho**: Centerville, Idaho City, Moscow, Priest River, Smith's Ferry, Winchester. **Montana**: Columbia Falls, Cramer Creek, Darby, Helena, Kalispell. **Nevada**: Galena Creek (Washow Co.), Kyle Canyon (Clark Co.). **New Mexico**: Capitan, Cloudcroft, Lincoln N. F., Meek. **Oregon**: Ashland, Cedar Mt., Grants Pass, Hood River, Klamath Falls, Prineville, Wallowa N. F. **South Dakota**: Pine Ridge. **Utah**: Eureka, Mammoth Mt. **Washington**: Buckeye, Olympic N. P., Pullman, Quinault, Sunrise Park, Tacoma, Toppenish.

HOSTS.— *Pinus jeffreyi, P. ponderosa, P. radiata, P.* spp.

BIOLOGY.— Evidently very similar to *porosus.*

NOTES.— The above treatment was based on the type series of 86 specimens and on 87 other specimens.

### 6. *Hylurgops rugipennis rugipennis* (Mannerheim)

Fig. 42

*Hylastes rugipennis* Mannerheim, 1843, Moskov. Obshch. Isp. Prirody, Otd. Biol. Biul. (Bull. Soc. Imp. Nat. Moscou) 16(2):297 (Syntypes?; Sitka Island, Alaska: lost? Not in Helsinki Mus.)

DIAGNOSIS.— This form intergrades on a narrow zone with *r. pinifex* (Fitch), from which it may be distinguished by characters summarized in the above key.

MALE.— Length 3.6–4.8 mm, 2.44 times as long as wide; color reddish brown.

Frons essentially as in *incomptus* but with the median carina acute.

Pronotum about 0.9 times as long as wide; widest about a third pronotum length from base, sides strongly arcuate and converging to constriction just behind broadly rounded anterior margin; surface shining, closely, rather deeply, almost uniformly punctured; vestiture very fine, hairlike, usually abraded.

Elytra 1.7 times as long as wide, 2.1 times as long as pronotum; sides almost straight and parallel on basal two-thirds to declivital base, then broadly rounded behind; striae slightly impressed, punctures rather small, deep; interstriae as wide as striae, convex, slightly irregular, punctures fine, confused, a few of them narrowly crenulate, tending to form an indefinite row of tubercles. Declivity steep, convex; striae more narrowly impressed than on disc; interstriae 1 and 9 weakly elevated, 2 feebly impressed; each armed by a row of fine, rather widely spaced granules. Vestiture consisting of short ground cover of broad, oval scales on declivity, replaced by fine hair on upper declivity and disc (scales very rarely extend anterior to declivital base), and rows of longer, erect, interstrial hairlike bristles.

FEMALE.— Evidently as in male except on abdominal terga.

DISTRIBUTION.— The Pacific Coast from Alaska to California.

ALASKA: Farragut Bay, Ft. Yukon, Juneau, Ketchikan, Kodiak Island, Loring, Sitka, Skagway. CANADA: **British Columbia**: Aspen Grove, Beaton River, Creston, Glacier, Inverness, Lorna, Mainland, Massett (Queen Charlotte Islands), McBride, Merritt (Midday Valley), Mutokatla, Pine Pass, Skidgate, Stanley Park, Taylor Lake, Terrace, Trinity Valley, Vancouver. **Yukon**: Yukon Terr. USA: **California**: Carmel, Crescent City, Del Norte, Inverness, McKerrick (Mendocino Co.), Monterey, Pacific Grove. **Oregon**: Ahlers, Astoria, Breitenbush, Cannon Beach, Crater Lake, Detroit, Fogarty, Gold Lake (Willamette N. F.), McMinnville, Newport, North Bend, Otis, Portland, Santiam Pass, Seaside, Taft, Waldport. **Washington**: Aberdeen, Easton, Eatonville, Forks, Friday Harbor, Hoquiam, Lake Crescent, Metaline Falls, Mt. Adams, Mt. Rainier, Olympic N. P., Quinault, Satsop, Sauk, Sulton.

HOSTS.— *Picea engelmannii, P. sitchensis, Pinus attenuata, P. contorta, P. monticola, P. muricata, P. radiata,* and *Pseudotsuga menziesii.*

BIOLOGY.— Specimens in humid areas along the Pacific Coast were taken either from limbs or the bole of fallen trees. The biramous, transverse egg tunnels are of the characteristic hylesinine type that are primarily in the phloem tissues but may engrave the wood slightly. Larval mines wander aimlessly in the phloem tissues and usually are at least partly visible on the inner surface of peeled bark.

NOTES.— The above treatment was based on two specimens from Juneau, Alaska, and on 75 other specimens from localities listed above.

Specimens from the coastal areas appear to be anatomically and biologically distinct from those east of the area from the Cascade Mountains to Vernon, British Columbia. Near this line series may fit one form or the other, they may be intermediate in the characters exhibited, or they may contain a mixture of extremes and intermediates of both forms. The zone of intergradation appears to be relatively narrow and except near this line the coastal form represented by the name *rugipennis,* is easily distinguished from the more

widely distributed inland or eastern form represented by the name *pinifex*. In view of this narrow zone of intergradation between two otherwise distinct populations, subspecies must be recognized.

### 7. *Hylurgops rugipennis pinifex* (Fitch)
Figs. 39, 42

*Hylastes pinifex* Fitch, 1858, Trans. New York Agric. Soc. 17:729 (Lectotype, female; New York; U.S. Nat. Mus., 42807, present designation)

DIAGNOSIS.— As mentioned above under *r. rugipennis*, there appears to be intergradation between these forms. Therefore, they are treated as subspecies that can be separated from one another by characters mentioned in the above key.

MALE.— Length 3.7–5.2 mm, 2.48 times as long as wide; color reddish brown.

Frons as in *r. rugipennis*. Pronotum as in *r. rugipennis* except more small punctures usually present.

Elytra 1.5 times as long as wide, 1.8 times as long as pronotum; profile as in *r. rugipennis*; striae slightly impressed, punctures rather small, deep; interstriae as wide as striae, slightly convex, shining, most punctures weakly to moderately crenulate, many crenulations half as wide as interstriae and not oriented to form a uniseriate row. Declivity as in *r. rugipennis*. Vestiture consisting of short, oval scales on entire declivity, often extending to anterior half of disc, usually replaced anteriorly by hairlike setae; and rows of bristles as in *r. rugipennis*.

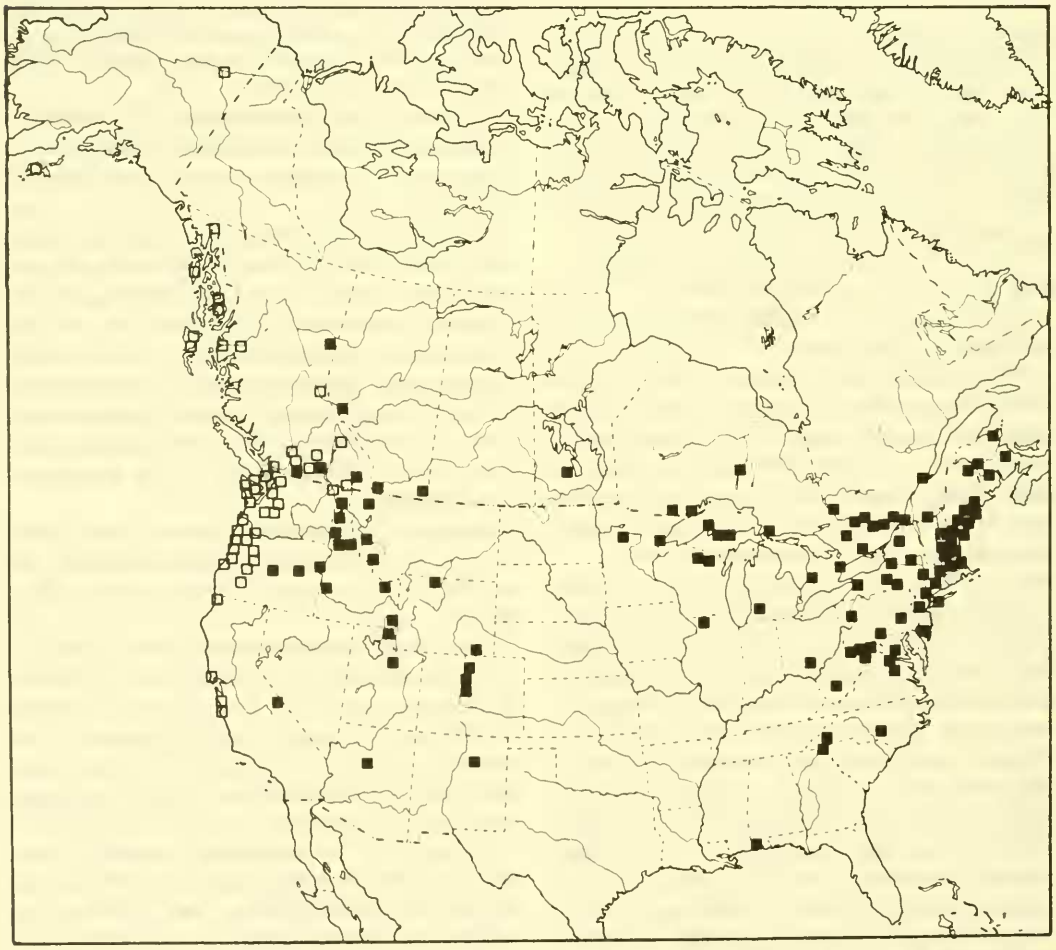


Fig. 42. *Hylurgops rugipennis* subspp., distribution map: *r. rugipennis*, open squares; *r. pinifex*, solid squares.

FEMALE.— Evidently similar to male except on abdominal terga.

DISTRIBUTION.— Inland British Columbia to Utah and Colorado then eastward to Nova Scotia and Alabama.

CANADA: **Alberta**: Cypress Hills, Jasper, Loggan, Waterton N. P. **British Columbia**: Aspen Grove, Lorna, Marysville, Rolla. **Manitoba**: Grass River. **New Brunswick**: Bathurst, Fredricton, McGraw Brook, Plaster Rock, St. Louis, Salmon River. **Nova Scotia**: Kejimkuyik. **Ontario**: Algonquin Park, Chalk River, Constance Bay, Ft. Williams, Longlac, Marmora, Petawawa, Quetico Park, Seaforth (Lake Huron), Thessalon, Toronto, Whitefish Point. **Quebec**: Aylmer, Ft. Coulonge, Hudson, Hull, Lake Memphremagog, Lake Opasatika, Laniel, Rigaud, Quebec, St. Anne de Bellevue. USA: **Alabama**: Mobile. **Arizona**: Williams. **California**: Blancos Corral in White Mts. (Mono Co.). **Colorado**: Alma, Byers R. S., Dillon, Elk Creek near Fraser (Grand Co.), Estes Park, Fraser. **Connecticut**: Lichfield. **District of Columbia**: Washington. **Idaho**: Coeur d'Alene, Collins, Eagle, Emerald Creek (Clark Co.), Payette N. F., Moscow, Orofino, Pierce, Sand Point, Soda Springs, Utah Co. **Maine**: Brunswick, Camp Caribou, Monmouth, Norridgewock, Old Town, Paris, Portland, Waldoboro. **Massachusetts**: Boston, Framingham, Southboro, W. Springfield, Stoneham. **Michigan**: Eagle Harbor, Grand Island, Gull Lake (Kalamazoo Co.), Marquette, Munsing. **Minnesota**: Duluth, Itasca Park. **Montana**: Cabinet N. F., Columbia Falls, Missoula, Sula. **New Hampshire**: Durham, Franconia, Hanover, Manchester, Webster. **New Jersey**: Chester, Da Costa. **New Mexico**: Las Vegas. **New York**: Buffalo, Caroline, Cranberry Lake, Gloversville, Ithaca, Nassau, Pocono Lake, Syracuse, West Point, Wyandanch. **North Carolina**: Ashville, Davidson River, Hendersonville, Pink Beds, Pisgah Ridge, Southern Pines. **Ohio**: Chillicothe. **Oregon**: Grant Co., Pine. **Pennsylvania**: N. Bloomfield, Chambersburg, Cooksburg, Mt. Alto, Montebello. **Utah**: Logan Canyon, Wolf Creek Pass. **Virginia**: Falls Church, Rixey, Vetch. **West Virginia**: Crow (Raleigh Co.), Dellslow, Grand Co., Hampshire Co., Monongalia Co., Morgantown, Pendleton. **Wisconsin**: Lac du Flambeau, Three Lakes. **Wyoming**: Centennial, Lovell.

HOSTS.— *Pinus contorta*, *P. flexilis*, *P. resinosa*, and *P. virginiana*.

BIOLOGY.— Basically as in *r. rugipennis* except the tunnels are constructed in stumps and roots at or below the ground level and only rarely in the bole of fallen trees or logs.

NOTES.— The type and 658 other specimens were studied. See the above discussion under *r. rugipennis* concerning intergradation between this widely distributed form and the more restricted form on the Pacific Coast.

This subspecies is very similar to *glabratus* (Zetterstedt), of Europe and Asia, which it resembles as closely as it does *r. rugipennis*. The minute and often inconsistent differences between the two forms suggest that geographical races should be recognized. In spite of this, separate names are retained because the differences, though minute, are definite.

The female cotype of *Hylastes pinifex* Fitch, U.S. National Museum type No. 42807, is here designated as the lectotype of Fitch's species.

### 8. *Hylurgops subcostulatus subcostulatus* (Mannerheim)

Figs. 40A,B

*Hylastes subcostulatus* Mannerheim, 1853, Bull. Soc. Imp. Sci. Nat. Moscou 26(3): 239, (Holotype, sex?; Kenai Peninsula, Alaska; presumably lost)

*Hylastes cristatus* Mannerheim, 1853, Bull. Soc. Imp. Sci. Nat. Moscou 26(3):239 Holotype, sex?; Kenai Peninsula, Alaska; presumably lost).

DIAGNOSIS.— As indicated in the above key this is the only American *Hylurgops* with the alternate declivital interstriae strongly elevated. From about central Arizona and New Mexico northward the elevations are more nearly uniform in height and the tubercles they bear are comparatively small; the population from that point southward is placed in the subspecies *alternans*.

MALE.— Length 3.1–4.2 mm, 2.5 times as long as wide; color dark reddish brown.

Frons essentially as in *incomptus* except rostrum slightly smaller and transverse impression slightly deeper.

Pronotum 0.90 times as long as wide; widest one-third from base, sides on basal two-thirds strongly arcuate and converging slightly, more strongly one-third from anterior margin, rather narrowly rounded in front; surface unarmed, densely covered by punctures of two sizes, larger ones separated by distances equal to less than diameter of a puncture, smaller ones confined to interspaces and about half as large as larger punctures. Each small puncture bearing a small, ragged scale; a few bristles on lateral margins.

Elytra 1.8 times as long as wide 2.2 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather broadly rounded behind but with posterior outline interrupted by strongly elevated interstriae; striae slightly impressed, punctures deep; interstriae as wide as striae, convex, subcrenulate toward base, odd-numbered

interstriae elevated toward declivity, punctures fine, close, confused, with an indefinite median row of irregularly spaced, fine granules. Declivity rather steep, convex; interstriae 1, 3, 7, and 9 abruptly, strongly elevated, about as high as wide, summit almost uniform except where armed by a row of moderately large, pointed tubercles, 2, 4, 6, and 8 unarmed. Ground vestiture of abundant, small scales to base; rows of interstrial bristles visible on posterior half, each bristle short, rather stout.

Body commonly covered by an incrustation.

FEMALE.— Evidently as in male except on abdominal terga.

DISTRIBUTION.— Alaska and Montana to northern Arizona and New Mexico.

ALASKA: Kenai Peninsula. CANADA: **British Columbia**: Coldwater, Kelowma, Midday Valley, Peachland, Summerland, Vancouver. USA: **Arizona**: Chiricahua Mts., Coconino N. F., Coronado N. F., Grand Canyon, Huachuca Mts., Kaibab N. F., Lakeside, Prescott N. F., Santa Catalina Mts., Williams. **California**: Acta, Bass Lake, Big Pines Park, Blacks Mt., Blue Lake, Burney, Charleton Flats, Chester, Dorrington, Fallen Leaf Lake, Grass Valley, Hackamore, Lassen N. F., Mather, Meadow Valley (Plumas Co.), Mineral, Oakland, Pollock Pines, San Diego, Sequoia N. P., Tahquitz (San Juacinto Mts.), Truckee, Walker Mine (Plumas Co.). **Colorado**: Bailey, Boulder, Estes Park, Evergreen, Glennhaven, Golden, Norwood, Pingree Park, Uncompahgre N. F. **Idaho**: Athol (Kootenai Co.), Coeur d'Alene, Harpster Grade, Moscow, Potlatch, Smith's Ferry, Tamarack, Westmond, Whitebird. **Montana**: Hamilton, Sula. **New Mexico**: Cloudcroft, Lincoln N. F., Mt. Taylor. **Oregon**: Ashland, Blue Mts., Corvallis, Green Springs (Jackson Co.), Keno, Klamath Co., Santiam Pass, Sisters, Summit Prairie, Warm Springs Indian Reservation. **South Dakota**: Black Hills, Custer, Hill City, Spearfish. **Utah**: Ashley N. F., Long Hollow (Dixie N. F.), Mammoth Mt., Sanford Canyon (Dixie N. F.). **Washington**: Columbia Co., Kooskooskie, Natches, Preston Creek (Wenatchee N. F.). **Wyoming**: Centennial.

HOSTS.— Evidently all species of *Pinus* and *Picea* within its range.

BIOLOGY.— Most commonly taken in prostrate trees or logs, but it will also breed in erect trees killed by other beetles. It is one of the few bark beetles that breed successfully in sour logs. Presumably the gallery system is similar to that described above for *incomptus*.

NOTES.— The above treatment was based on 420 specimens that agree with material in the U.S. National Museum and in the Canadian National Collection. The original material on which Mannerheim based *subcostulatus* and *cristatus* is missing from the Helsinki Museum and is presumed lost. The descriptions are adequate to characterize this species; however, that of *cristatus* indicates a size of 1 lin. (2.12 mm), and for *subcostulatus* 1¼ lin. (2.65 mm), which is smaller than specimens examined during this study. In view of other measurements given by Mannerheim, discrepancies of this magnitude might be expected.

### 9. *Hylurgops subcostulatus alternans* (Chapuis)

Fig. 42C

*Hylastes alternans* Chapuis, 1869, Synopsis des Scolytides, p. 22 (Mexico; Brussels Mus.)

DIAGNOSIS.— The population of this species from central Arizona and New Mexico southward has the alternate declivital interspaces more strongly elevated and somewhat inflated at each tubercle arming its summit. The two widely distributed forms intergrade in a narrow belt in northern Arizona and New Mexico.

MALE.— Length 3.3–4.4 mm, 2.4 times as long as wide; color dark reddish brown.

This subspecies differs from *s. subcostulatus* only in details of elytral structure. The elevated declivital intervals are rather strongly constricted in height and width between tubercles; the strial punctures are also distinctly larger.

FEMALE.— Essentially as in male except for the abdominal terga.

DISTRIBUTION.— Southern Arizona and southern New Mexico to Mexico (state).

MEXICO: **Chiapas**: 14 km E San Cristóbal, 31-VII-57, J. A. Chemsak. **Distrito Federal**: Mexico. **Durango**: 100 km W Durango, 5-VI-65, 2500 m, No. 28, *Pinus*, S. L. Wood. **Guerrero**: Omilteme, H. H. Smith. **Mexico**: 21 km W San Martin de Texmelucan, 14-VII-53, 2800 m, No. 103, *Pinus*, S. L. Wood.

HOSTS.— Evidently any species of *Pinus* within its range, but most common in *P. ponderosa* and *P. leiophylla*.

BIOLOGY.— Evidently as in *subcostulatus*, but less commonly taken in prostrate trees or logs; usually in standing, dying trees.

NOTES.— The above treatment was based on 12 specimens that agree with Blandford's Biologia Centrali-Americana material.

Because the zone of intergradation between the subspecies of *subcostulatus* is in an

inconvenient geographical area, and because it is gradual and rather extensive, I have arbitrarily designated all specimens north of the Mexican border as *s. subcostulatus* and all those south of the border as *s. alternans*. Actually, those from the southern one-fourth of Arizona and New Mexico clearly are *s. alternans*, those from the northern one-fourth are *s. subcostulatus*, and those from the intervening area usually cannot be placed with confidence in either subspecies.

## GENUS *HYLASTES* ERICHSON

*Hylastes* Erichson, 1836, Archiv. Naturgesch. 2(1):47 (Type-species: *Bostrichus ater* Paykull, subsequent designation by Westwood, 1838, Synops. Gen. British Ins:, p. 39, also by Thomson, 1859, Skand. Coleopt. synop. bearb, p. 146)

DIAGNOSIS.— This genus is very closely related to *Hylurgops* from which some species are separated with difficulty. Characters mentioned in the above genetic key and in the diagnosis of *Hylurgops* serve to distinguish it.

DESCRIPTION.— Length 2.1–6.0 mm, 2.6–3.2 times as long as wide; color black except reddish brown in two species.

Frons usually with a transverse impression midway between level of antennal insertion and upper level of eyes, convex above, flattened or weakly convex below this point, lower area often with a fine, median carina or a median groove. Eye subovate, entire. Antennal funicle 7-segmented; club conical, basal segment usually longer than others. Pronotum elongate, unarmed. Scutellum small, oval. Crenulations on elytral bases poorly developed, bases not elevated; striae rarely impressed, punctures distinct; interstriae variously sculptured. Declivity convex, steep. Vestiture usually including scales and hair. Third tarsal segments at most emarginate, not bilobed.

DISTRIBUTION.— The Holarctic realm; 15 species occur throughout the coniferous forests of North and Central America south to Honduras. An additional dozen or more species occur in the coniferous forests of north Africa, Europe, and Asia.

BIOLOGY.— All species breed in the phloem tissues in the stumps and roots and occasionally in logs of coniferous trees. The gallery systems of North American species have not been adequately studied, but are similar to those described above for *Hylurgops*.

### Key to the Species of *Hylastes*

1. Frons entirely devoid of a median carina; discal interstriae with punctures uniseriate (except *fulgidus*); small species, less than 3.0 mm (some *fulgidus* to 3.5 mm) ..... 2
— Frons with a definite median carina, often restricted to area near epistoma or to central area; punctures of discal interstriae confused (except *longicollis*); larger than 3.3 mm ..... 4

2(1). Interspacial areas between pronotal punctures smooth, shining, entirely devoid of reticulation; punctures on discal interstriae confused; anterior tibiae with five to eight socketed teeth; S California and SW Kansas to Michoacán; 2.8–3.5 mm ..... 1. ***fulgidus*** **Blackman**
— Interspacial areas between pronotal punctures partly or mostly reticulate; punctures on elytral disc usually subcrenulate or granulate, usually uniseriate; anterior tibiae with four to five socketed teeth; smaller species ..... 3

3(2). Frons and vertex punctured, interspaces smooth to feebly granulate, median groove feebly indicated or absent; California and Hidalgo to Maryland and Florida; 2.0–2.5 mm ..... 2. ***tenuis*** **Eichhoff**
— Frons and vertex devoid of punctures, coarsely, closely granulate, lower half usually with a conspicuous median sulcus; Texas to North Carolina and Florida; 2.3–2.7 mm ..... 3. ***exilis*** **Chapuis**

4(1). Elytral declivity devoid of scalelike vestiture; body stout, less than 2.6 times as long as wide; pronotum widest on basal fourth; strial punctures rather large, interstriae coarsely sculptured, rather narrowly convex on declivity, declivital

tubercles rather large; posteriorly interstriae 8 higher than 9; New Jersey and Florida to E Texas; 3.3–5.0 mm ..... 4. ***salebrosus*** **Eichhoff**

— Ground vestiture of elytral declivity consisting of abundant scales (except *ruber*); body more slender, 2.8 or more times as long as wide; pronotum widest at or in front of middle; strial punctures usually smaller, interstriae more broadly rounded, more finely sculptured, declivital tubercles fine ..... 5

5(4). Strial punctures on disc subrectangular, noticeably longer than wide, much wider than interstriae; interstrial punctures uniseriate; hairlike setae on elytral declivity more abundant than scalelike setae; California and British Columbia to South Dakota; 3.3–3.9 mm ..... 5. ***longicollis*** **Swaine**

— Strial punctures on disc circular or at least wider than long; interstriae usually at least as wide as striae, their punctures confused; scalelike setae on declivity much more abundant than hairlike setae; last visible female sternum normal, convex, in male medially impressed and ornamented by fine, often dense pubescense; female pronotum normally more slender; larger species ..... 6

6(5). Premandibular epistomal process large, usually narrowly emarginate, bilobed, lateral apical margins conspicuously elevated, concavity between them continuous with impressed area extending to near antennal insertions, median carina not divided at its lower extremity; elytral vestiture largely hairlike on declivity, scalelike setae sparse or entirely absent; body color reddish brown; Northwest Territories and Alberta to Arizona; 4.8–5.2 mm ..... 6. ***ruber*** **Swaine**

— Premandibular epistomal process sinuate at most, its lateral apical margins not elevated; median frontal carina forked at lower end, a ridge or costa continuing to near lateral apices of epistomal lobe, median portion of lobe hemispherically or subtriangularly impressed or excavated below costae and bearing a specialized tuft of hairlike setae; vestiture on elytral declivity consisting of abundant scales; body color dark brown to black; male sternum 5 flattened or medially impressed and ornamented by numerous setae ..... 7

7(6). Fore tibia armed by six teeth, basal half of tibia rather slender; hind tibia with two teeth on lateral margin before angle; pronotum not reticulate (except toward margins in *porculus*); usually smaller than 4.0 mm except those from Mexico ..... 8

— Fore tibia armed by seven or eight teeth (rarely six), basal half of tibia stout; hind tibia with three or four teeth on lateral margin before angle; pronotum at least partly reticulate in most specimens; usually larger than 4.0 mm ..... 12

8(7). Pronotal punctures fine, deep, interspaces averaging about as wide as a puncture; striae, narrower, interstriae about one and one-half times as wide; punctures on head finer, usually regular and not confluent; color black; Mexico; larger than 4.2 mm ..... 9

— Pronotal punctures coarse, interspaces averaging about half as wide as a puncture; striae wider, almost as wide as interstriae; frontal area coarsely punctured; brown to black ..... 11

9(8). Discal strial punctures very small, shallow, interstriae three or more times as wide as striae; interstrial punctures almost as large as those of striae; declivital striae slightly impressed, punctures larger and deeper than those of disc, interstriae three times as wide as striae; Hidalgo to Morelos; 4.8 mm ..... 7. ***flohri*** **(Eggers)**

— Discal strial punctures rather coarse, deep, interstriae less than twice as wide as striae; discal punctures of striae at least twice as large as those of interstriae; strial punctures on declivity not larger than those on disc ..... 10

10(9). Declivital striae feebly or not at all impressed, punctures coarse, deep, about equal in width to interstriae; interstrial tubercles on declivity more widely spaced, separated by distances about equal to width of an interstriae; Arizona and Durango to Mexico; 4.2–4.9 mm ..... 8. ***mexicanus*** **Wood**

— Declivital striae narrowly impressed, punctures fine, widely spaced; declivital interstriae at least three times as wide as striae, tubercles close, spaced by distances equal to less than half width of an interstriae; punctures on head minute; Hidalgo; 4.3 mm ..... 9. ***niger*** **Wood**

11(8). Pronotal surface of interspaces smooth, shining; pronotal punctures smaller, more uniformly distributed; British Columbia and Montana to Guatemala; 3.3–4.0 mm ..... 10. ***gracilis*** **LeConte**

— Pronotal interspaces at least partly reticulate in marginal areas (rarely entirely shining); pronotal punctures larger, more irregularly placed; Manitoba and New Brunswick to Texas and Florida; 3.8–5.0 mm ..... 11. ***porculus*** **Erichson**

12(7). Discal interstriae finely crenulate to declivity; declivital interstriae armed by small, pointed tubercles; pronotum very closely, deeply punctured; Arizona and New Mexico; 4.0–4.6 mm ..... 12. ***asperatus*** **Wood**

— Discal interstriae usually irregular but not crenulate; pronotum less coarsely punctured; declivital interstriae usually unarmed or minute tubercles confused (except most *macer*) ..... 13

13(12). Entire surface of elytra and pronotum minutely reticulate, dull; interstriae tending to be very slightly wider than striae, less strongly convex, the surface less irregular, punctures finer and as much as irregularly three ranked; British Columbia and California to South Dakota and Arizona; 5.1–6.0 mm ..... 13. ***macer*** **LeConte**

— Surface of elytra smooth, shining; interstriae tending to be slightly narrower than striae, more convex and irregular, punctures larger and mostly uniseriate or two-ranked; usually stouter and slightly smaller ..... 14

14(13). Striae usually wider than interstriae; interstrial punctures rather coarse; reticulation on pronotum usually less evident, punctures larger; female body 3.0 times as long as wide; in *Pinus*; Alaska and California to W. Montana; 3.8–4.9 mm ..... 14. ***nigrinus*** **(Mannerheim)**

— Striae usually narrower than interstriae; interstrial punctures finer; reticulation on pronotum clearly evident, punctures slightly smaller; female body stouter, 2.8 times as long as wide; *Abies*; Utah and Wyoming to New Mexico; 4.4–5.5 mm ..... 15. ***subopacus*** **Blackman**

### 1. *Hylastes fulgidus* Blackman

*Hylastes fulgidus*, Blackman, 1941, U.S. Dept. Agric. Misc. Pub. 417:18 (Holotype, female; Las Vegas Hot Springs, New Mexico; U.S. Nat. Mus., 54035)

DIAGNOSIS.— This species is allied to *tenuis* Eichhoff, but it may be distinguished by the larger size, by the smooth, shining frons with nongranulate punctures, by the smooth, shining, nonreticulate pronotum having somewhat smaller punctures, and by the more abundant declivital scales. As in *tenuis* the frons is completely devoid of a median carina.

FEMALE.— Length 2.8–3.5 mm, 2.8 times as long as wide; color black.

Frons shallowly, transversely impressed just below upper level of eyes, convex above and slight inflated below this point, transversely impressed just above epistomal margin except at median line; surface reticulate on lower half, punctures rather fine, close, deep; vestiture inconspicuous.

Pronotum 1.2 times as long as wide; widest near middle, sides moderately arcuate, rather narrowly rounded in front; surface smooth and shining, punctures large, deep, close,

smaller on anterior third; median line obscurely indicated.

Elytra 1.9 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on basal three-fourths to declivital base, broadly rounded behind; striae feebly if at all impressed, punctures moderately large, deep; interstriae as wide as striae, feebly convex, punctures rather coarse, confused, not at all granulate. Declivity convex, steep; interstriae slightly wider than striae, granules not evident. Discal vestiture hairlike, short, rather abundant; on declivity of rather abundant scalelike ground cover and rows of longer bristles.

MALE.— Distinguishable from female only by abdominal terga.

DISTRIBUTION.— California and SW Kansas to Baja California and Michoacán.

USA: **Arizona**: Cave Creek in Chiricahua Mts., 21-VI-58; Rustler's Park in Chiricahua Mts., 5-VII-40, R. H. Beamer; Huachuca Mts.; Hualpai M., 6-VII-38, J. N. Knull; Prescott N. F., 8-VII-59, *Pinus ponderosa*. **California**: Chuchupate R. S. (Ventura Co.), 9-V-59, C. W. O'Brien; Mt. Diablo, 15-III-47, R. Coleman; Northfork, 25-III-26; O'Neal (Madera Co.), 16-III-47, A. T. McClay. **Colorado**: New Castle, Hopk. US 31408-28. **Kansas**: Wallace Co. **Nevada**: Beaver Dam St. Pk. (Lincoln Co.). **New Mexico**: Cloudcroft, 27-VI-40, flight, R. H. Beamer; Edgewood, B-1296, C. C. Hoff; Gallup; Las Vegas, 9-VII; Los Alamos, 10-II-58, *Pinus edulis*. MEXICO: **Baja California**: Sierra San Pedro Martir at La Sanja, 28-V-58, J. Powell. **Chihuahua**: La Laja, 16-VII-60, flight, S. L. Wood; 26 km NE San Juanito, 19-VII-60, flight, S. L. Wood. **Durango**: 50 km SW El Salto, 23-VII-53, flight, S. L. Wood. **Mexico**: Amecameca. **Michoacán**: Mazamitla, 24-VII-53, C. and P. Vaurie. **Morelia**: Calpulapan. **Zacatecas**: 6 km W Monte Escondido, 2600 m, flight, R. H. Beamer; "Durango," VII-53.

HOSTS.— *Pinus edulis*, *P. ponderosa*, and presumably *P.* spp.

BIOLOGY.— Unknown; presumably it infests stumps or roots. Evidently most or all the above specimens were taken in flight.

NOTES.— The above treatment was based on the holotype and on 49 other specimens.

### 2. *Hylastes tenuis* Eichhoff
Fig. 204

*Hylastes tenuis* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:147 (Syntypes ♀; Amerique Boreale; presumably lost with the Hamburg Mus.)

*Hylastes criticus* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:147 (Two syntypes; Amerique Boreale; presumably lost with the Hamburg Mus.); Blackman, 1941, U.S. Dept. Agric. Misc. Pub. 417:22. *Synonymy*

*Hylastes pusillus* Blackman, 1941, U.S. Dept. Agric. Misc. Publ. 417:23 (Holotype, female; Florida; U.S. Nat. Mus., 54036); Wood, 1971, Great Basin Nat. 31:146. *Synonymy*

*Hylastes parvus* Blackman, 1941, U.S. Dept. Agric. Misc. Publ. 417:24 (Holotype, female; Williams, Arizona; U.S. Nat. Mus., 54037); Wood, 1971, Great Basin Nat. 31:146. *Synonymy*

*Hylastes minutus* Blackman, 1941, U.S. Dept. Agric. Misc. Publ. 417:25 (Holotype, female; Lake Tahoe, Nevada; U.S. Nat. Mus., 54038); Wood, 1971, Great Basin Nat. 31:146. *Synonymy*

DIAGNOSIS.— This species is very closely related to *attenuatus* Erichson, of Europe, from which occasional specimens from the Atlantic Coast states are distinguished with difficulty. Among American species it is allied to *fulgidus* Blackman, from which it is easily distinguished by characters included in the above key.

FEMALE.— Length 2.1–2.7 mm, 3.0 times as long as wide; dark brown to almost black.

Frons with a weak, transverse impression just below upper level of eyes, convex above and slightly inflated below this point, transversely impressed immediately above epistomal margin except at median line; middle third of median line often narrowly impressed; surface coarsely, rather shallowly punctured, fundus of each puncture reticulate at least on upper half of frons; vestiture inconspicuous.

Pronotum about 1.2 times as long as wide; widest on basal half, sides weakly arcuate, broadly rounded in front; surface reticulate except toward median line, with coarse deep punctures.

Elytra 1.9 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on basal two-thirds to declivital base, rather narrowly rounded behind; striae 1 weakly, others not impressed, punctures large, deep; interstriae as wide as striae, feebly convex, each bearing a uniseriate row of fine, rounded, setiferous granules. Declivity narrowly convex, slope rather gradual on upper half, steep below; sculpture essentially as on disc. Vestiture consisting of interstrial rows of short, hairlike bristles, somewhat longer on declivity; and, on disc, supplemental rows of scales may be present, usually not more than one row on each interstrial margin.

MALE.— Except for abdominal terga consistent differences not apparent.

DISTRIBUTION.— California, and New York to Hidalgo and Florida.

USA: **Alabama**: Horn Mt., Mobile, Montomery. **Arkansas**: Bradley Co. **Arizona**: Baboguivari Mt. (Pima Co.), Chiricahua Mts., Flagstaff, Hualpai M., Jacob's Lake, Oak Creek Canyon, Prescott N. F., Williams, Winslow. **California**: Bass Lake, Big Basin (San Mateo Co.), Carmel, Carrville, Grass Valley, Miami, Mokel Hill (Calavaras Co.), Mt. Laguna (Cleveland N. F.). **District of Columbia**: Washington, Woodridge. **Florida**: Lake Placid, Key West, Monticello, Sebring. **Georgia**: Clayton. **Idaho**: Nez Perce. **Kentucky**: Irving (Estill Co.), Knox Co. **Louisiana**: Bogalusa, Elizabeth. **Maryland**: Beltsville, Hyattsville, Oldenton, Plumbers Island, Plum Point, Travilah. **Massachusetts**: Framingham. **Mississippi**: Ocean Springs. **Nevada**: Lake Tahoe. **New Jersey**: Beach Haven. **New Mexico**: Las Vegas. **New York**: New York, Yaphank (Long Island). **North Carolina**: Asheville, Black Mt., Chadbourn, Durham, Gray Beard Mt., Lake Toxaway, Pink Beds, Pishgah Ridge, Southern Pines, Swannanoa Valley, Tryon, Whitesides Mt. (Highlands). **Pennsylvania**: Clark's Valley, Cold Springs (Adams Co.), Hummelstown, Mamada Gap, University Park. **South Carolina**: Aiken, Florence, Myrtle Beach. **Tennessee**: Chilhowee. **Texas**: Big Bend, Call. **Utah**: Zion N. P. **Virginia**: Camp Pickett, Ft. Monroe, Nelson Co., Virginia Beach, West Point. **West Virginia**: Kanawha Station, Morgantown, Roncevert, West Sulphur. MEXICO: **Hidalgo**: Jacala. **Mexico**: San Rafael.

HOSTS.— Evidently any species of *Pinus* within its range; less commonly from other conifers.

BIOLOGY.— Largely unknown, presumably a root-infesting species.

NOTES.— The types of *tenuis* and *criticus* were examined by J. M. Swaine prior to their loss and compared to material in his collection. The above treatment was based on my material that agrees with Swaine's specimens and that was compared to holotypes of *pusillus*, *parvus*, and *minutus*. The features described by Blackman for the species treated here as synonyms appear to be normal variations. There are numerous minute variations within a series involving the shape of the pronotum, appearance of the elytral surface, and vestiture. Some of these variations result from abrasion. In all, 279 specimens were examined, 88 of them were from the western United States.

### 3. *Hylastes exilis* Chapuis

*Hylastes exilis* Chapuis, 1869, Synopsis des Scolytides, p. 20 (Holotype, sex?; "Nuorlean," presumably New Orleans, Louisiana; Brussels Mus.)

DIAGNOSIS.— This species is distinguished from *tenuis* Eichhoff by the slightly larger average size, by the rather coarsely granulate frons and vertex that are devoid of punctures, by the distinct median groove on the frons, and by the very slightly larger (variable) elytral crenulations.

FEMALE.— Length 2.3–2.7 mm, 2.8 times as long as wide; color black.

Frons as in *tenuis* except transverse impression at middle more distinct, median sulcus on lower half always distinctly impressed, and surface devoid of punctures, rather closely, coarsely granulate above transverse impression, more finely granulate on lower half.

Pronotum and elytra as in *tenuis* except interstrial crenulations average very slightly larger, slightly confused, often closer (variable).

MALE.— Similar to female in all respects; presence of declivital interstrial scales possibly restricted to males.

DISTRIBUTION.— Texas to North Carolina and Florida.

USA: **Alabama**: Conecuh, 7-XI-61, *P. palustris*, E. I. Hazard. **Arkansas**: Texarkana, 26-III-07, W. D. Pierce. **District of Columbia**: Washington, V, Hubbard and Schwartz. **Florida**: Flagler Co., 12-X-77, *P. elliotii*, T. H. Atkinson; Lake Placid, 13-VII-48, R. H. Beamer; Lake Worth, 1889, L. B. Parker; Sebring, 20-VI-51, at light, S. L. Wood; Vero Beach, 15-II-14, flight, C. G. Ainselle. **Louisiana**: Elizabeth, VII-IX-67, *Pinus taeda*. **Mississippi**: Lucedale, 28-IV-29, H. Dietrich,; Starkville, 19-V-20, M. W. Blackman. **North Carolina**: Chapel Hill, 28-IV-29, H. Dietrich; Chadbourn, 20-IV-10, E. G. Smith; Southern Pines, 19-IV-17, A. H. Mantee. **South Carolina**: Bishopville, 17-IV-61, V. M. Kirk; Myrtle Beach, 22-IV-57, 11-IV-62, V. M. Kirk. **Texas**: Kirbyville, 2-III-08, E. S. Tucker.

HOSTS.— *Pinus elliotii*, *P. plaustris*, *P. taeda*, and probably other *P.* spp.

BIOLOGY.— Not recorded. It probably breeds in the stumps and roots of pine trees. Most specimens were collected in flight in pine forests.

NOTES.— The above treatment was based on the holotype and on 21 other specimens.

### 4. *Hylastes salebrosus* Eichhoff

*Hylastes salebrosus* Eichhoff, 1868 (May), Berliner Ent. Zeitschr. 12:146 (Lectotype, male; Carolina; U.S. Nat. Mus., present designation)

*Hylastes scobinosus* Eichhoff, 1868 (May), Berliner Ent. Zeitschr, 12:146 (Syntypes?, sex?; Carolina presumably lost in the Hamburg Museum.). *New Synonymy*

*Hylurgus scabripennis* Zimmermann, 1868 (September), Trans. Amer. Ent. Soc. 2:149 (Syntypes: Atlantic States; Mus. Comp. Zool.); Blandford, 1898, Ent. News 9:5. *Synonymy*

DIAGNOSIS.— This species is not closely allied to any species known to me. It differs from all other *Hylastes* species in having the elytral vestiture hairlike, scales are entirely absent; punctation of the pronotum is more nearly like the Rhyncolini than *Hylastes*; and the declivital interstriae are much more coarsely tuberculate than in other *Hylastes*.

FEMALE.— Length 3.3–5.0 mm, 2.4–2.5 times as long as wide; color black.

Frons weakly, transversely impressed just below upper level of eyes, more strongly, broadly, transversely impressed just above epistomal margin; epistomal lobe poorly developed; median carina rather poorly developed but usually distinct on its upper half; surface rather finely, obscurely punctured on lower half, becoming rather coarsely granulate above.

Pronotum 1.05 times as long as wide, widest at base, sides arcuately converging to weak constriction just behind broadly rounded anterior margin; surface smooth with rather small, deep punctures, their size decreasing on anterior third; spaces between punctures variable but usually slightly less than diameter of a puncture.

Elytra 1.5–1.6 times as long as wide, 1.8 times as long as pronotum; sides very feebly arcuate to declivital base then somewhat narrowly rounded behind; striae impressed, punctures rather small, distinct; interstriae one and one-half times as wide as striae, convex, surface subshining, with transverse lines through irregular, confused punctures, more nearly subcrenulate toward base and declivity. Declivity convex, moderately steep; interstrial crenulations close, tuberculate, in rows. Vestiture largely confined to declivity; short, fine middle row on each interstriae slightly stouter but usually not longer.

MALE.— Similar to female except last visible abdominal sternum flattened or weakly impressed toward median line, not convex as in female.

DISTRIBUTION.— New Jersey and Texas to Florida.

USA: **Alabama**: Altmore, Mobile. **Florida**: Biscayne Bay, Gainsville, Montacello, Snead, Suwanee Springs. **Georgia**: Atlanta, Clayton. **Louisiana**: Bogalusa. **Maryland**: Beltsville. **Mississippi**: Lucedale. **New Jersey**: Lakewood, Sommerset Co. **North Carolina**: Ashville, Camp Pickett, Pink Beds, Pisgah Ridge, Southern Pines, Swannanoa Valley, Tryon. **South Carolina**: Clemson College, Florence, Lumber. **Texas**: Call, Willis. **Virginia**: Cape Charles, Enterprise, Ft. Monroe, Nelson Co.

HOSTS.— Presumably all species of *Pinus* within its range.

BIOLOGY.— This species evidently breeds in stumps or in roots well below ground level. Because newly emerged adults have been taken from seedlings, it is possible that a feeding on green host tissues is necessary for maturation. Adults sometimes are attracted in large numbers to green lumber at sawmills.

NOTES.— Two cotypes of *salebrosus*, a male and a female, in the U.S. National Museum apparently are the only existing specimens of the original series. I, therefore, here designate the first specimen, a male, as the lectotype of *salebrosus* Eichhoff. A female specimen in the U.S. National Museum received from Eichhoff and labeled as a cotype of *scobinosus* is from "Tennese" (sic) and cannot be regarded as a member of the original type series; however, because it was examined by Eichhoff it is used as the basis for placing this name in synonymy. In addition to these, 151 specimens were examined during this study.

### 5. *Hylastes longicollis* Swaine

*Hylastes longicollis* Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Bull 14(2):79 (Holotype, sex?; Atlanta, Idaho; Canadian Nat. Coll., 9246)

DIAGNOSIS.— The structure of the epistomal process, the paucity of elytral scales and the light body color indicate a relationship to *ruber* Swaine and distinguish these species from other *Hylastes*. The small size and the large, quadrate punctures distinguish it from *ruber*.

FEMALE.— Length 3.0–3.9 mm, 2.9 times as long as wide; color moderately dark reddish brown.

Frons with transverse impression just below upper level of eyes very poorly developed, subinflated at level of antennal insertion, epistomal margin rather narrowly impressed; epistomal lobe wide, poorly developed, devoid of a pair of elevations extending to median carina; a fine, acutely elevated carina extending on lower half from transverse impression to near base of epistomal lobe; surface rather coarsely, shallowly punctured; vestiture consisting of short hair.

Pronotum 1.22 times as long as wide, widest just in front of middle; sides straight

and diverging slightly on basal half, rather broadly rounded in front; surface smooth, shining, with very coarse, moderately deep punctures, their inner surfaces subreticulate, interstriae equal to less than half diameter of a puncture; median line evident on middle half; vestiture consisting of fine, moderately short hair over entire surface.

Elytra 1.93 times as long as wide, 1.9 times as long as pronotum; sides almost straight and parallel to declivital base, narrowly rounded behind; striae not impressed, punctures coarse, mostly longitudinally subrectangular; interstriae about half as wide as striae, punctures fine, subgranulate on anterior lip, almost uniseriate. Declivity narrowly convex, moderately steep; striae about as wide as interstriae. Vestiture consisting of short, rather fine interstrial hair on disc, becoming stout on declivity and with an indefinite row of slender scales on each margin of each interstriae.

MALE.— Similar to female except body evidently a little stouter, with the last visible abdominal sternum slightly flatter and shorter (very indefinite).

DISTRIBUTION.— British Columbia and Alberta to California and South Dakota.

CANADA: **Alberta**: Cypress Hills, 1-VI-25, F. S. Carr. **British Columbia**: Aspen Grove, 23-VI-33, *Pinus contorta*, K. Graham; Cranbrook; Emerald Lake; Creston, 31-V-56, G. S. Smith; Lorna, 29-VI-24, G. Hopping; Merritt (Midday Valley), 7-VI-25, *P. ponderosa*, J. Stanley; Pender Harbor, 10-V-28, G. R. Hopping; Terrace; Trinity Valley, 18-V-28, J. R. Howell. USA: **California**: Giant Forest (Tulare Co.), 19-VII-15, 3200 m, R. Hopping; Lake Tahoe; Lodgepole Camp (Sequoia), 24-VI-48, A. T. McClay; Meadow Valley (Plumas Co.), 26-VI-30; Miami R. S. (Mariposa Co.), 20-V-42, A. J. Walz; Round Meadow Giant Forest (Tulare Co.); White Cloud Camp (Nevada Co.), 30-V-65, P. Arnaud. **Idaho**: Coeur d'Alene, 20-VI-36, *P. monticola*, T. O. Thatcher; Idaho City, 26-V-70, trap; Kootenai Co., 19-VI-68, trap; Krassel R. S., 14-VI-66, flight, M. M. Furniss; McCall, 14-VI-31, M. A. Cazier; Robinson Lake (Latah Co.), 11-VI-53, R. Abbott. **Montana**: Columbia Falls, 18-V-10, J. Brunner; St. Regis, 25-V-70, *P. contorta*, M. D. McGregor. **Oregon**: Clackamas Co., 25-VII-66; Hood River; Mary's Peak, 19-VI-61, flight, S. L. Wood; Prineville, VIII-35, *P. ponderosa*, W. J. Buckhorn; Tollgate, 8-VI-31, McLane. **South Dakota**: Black Hills, Hopk. US635b. **Washington**: Mt. Baker N. F., 15-VII-35, A. M. Holland; Quilcane, 26-VI-35, flight, R. L. Furniss; Olympic N. P., 18-VII-66.

HOSTS.— *Pinus contorta*, *P. monticola*, *P. ponderosa*.

BIOLOGY.— It has been taken from stumps at or below the ground level.

NOTES.— The above treatment was based on my female homotype from Coeur d'Alene N. F., Idaho, and 129 additional specimens.

### 6. *Hylastes ruber* Swaine

*Hylastes ruber* Swaine, 1915, Canadian Ent. 47:367 (Holotype, sex?; Golden, British Columbia; Canadian Nat. Coll. 9245)

DIAGNOSIS.— This species is rather closely allied to *longicollis* Swaine, but it is easily distinguished by the larger size, by the smaller, circular strial punctures, and by the confused interstrial punctures.

FEMALE.— Length 4.8–5.2 mm, 2.8 times as long as wide; color reddish brown.

Frons with transverse interocular impression very weak, subinflated near level of antennal insertion, narrowly, transversely impressed immediately above epistomal margin; epistomal lobe wide, rather large, not reinforced by a pair of ridges extending to median carina; median carina acutely elevated from interocular impression to a point just above base of epistomal lobe, its lower end not forked; surface coarsely, closely, rather deeply punctured; vestiture hairlike, short, inconspicuous.

Pronotum 1.12 times as long as wide; widest at or just behind middle, sides arcuate from base to feeble constriction just behind rather broadly rounded anterior margin; surface smooth, shining, punctures coarse, close, their centers subreticulate, interspaces less than half diameter of puncture; punctures on anterior fifth reduced in size, their interspaces here commonly reticulate; median line indicated on about middle three-fourths; hairlike vestiture minute, usually completely abraded.

Elytra 1.8 times as long as wide, 1.9 times as long as pronotum; sides almost straight and parallel on basal three-fourths to declivital base then rather broadly rounded behind; striae feebly if at all impressed, punctures circular, moderately large, deep; interstriae as wide as striae, punctures minute, confused, very finely granulate or subgranulate. Declivity convex, steep, striae moderately impressed; interstriae convex, tubercles larger. Vestiture consisting of minute, semirecumbent hair.

MALE.— Similar to female except body evidently slightly stouter and last visible abdominal sternum somewhat flattened and shorter.

DISTRIBUTION.— Northwest Territories and Alberta to Arizona.

CANADA: **Alberta**: Bow River. **British Columbia**: Cranbrook, 29-VI-20, G. Garrett; Creston, 15-V-53, 21-VI-55, G. S. Smith; Copper Mt., 20-V-28, G. S. Smith; Kokanee Mt., London Hill Mine on Bear Lake, 21-VII-03; Trinity Valley, 15-V-27, W. Mathers; Vancouver, 20-VI-39, H. B. Leech; Vernon, 20-VI-39, H. B. Leech. **Northwest Territories**: Aklavik, 20-VIII-30, O. Bryant. USA: **Arizona**: Hanagan Camp (Greenlee Co.), 12-VII-68, D. E. Bright. **Idaho**: Idaho City, 26-V-71, trap, M. M. Furniss; Kootenai Co., 11-VII-68, trap, M. M. Furniss; Krassel, V-58, Douglas fir, M. M. Furniss, McCall; Rocky Point (Benewah Co.), 23-VI-64, R. W. Portman; Moscow, 30-V-31, P. Rice. **Montana**: Columbia Falls; Kalispell, 18-V-20. **Oregon**: Bear Springs (Wapinita), 30-VI-41, K. M. Fender; Clear Lake, 15-VI-45, K. M. Fender; Clackamas Co., 25-VII-66; Hood River, 20-V; Pacific City, 21-VII-42, K. M. Fender; Tollgate. **Washington**: Buckeye; Easton; Omak, 7-VII-66; Satsop River, VIII-32; Seattle, 8-V-60; Walla Walla, 9-V-36, E. W. Jones.

HOST.— *Pseudotsuga menziesii.*

BIOLOGY.— Evidently restricted to the stumps and roots of the host tree. The habits evidently are similar to those of other *Hylastes.*

NOTES.— The above treatment was based on the holotype and on 134 other specimens.

### 7. *Hylastes flohri* (Eggers)

*Hylurgops flohri* Eggers, 1926, Ent. Blätt. 26:166 (Holotype, female; Mexico; Berlin Zool. Mus.)
*Hylastes flohri:* Wood, 1966, Great Basin Nat. 26:24.

DIAGNOSIS.— This species is rather closely allied to *mexicanus* Wood, from which it is rather easily distinguished by characters summarized in the above key.

FEMALE.— Length 4.8 mm, 2.8 times as long as wide; color black.

Frons with interocular transverse impression shallow, broad, rather well developed; weakly inflated at level of antennal insertion, rather broadly impressed above epistomal margin; surface rather coarsely, closely, rather deeply punctured; median carina fine, weakly elevated from interocular impression to base of epistomal lobe, where it forks (obscure) and elevations continue to poorly developed epistomal lobe; vestiture minute, obscure, hairlike.

Pronotum 1.1 times as long as wide; widest at base, sides on basal two-thirds almost straight and converging slightly toward rather broadly rounded anterior margin; surface smooth and shining, punctures small, deep, reduced anteriorly, interspaces irregular but usually at least equal to diameter of a puncture; median line not evident; glabrous.

Elytra about 1.8 times as long as wide, 1.8 times as long as pronotum; outline as in *mexicanus*; striae 1 weakly others not impressed, punctures very small, not clearly impressed; interstriae three to four times as wide as striae, surface irregular, shining, punctures moderately abundant, fine, confused, almost as large as those of striae. Declivity convex, rather steep; striae rather weakly impressed, punctures small but much larger than on disc; interstriae subshining, about three times as wide as striae, each with a row of fine, rounded granules almost in uniseriate rows. Vestiture confined to declivital interstriae, consisting of small, moderate to sparse scales and median rows of equally short, coarse hairlike setae.

DISTRIBUTION.— Hidalgo to Morelos.

MEXICO: **Distrito Federal**: Km 43 on Highway 95. **Hidalgo**: 30 km E Tulancingo, 10-VII-67, 2100 m, *Pinus*, S. L. Wood. **Mexico**: Amecameca, Parque Zoquiapan. **Morelos**: Km 44 on Highway S-082.

HOST.— *Pinus* sp.

BIOLOGY.— Two specimens were taken just entering the phloem tissues on the lower side of a pine log 40 cm in diameter. It is presumed their habits resemble those of other *Hylastes.*

NOTES.— The above treatment was based on the female holotype and on nine other specimens. The labels on the type include "Sal.," "Salizar, Rohr," "Coll. J. Flohr."

### 8. *Hylastes mexicanus* Wood

*Hylastes mexicanus* Wood, 1967, Great Basin Nat. 27:36 (Holotype, female; 62 km west Toluca, Mexico, Mexico; Wood Coll.)

DIAGNOSIS.— The very fine, deep, pronotal punctures and the narrower striae distinguish this species and *flohri* Eggers from other representatives of the genus. This species is also distinguished from *flohri* by characters summarized in the above key.

FEMALE.— Length 4.3–4.5 mm, 2.8 times as long as wide; color black.

Frons convex, with a weak, transverse impression between eyes and more strongly impressed just above epistoma; median carina inconspicuous, more strongly elevated below

level of antennal insertion, continuing dorsad as a fine line to interocular impression, lower end forked; surface smooth and shining above, rather dull below, very finely, deeply, closely punctured; vestiture minute, inconspicuous, convering entire surface.

Pronotum 1.1 times as long as wide; sides widest on basal third, but almost parallel to a point just anterior to middle then broadly, evenly rounded to anterior margin; surface smooth and shining, with punctures fine, deep, close, separated by distances about equal to their own diameters; median line not evident; glabrous.

Elytra 1.9 times as long as wide, 1.9 times as long as pronotum; sides straight and parallel on basal half, then increasingly arcuate to rather narrowly rounded posterior margin; striae 1 moderately, others weakly impressed, punctures small, deep; interstriae as wide as striae, feebly convex, subshining, punctures rather coarse, close, deep, confused, their diameters often only slightly smaller than those of striae. Declivity convex, steep; striae 1 weakly impressed, as wide as interstriae, punctures coarse, deep; interstriae each with a row of fine tubercles; surface reticulate. Vestiture confined to declivity, stout, consisting of small scalelike setae except for median rows of equally short hairlike bristles on each interstriae.

MALE.— Similar to female except frons narrower, and last visible abdominal sternum impressed medially and pubescent.

DISTRIBUTION.— Arizona and Durango to Mexico (Estado).

USA: **Arizona**: Carr Canyon, Cochise Co., 23-VII-68, D. E. Bright. MEXICO: **Durango**: 16 km W El Salto, VII-64, flight, J. B. Thomas. **Mexico**: 62 km W Toluca, 15-VII-53, 2600 m, *Pinus*, S. L. Wood. **Morelos**: Tres Marias, Wickham.

BIOLOGY.— Specimens were collected at the base of a large pine tree. Presumably they have habits similar to other *Hylastes*.

NOTES.— The above treatment was modified from the original description based on the type series of 69 specimens, and on about 300 other specimens from the same locality.

## 9. *Hylastes niger* Wood

*Hylastes niger* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):7 (Holotype, male; 31 km E Tulancingo, Hidalgo, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *mexicanus* Wood by the narrowly impressed declivital striae with the punctures much smaller, and by the much more closely spaced granules on the declivital interstriae.

MALE.— Length 4.3 mm, 2.7 times as long as wide; color black.

Frons and pronotum as in *mexicanus* except frons less distinctly reticulate, pronotum with punctures distinctly smaller.

Elytra as in *mexicanus* except strial punctures much smaller, interstriae twice as wide as striae on disc, almost three times as wide on declivity; declivity not as steep; interstrial granules on declivity much more closely spaced, spaced by distances equal to less than half width of an interstriae.

FEMALE.— Similar to male except frons more finely punctured; anterior discal area of pronotum with punctures reduced to almost obsolete.

DISTRIBUTION.— Hidalgo.

MEXICO: **Hidalgo**: 30 km E Tulancingo, 10-VII-67, 2100 m, No. 185, *Pinus*, S. L. Wood; Zacualtapan.

BIOLOGY.— Two specimens were taken from the same new tunnel on the lower side of a log 60 cm in diameter.

NOTES.— The above treatment was based on the holotype, allotype, and eight other specimens.

## 10. *Hylastes gracilis* LeConte

Fig. 43

*Hylastes gracilis* LeConte, 1868, Trans. Amer. Ent. Soc. 2:174 (Lectotype, female; Tahoe Valley, California: Mus. Comp. Zool., 958, designated by Wood, 1971, Great Basin Nat. 31:145.)

*Hylastes vastans* Chapuis, 1869, Synopsis des Scolytides, p. 17 (Holotype, female; Mexico; Brussels Mus.); Wood, 1971, Great Basin Nat. 31:145. *Synonymy*

*Hylastes longus* LeConte, 1876, Proc. Amer. Philos. Soc. 15:388 (Holotype, female; Colorado; Mus. Comp. Zool.); Wood, 1972, Great Basin Nat. 32:195. *Synonymy*

*Hylastes nitidus* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):19 (Holotype, sex?; Las Vegas, New Mexico; Canadian Nat. Coll.); Wood, 1971, Great Basin Nat. 31:145. *Synonymy*

*Hylastes asper* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):19 (Holotype, female; Larimer Co., Colorado; Canadian Nat. Coll., 9244); Wood, 1975, Great Basin Nat. 35:22. *Synonymy*

DIAGNOSIS.— This small, widely distributed, common species is distinguished

from allied species by the dark brown color, by the size, and by other characters summarized in the above key. Occasional specimens are distinguished from *fulgidus* Blackman with difficulty.

FEMALE.— Length 3.3–4.0 mm, 3.0 times as long as wide; color dark brown.

Fronx convex, interocular, transverse impression weak, weakly subinflated at level of antennal insertion immediately above narrow epistomal impression; surface shining, closely, coarsely, deeply punctured; median carina usually extending from interocular impression to base of epistomal lobe, fine, acutely elevated to very obscure, in some specimens either dorsal or ventral half may be obsolete; vestiture short, rather abundant, stout.

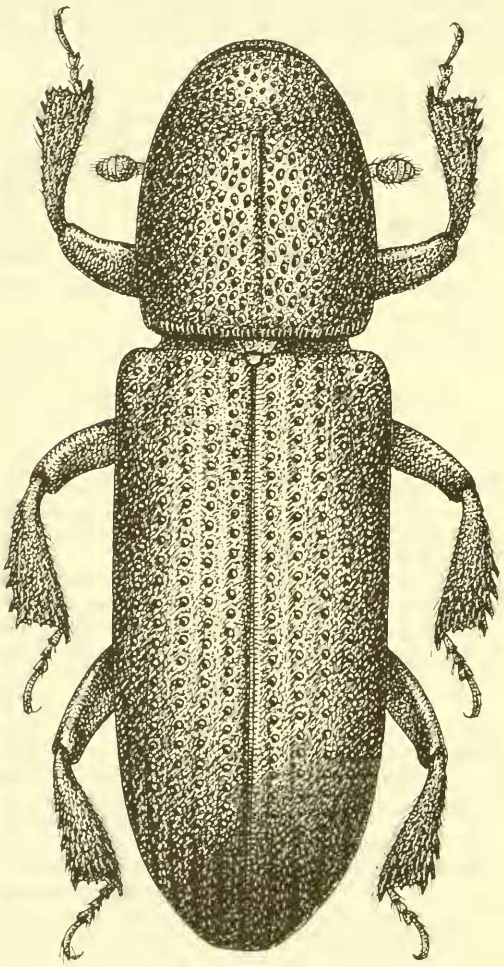


Fig. 43. *Hylastes gracilis*: Dorsal aspect. (After Bright and Stark 1973:147.)

Pronotum 1.19 times as long as wide; widest at middle, sides weakly arcuate, almost parallel on basal two-thirds, not constricted before broadly rounded anterior margin; surface smooth, shining, punctures moderately coarse, deep, separated by interspaces equal to not more than diameter of a puncture (usually less); glabrous.

Elytra 1.9 times as long as wide, 1.9 times as long as pronotum; sides almost straight and parallel on basal three-fourths to declivital base, then rather narrowly rounded behind; striae 1 weakly, others not impressed, punctures coarse, deep; interstriae as wide as striae, almost smooth, punctures fine, almost uniseriate. Declivity convex, rather steep; strial punctures slightly larger than on disc; interstriae weakly convex, each armed by a row of fine granules. Vestiture consisting of fine hair on disc, becoming moderately abundant, slender scales on declivity.

MALE.— Similar to female except very slightly stouter, and with last visible abdominal sternum impressed and pubescent in median area.

DISTRIBUTION.— British Columbia and South Dakota to (probably) Honduras.

CANADA: **British Columbia**: Creston, Merritt (Midday Valley), Newgate, Oliver, Summerland. USA: **Arizona**: Chiricahua Mts., Flagstaff, Graham Mts., Grand Canyon; Hanagan Camp (Greenlee Co.), Lakeside, McNary, Oak Creek Canyon, Prescott N. F., Vail Lake, Willians. **California**: Numerous localities from every county. **Colorado**: Estes Park, Manitou, Montrose. **Idaho**: Avon, Krassel. **Montana**: Ashland. **Nebraska**: Glen. **Nevada**: Baker, Beaver Dam St. Pk. (Lincoln Co.), Lake Tahoe. **New Mexico**: Albuquerque, Bandelier, Capitan Mts., Cloudcroft, Las Vegas, Lincoln N. F., Jimenez Springs, Santa Fe, Torrance Co., Ute Park. **Oregon**: Bear Springs, Lakeview, Quartz Mt. (Lake Co.), Rankin. **South Dakota**: Black Hills, Piedmont. **Washington**: Blewett, Maple Valley, Mt. Adams, Peshastin Creek. MEXICO: **Baja California**: Laguna Hansen at Sierra Juarez. **Chiapas**: San Cristobal. **Durango**: El Salto, La Ciudad, Las Boregas. **Hidalgo**: Tulancingo. GUATEMALA: Cerro Calel.

HOSTS.— *Pinus edulis, P. monophylla, P. jeffreyi, P. ponderosa, P. pseudostrobus*; *Abies concolor* has been recorded, but it is not a normal host.

BIOLOGY.— Usually taken from the phloem tissues of stumps and roots of the host. Evidently the habits are similar to other *Hylastes*.

NOTES.— The above treatment was based on types of *gracilis, vastans, longus, asper,*

*nitidus*, and 296 other specimens. All definitely fall within the limits of this somewhat variable species.

Though a majority of the specimens from a given geographical area fit the above description rather well, occasional individuals exhibit frontal characters that are rather different in one or more respects. When adequate material was available these were easily recognized as local variants; however, when only the extreme variants were available there was some hesitation about their correct identity.

### 11. *Hylastes porculus* Erichson
Fig. 46

*Hylastes porculus* Erichson, 1836, Archiv Naturgesch. 2:49 (Holotype, male; Pennsylvania; Berlin Zool. Mus.)

*Hylastes carbonarius* Fitch, 1858, Noxious Insects of New York, Rpt. 4:730 (Holotype, female; Albany, New York; U.S. Nat. Mus., 42808); LeConte, 1876, Proc. Amer. Philos. Soc. 15:389. *Synonymy*

*Hylurgus cavernosus* Zimmermann, 1868, Trans. Amer. Ent. Soc. 2:149 (Lectotype, male; Atlantic states; Mus. Comp. Zool., present designation); Eichhoff, 1896, Proc. U.S. Nat. Mus. 18:606. *Synonymy*

*Hylastes granosus* Chapuis, 1869, Synopsis des Scolytides, p. 17 (Syntypes; Southern and Middle states; Brussels Mus.); LeConte, 1876, Proc. Amer. Philos. Soc. 15:389. *Synonymy*

*Hylastes scaber* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):18 (Holotype, sex?; Virginia; Canadian Nat. Coll., 9326); Eggers, 1934, Ent. Nachrichtenbl. 8:25. *Synonymy*

*Hylastes swainei* Eggers, 1934, Ent. Nachrichtenbl. 8:25 (Holotype, male; Frater, Ontario; U.S. Nat. Mus.); Blackman, 1941, U.S. Dept. Agric. Misc. Pub. 417:11. *Synonymy*

*Hylastes webbi* Blackman, 1941, U.S. Dept. Agric. Misc. Pub. 417:10 (Holotype, female; Elmore, South Dakota; U.S. Mus., 54033); Wood, 1971, Great Basin Nat. 31:146. *Synonymy*

*Hylastes canadensis* Blackman, 1941, U.S. Dept. Agric. Misc. Pub. 417:15 (Holotype, female; Aweme, Manitoba; U.S. Nat. Mus., 54034); Wood, 1971, Great Basin Nat. 31:146. *Synonymy*

DIAGNOSIS.— This species is intermediate between *gracilis* LeConte and *nigrinus* (Mannerheim). A summary of characters that distinguish it from the former species is included in the above key. From *nigrinus* it is distinguished by the more abundant pronotal punctures, by the smoother discal interstriae, by the longer frontal carina, and by the tibial armature.

FEMALE.— Length 3.8–5.0 mm, 2.7 times as long as wide; color black.

Frons as in *gracilis*, with interocular impression usually more pronounced; frontal carina acutely raised from interocular impression to base of epistomal lobe.

Pronotum 1.13 times as long as wide; widest at or immediately anterior to middle, sides on basal half weakly arcuate, rather broadly rounded in front; surface obscurely reticulate over entire surface in material from eastern areas, at basal or other margins in those from northwestern area of distribution; punctures coarse, somewhat irregular in size, separated by distances one-half to equal diameter of a puncture; glabrous.

Elytra 1.7 times as long as wide, 1.8 times as long as pronotum; outline as in *gracilis*; striae 1 weakly, others feebly or not at all impressed, punctures coarse, deep; interstriae narrower than striae, somewhat convex, smooth, but undulating, punctures fine, confused. Declivity convex, steep; basically as on disc; tubercles minute if present. Vestiture consisting of sparse, almost scalelike bristles on declivity.

MALE.— Similar to female except usually stouter and last visible abdominal sternum medially impressed and pubescent.

DISTRIBUTION.— Manitoba and New Brunswick to Texas and Florida.

CANADA: **Manitoba**: Aweme, Treesbank, Winnepeg. **New Brunswick**: Fredricton. **Ontario**: Frater, Petawawa Res., Sudbury. **Quebec**: Berthier, Wright. USA: **Alabama**: Cleborn Co., Montgomery. **Arkansas**: Bradley Co. **Connecticut**: "Ct." **District of Columbia**: Washington. **Florida**: "Fla." **Georgia**: Clayton, Dallas, Habersham Co., Mt. Airy, Savannah. **Louisiana**: Bogalusa. **Maine**: Orono, Paris. **Maryland**: Bladensburg, Glen Echo, Hyattsville, Travilah. **Massachusetts**: Petersham. **Michigan**: Marquette, Whitefish Point. **Minnesota**: Itasca Park, Whitewater St. Pk. **New Hampshire**: Durham, Hanover, Henniker. **New Jersey**: Atlantic City, Cape May, Five Mile Beach, Lakewood, Malaga, Newfoundland. **New York**: Jamaica (Long Island), Warrensburg. **North Carolina**: Asheville, Durham, Harnett Co., Lake Toxaway, Pink Beds, Southern Pines, Tryon. **Pennsylvania**: Mt. Alto, University Park. **South Carolina**: Florence, Greenville. **South Dakota**: Elmore. **Tennessee**: "Tenn." **Texas**: Call. **Virginia**: Cape Charles, Falls Church, Ft. Monroe, Gloucester Co., Mt. Vernon, Nelson Co. **West Virginia**: Dellslow, Greenbriar, Hardy Co., Raleigh Co., Randolph Co. **Wisconsin**: Washington Co., Wood Co.

HOSTS.— Presumably all species of *Pinus* within its range.

BIOLOGY.— As in other species of the genus.

NOTES.— The above description was based on the holotypes of *porculus* (4.0 mm), *canadensis*, *scaber*, *swainei*, and *webbi* and on 199 other specimens. The first syntype of *Hylastes cavernosus* Zimmermann, a male previously designated by a type label, is here designated as the lectotype of Zimmermann's species.

In all probability the populations designated here as *nigrinus* (Mannerheim) and *asperatus* Wood intergrade with *porculus* and, therefore, represent no more than subspecies. The data presently available are not adequate to properly determine their status.

### 12. *Hylastes asperatus* Wood

*Hylastes asperatus* Wood, 1975, Great Basin Nat. 35:24 (Holotype, female; New Mexico; Wood Coll.)

DIAGNOSIS.— This is a difficult species to recognize. The pronotal punctures are irregular in size, as in *porculus*, but much closer; the discal interstriae are slightly wider than allied species, more nearly convex, and very finely, closely crenulate (usually not clearly apparent unless the light source is posterior to the specimen).

FEMALE.— Length 4.0–4.6 mm, 2.7 times as long as wide; color dark brown.

Frons as in *gracilis* with interocular impression moderately strong, fine, low carina evidently always extending from this impression to base of epistomal lobe where it forks as in related species.

Pronotum 1.2 times as long as wide; sides on slightly more than basal half straight and parallel, rather broadly rounded in front; surface subshining, indications of reticulation obscure but usually visible at high magnification toward anterior or basal areas, punctures coarse, very close, deep, irregular in size in some specimens, interspaces usually equal to less than one-fourth diameter of a puncture; median line partly impunctate, not raised; glabrous.

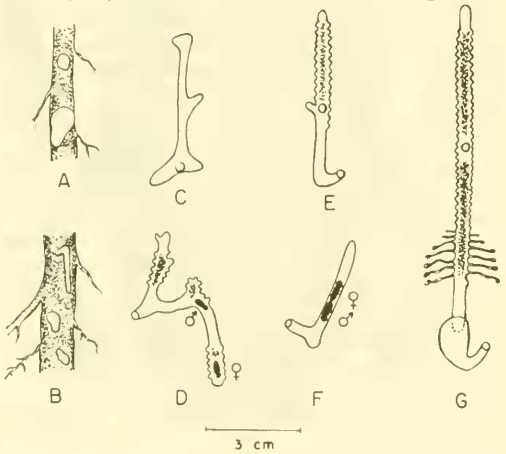



Fig. 44. *Hylastes nigrinus*: Galleries in Douglas-fir roots; A–B, maturation feeding; C–G, egg galleries. (After Zethner-Møller and Rudinsky 1967:904.)

Elytra 1.8 times as long as wide, 1.8 times as long as pronotum; outline as in *gracilis*; striae moderately impressed, punctures rather coarse, deep; interstriae as wide as striae, punctures moderately coarse, close, confused, their anterior margins elevated into fine, crenulate, transverse ridges of variable height (this character approached in allied species, but not to this degree). Declivity convex, steep; striae narrowly, deeply impressed, punctures somewhat obscure; interstriae about twice as wide as striae, armed by very fine, confused tubercles. Vestiture confined to declivity, scalelike.

MALE.— Similar to female except slightly stouter, and last visible abdominal sternum medially impressed and pubescent.

DISTRIBUTION.— Arizona and New Mexico.

USA: **Arizona**: Hanagan Camp (Greenlee Co.), 12-VII-68, D. E. Bright; Santa Catalina Mts., 5-VIII-68, flight, D. E. Bright. **New Mexico**: Alma (Carton Co.), Las Vegas, VII-52, 2300 m, F. H. Snow; Sierra Blanca Mt., Hopk. US7216.

HOSTS.— Not recorded, presumably *Pinus*.

BIOLOGY.— Presumably this species breeds in stumps and roots of the host tree.

NOTES.— The type series 29 species was examined.

This might possibly be a geographical race of *porculus* Erichson.

### 13. *Hylastes macer* LeConte

Fig. 45

*Hylastes macer* LeConte, 1868, Trans. Amer. Ent. Soc. 2:175 (Lectotype, male; California; Mus. Comp. Zool., 963, present designation)

DIAGNOSIS.— Although allied to *nigrinus* (Mannerheim) and *subopacus* Blackman, this species is unique in having the entire surfaces of the pronotum and elytra finely reticulate; it is also the largest American *Hylastes*.

FEMALE.— Length 5.1–6.0 mm, 3.0 times as long as wide; color black.

Frons essentially as in *asper*.

Pronotum 1.3 times as long as wide; widest at middle, sides rather strongly, almost uniformly arcuate from base to just before broadly rounded anterior margin; entire surface finely reticulate, punctures rather small, shallow, irregular in size and outline, interspaces averaging distances slightly less than diameter of a puncture; median line partly impunctate, not elevated; glabrous.

Elytra 1.9 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on basal half, then converging slightly to a point just behind declivital base, narrowly rounded behind; striae 1 moderately, others feebly impressed, punctures moderately large and deep; interstriae as wide as striae, weakly convex, reticulate, sculpture slightly irregular, punctures fine, close, confused. Declivity convex, gradual above, rather steep on lower half; striae and strial punctures a little more strongly impressed than on disc; interstriae convex, armed by small, confused granules. Vestiture confined to declivity, scalelike.

MALE.— Similar to female except usually slightly stouter, and last visible abdominal sternum medially impressed and pubescent.

DISTRIBUTION.— British Columbia and South Dakota to California, Arizona, and Colorado.

CANADA: **British Columbia**: Cranbrook, Creston, Kootenay N. P., Merritt (Midday Valley), Oliver. USA: **Arizona**: Chiricahua Mts., Flagstaff, Kaibab N. F., Williams. **California**: Alpine, Alta Sierra (Kern Co.), Amador Co., Bass Lake, Calistoga, Camp Wolfboro (Calaveras Co.), Carmel, Carrville, Cedarville, Chester, China Camp, Colony Mill (Tulare Co.), Deer Creek (Tahama Co.), Echo Lake, Emigrant Gap, Fresno, Hamburg, Hat Creek, Hobart Mills, Huckleberry Meadow, Incline (Mariposa Co.), Kings Canyon, Lake Tahoe, La Moine, Lassen N. P., Lomo, Meadow Valley (Plumas Co.), Meyers, Miami R. S., Millwood (Fresno Co.), Modoc Co., Mt. St. Helena, Nevada City, Northfork, Pinecrest, Placer Co., Plaskett Station (Glenn Co.), Sand Flat, San Juacinto Mts., Silver Creek (Alpine Co.), Siskiyou Co., Sterling, Summerdale, Trinity Co., Woodford (Alpine Co.), Yosemite N. P. **Colorado**: Estes Park, Ft. Collins. **Idaho**: Granite, Idaho City, Krassel, Moscow, Potlatch, Robinson Lake (Latah Co.), Slate Creek R. S. (Idaho Co.), Smith's Ferry, Wallace. **Montana**: Columbia Falls, Helena. **Nebraska**: Pine Ridge. **Nevada**: Baker, Kyle Canyon (Clark Co.) **Oregon**: Anthony Lake, Beatty, Cave City, Crater Lake N. P., Deming Creek (Klamath Co.), Gardiner, Glenada, Klamath Falls, Meacham, Ochoco N. F., Pinehurst, Prineville, Tollgate, Wallowa Lake. **South Dakota**: Black Hills. **Utah**: Escalante, Bryce Canyon N. P., Zion N. P. **Washington**: Blewett, Buckeye, Easton, Ft. Lewis, Glenwood, Grand Coulee, Mt. Rainier, Seattle, Skammani Co., Vaughn, Walla Walla.

HOSTS.— *Pinus* spp., less commonly from *Picea engelmannii*.

BIOLOGY.— Galleries are constructed in phloem tissues of stumps and roots of the host tree.

NOTES.— The first specimen in the LeConte series, a male from California, has long been regarded as the type of this species; I here designate that specimen as the lectotype of *macer*. The lectotype and 682 other specimens were examined.

### 14. *Hylastes nigrinus* (Mannerheim)

Figs. 18, 19, 20, 45, 46

*Hylurgus nigrinus* Mannerheim, 1852, Bull. Soc. Imp. Sci. Nat. Moscou 25:356 (Holotype, female; Sitka Island, Alaska; Helsinki Mus.)

*Hylastes nigrinus*: LeConte, 1868, Trans Amer. Ent. Soc. 2:174

*Hylastes yukonis* Fall, 1926, Pan-Pacific Ent. 2:207 (Holotype, male; White Horse, Yukon Territory; Mus. Comp. Zool.); Wood, 1957, Canadian Ent. 89: 396. *Synonymy*

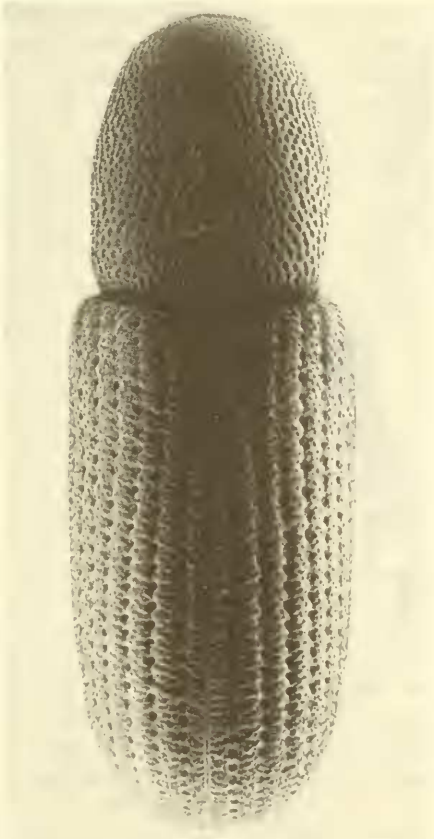


Fig. 45. *Hylastes macer*: Lateral aspect. (After Bright 1976:206.)

DIAGNOSIS.— This species is very closely related to *porculus*. The differences are obscure and characters may intergrade when additional material becomes available. This species has the pronotal punctures slightly smaller and more closely placed, and the punctures on the declivital striae are smaller. Because *nigrinus*, *asperatus*, and *porculus* replace one another geographically, it is entirely possible that they are only subspecies of one another. Additional material from intermediate localities must be examined before their status can be clarified.

FEMALE.— Length 3.8–4.9 mm, 2.7 times as long as wide; color black.

Frons as in *porculus*.

Pronotum 1.13 times as long as wide; widest at or just behind middle, sides rather weakly arcuate from base, rather broadly rounded in front; surface smooth and shining, usually with areas of obscure reticulation at base or other marginal areas, punctures rather coarse, deep, close, interspaces almost always equal to less than half diameter of a puncture; median line largely impunctate; glabrous.

Elytra 1.8 times as long as wide, 1.9 times as long as pronotum; outline as in *proculus*; striae feebly impressed, punctures coarse, deep; interstriae as wide as striae, weakly convex, surface irregular (undulating), smooth, shining, punctures small, close, confused. Declivity as in *porculus* except striae usually slightly narrower and deeper than interstriae (striae slightly wider than interstriae in *porculus*). Vestiture largely confined to declivity, consisting of interstrial scales as in related species.

MALE.— Similar to female except usually slightly stouter, and last visible abdominal sternum medially impressed and pubescent.

DISTRIBUTION.— Alaska and California to W Montana.

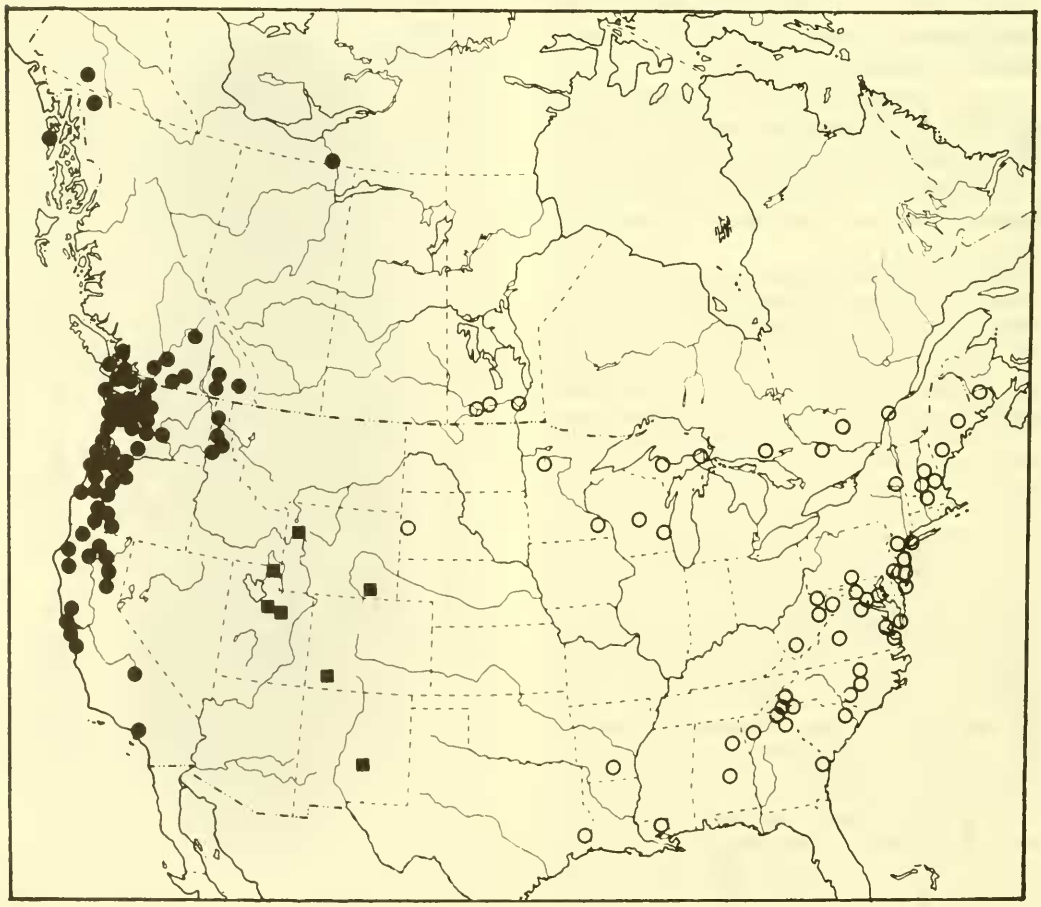


Fig. 46. *Hylastes* spp., distribution map: *nigrinus*, solid circles; *subopacus*, solid squares; *porculus*, open circles.

ALASKA: Sitka Island. CANADA: **Alberta**: "Laggan." **British Columbia**: Atlin, Bear Lake, Bowser, Kokanee Mt., Lorna, Lumberton, Merritt (Midday Valley), Nelson, North Bend, Pender Harbor, Port Renfrew, Sidney, Summerland, Victoria. **Northwest Territories**: Ft. Smith. **Yukon**: White Horse. USA: **California**: Ben Lomond, Chester, Fieldbrook, Ft. Seward, Happy Camp (Siskiyou Co.), Hat Creek, Lagunitas, Lamoine (Shasta Co.), Los Angeles, Los Gatos, Meadow Valley (Plumas Co.), McCloud, Mill Valley, Mt. St. Helena, Quincy, San Mateo Co., Santa Rosa, Sequoia N. P., Shasta N. F., Summit Road (Santa Cruz Co.). **Idaho**: Coeur d'Alene, Harvard (Latah Co.), Priest River, St. Maries (Benewah Co.). **Montana**: Lindburg Lake at Condon. **Oregon**: Amity, Astoria, Baker Creek, Bear Springs R. S., Cannon Beach, Clackamas Co., Clatsop Co., Clear Lake, Corvallis, Dayton, Detroit, Eugene, Forest Grove, Gardiner, Golden, Griffin Creek (Jackson Co.), Hillsboro, Hood River, Keno, Klamath Falls, Lane Co., Manzanita, Mary's Peak, McMinnville, Medford, Mosier, Mt. Hood, Neotsu, Newberg, Pacific City, Paradise Park, Portland, Sand Lake, Silver Creek Falls, Sisters, St. Helens, Scappoose, Sweet Basin, Tillamook, Trail, Veronia, Waldport, Wending, Winema N. F., Yamhill Co. **Washington**: American Lake, Beaver, Bothel, Chase Lake (Snohomish Co.), Cranberry Creek (Mason Co.), Eatonville, Elva, Everett, Glenwood, Green River Gorge, Lewis and Clark St. Pk., Lester, Moclips, Mt. Adams, Mt. Baker, Mt. Rainier, Ocean Park, Olympia, Olympic N. P., Parkland, Port Blakely, Puyallup, Quillayute, Quinault, Seattle, Sequim Bay St. Pk., Skye, Sol Duk Sp., Tacoma, Vantage, Vaughn, Wending, Winslow.

HOSTS.— The species of *Pinus*, *Picea*, *Pseudotsuga*, *Tsuga*, *Larix*, and *Abies* in approximately that order of preference.

BIOLOGY.— This common species infests the phloem tissues of stumps and roots of the host trees. The biramous adult galleries score the wood very lightly; evidently they most commonly run transverse to the grain of the wood. The larval mines appear to wander aimlessly through the phloem tissues.

NOTES.— The types of *nigrinus* and *yukonis* and 675 other specimens were examined.

There are some minor geographical variations in the population, but none of these exhibit trends toward those found in the geographical replacement species *porculus* in the eastern United States and *asperatus* in the southern Rocky Mountains. Until some indication of intergradation is found it appears best to retain these forms as valid species.

### 15. *Hylastes subopacus* Blackman
Fig. 46

*Hylastes subopacus* Blackman, 1941, U.S. Dept. Agric. Misc. Pub. 417:9 (Holotype, male; Capitan Mountains, New Mexico; U.S. Nat. Mus., 54032)

DIAGNOSIS.— This species is very closely related to *nigrinus* and replaces that species geographically in Utah, Colorado, and New Mexico. Its size, habits and structure suggest that it is a distinct species, not a geographical race. It is distinguished by characters summarized in the above key.

FEMALE.— Length 4.4–5.5 mm, 2.6 times as long as wide; color black.

Frons as in *nigrinus* except inflated area on lower half more poorly developed, epistomal impression somewhat more extensive.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on basal half, then arcuately converging to broadly rounded anterior margin; surface minutely, obscurely reticulate, punctures moderately small, rather deep, close, interspaces equal to less than half diameter of a puncture; middle half of median line impunctate; glabrous.

Elytra 1.6 times as long as wide, 1.8 times as long as pronotum; outline similar to *nigrinus*; striae feebly impressed anteriorly, stronger behind, punctures rather coarse, deep; interstriae slightly wider than striae, punctures small, confused, finely subasperate. Declivity as in *nigrinus*, striae slightly more strongly impressed, punctures small; interstrial tubercles usually smaller.

MALE.— Similar to female except slightly stouter, and last visible abdominal sternum medially impressed and pubescent.

DISTRIBUTION.— Utah and Wyoming to New Mexico.

USA: **Colorado**: Argentine Road; Silverton, VIII-85. **New Mexico**: Capitan Mts., 17-VII-07, J. L. Webb. **Utah**: Brighton, VII-18, Hubbard and Schwarz; Logan Canyon, 6-VII-48, and 18-VI-49, *Abies lasiocarpa*, S. L. Wood; Wolf Creek Pass, 17-VI-60, *Abies lasiocarpa*, S. L. Wood. **Wyoming**: Brooks Lake; Medicine Bow Range 1929, 3200 m.

HOST.— *Abies lasiocarpa*.

BIOLOGY.— Tunnels were constructed in phloem tissues of stumps and roots of large, dying, standing trees. The biramous parental tunnels tended to be transverse and scarcely engraved the wood. Larval mines usually were exposed on peeled bark and appeared to wander at random. Both larvae and adults were present on the three occasions when observations were made.

NOTES.— The male holotype, both male paratypes, and 19 other specimens were examined for this study.

## Tribe HYLESININI

Hylesinen Erichson, 1836, Archiv Naturgesch. 2:46 (Type-genus: *Hylesinus* Fabricius, 1801)

Phloeotrupidae Chapuis, 1866, *in*: Lacordaire, Hist. Nat. Insectes, Coleopt. 7:357 (Type-genus: *Phloeotrupes* Erichson, 1836)

Phloeobori Blandford, 1893, Trans. Ent. Soc. London 1893:426 (Type-genus: *Phloeoborus* Erichson, 1836)

Dactylopalpi Blandford, 1893, Trans. Ent. Soc. London 1893:426 (Type-genus: *Dactylopalpus* Chapuis, 1869)

Hylastinides Nüsslin, 1912, Naturwiss. Zeitschr. Forst- und Landwirtschaft 1912:273 (Type-genus; *Hylastinus* Bedel, 1888)

Alniphagini Murayama, 1963, Studies in the scolytid fauna of the northern half of the Far East, V, Hylesininae, p. 29 (Type-genus: *Alniphagus* Swaine, 1918)

Anatomical features.— The frons is obscurely to moderately sexually dimorphic, the eye is entire to feebly sinuate on the anterior margin, the antennal funicle is 6- or 7-segmented, the club is symmetrical and conical to moderately flattened, with the sutures indicated, the procoxae are contiguous to rather narrowly separated, the pronotum is armed by a few asperities (except in *Hylastinus*), the metascutellar area is separated from the postnotum by a distinct suture, and the sutural groove on the mesal surface at the base of the elytra is interrupted by a series of interlocking nodules and cavities.

Biological features.— All species are monogamous, all American species except *Phloeoborus* are phloeophagous. Their parental tunnels are either biramous or, if monoramous, there is a well-developed turning niche near the entrance tunnel. Eggs are deposited in niches. Larval mines usually follow a definite course away from the parental gallery and rarely cross one another. *Phloeoborus* is xylophagous and appears to have a symbiotic relationship with fungi, although not in a mycetophagous sense.

Taxonomy.— This tribe is somewhat intermediate between the Hylastini and Tomicini. Of the three native genera, two appear to have been derived from Eurasia (*Alniphagus* and *Hylesinus*) and one from South America (*Phloeoborus*). Most of the genera in this tribe occur in the Old World. The American genera of Hylesinini are easily recognized; those from other parts of the world may be distinguished with great difficulty.

### Genus *HYLASTINUS* Bedel

*Hylastinus* Bedel, 1888, Ann. Soc. Ent. France, Hors Ser. 6:388 (Type-species: *Ips obscurus* Marsham, monobasic)

Diagnosis.— This genus is not closely allied to other American genera. It is easily distinguished by characters summarized in the above key to genera and in the diagnosis of *obscurus* below.

Description.— Length 2.0–2.5 mm, 2.2 times as long as wide; color dark brown. Frons as described below for *obscurus*; eye entire, elongate; antennal scape elongate, funicle 7-segmented club with three sutures, 1 and 2 septate. Scutellum small, slightly depressed; bases of elytra armed by a single row of overlapping crenulations extending to striae 9. Declivity convex, steep; sculpture conservative. Vestiture hairlike. Prothoracic intercoxal piece moderately wide, margined laterally in front of coxae by an acutely elevated ridge extending from coxa to anterior margin. Third tarsal segments bilobed.

Distribution.— Four European species are known, one of which has been introduced into North America.

Biology.— The adults bore in the roots of leguminous hosts, where they rear their broods.

#### *Hylastinus obscurus* (Marsham)

*Ips obscurus* Marsham, 1803, Entomologia Britanica, p. 57 (Syntypes?; Type locality unknown, probably England; not located)

*Hylastes obscurus*: Chapman, 1869, Ent. Mon. Mag. 6:6.

*Synonymy*

*Hylastinus obscurus*: Bedel, 1888, Ann. Soc. Ent. France, Hors. Ser. 6:388. *Synonymy*

*Dermestes trifolii* Müller, 1803, Mem. Soc. Sci. Dep. du Mont. Tonerre 1:47 (Syntypes?; Central Europe; not located); Chapman, 1869, Ent. Mon. Mag. 6:6. *Synonymy*

*Hylesinus crenulatus* Duftschmid, 1825, Fauna Austriaca 3:104 (Syntypes?; Linz, Austria; depository not located); Hagedorn, 1910, Coleopt. Cat. 4:12. *Synonymy*

*Hylurgus piceus* Stephens, 1830, Illustrations of British Entomology 3:365 (Syntypes; London, England; British Mus. Nat. Hist.); Hagedorn, 1910, Coleopt. Cat. 4:12. *Synonymy*

*Hylurgus fuscescens* Stephens, 1830, Illustrations of British Entomology 3:365 (Syntypes?; London, England; British Mus. Nat. Hist.); Hagedorn, 1910, Coleopt. Cat. 4:12. *Synonymy*

*Hylastinus kroaticus* Fuchs, 1912, Morphologische Studien uber Borkenkäfer. II. Die europäischen Hylesinen, p. 39 (Syntypes?; Warasdin, Croatia; not known to me); Schedl, 1964, Riechenbachia 2:210 (Synonymy; as *croaticus*)

*Hylastinus pilosus* Eggers, 1944, Ent. Blätt. 40:140 (Holotype, male?; Algiers; U.S. Nat. Mus., 59131); Schedl, 1960, Ent. Mitt. 31:162. *Synonymy*

DIAGNOSIS.— This species, introduced from Europe, is not closely related to any native American species, although it superficially resembles *Hylurgopinus rufipes* (Eichhoff), with which it commonly is confused in collections. It is most easily distinguished from *rufipes* by the presence of a strongly elevated ridge extending from the lateral margin of the fore coxae to the anterior margin of the pronotum; it also has a conspicuous, transverse, interocular impression and it completely lacks a sharply defined premandibular epistomal lobe.

FEMALE.— Length 2.0–2.5 mm, 2.2 times as long as wide; color dark brown.

Frons convex, with a rather well-developed, transverse, interocular impression then slightly inflated to level of antennal insertion, transversely impressed just above epistomal margin, epistomal lobe rather well developed; surface coarsely reticulate, with coarse, close, very shallow obscure punctures; vestiture hairlike, short, inconspicuous.

Pronotum 0.9 times as long as wide; widest about one-third length from base, sides rather strongly arcuate on basal two-thirds, rather shallowly constricted just before broadly rounded anterior margin; surface coarsely, deeply, closely punctured, fundus of most punctures obscurely reticulate, interspaces very narrow, shining; vestiture hairlike, moderately long, rather abundant.

Elytra 1.4 times as long as wide, 1.9 times as long as pronotum; sides almost straight and parallel on basal two-thirds to declivital base, rather broadly rounded behind; basal margin of each elytron armed by a single row of moderately large, overlapping crenulations extending to base of striae 9; striae weakly impressed, punctures large, deep; interstriae distinctly narrower than striae, feebly convex, punctures rather fine, part of them subcrenulate, becoming tuberculate toward declivity. Declivity convex, rather steep; striae slightly narrower, interstriae more strongly convex than on disc; each interstriae armed by a row of rather fine, pointed tubercles. Vestiture consisting of coarse, hairlike, interstrial setae about equal in length to diameter of a strial puncture, and median rows of interstrial hair about twice as long as more abundant ground vestiture.

MALE.— Apparently distinguished from female only by differences in terminal abdominal terga.

DISTRIBUTION.— North Africa, south and central Europe to the Caucasus, British Columbia and Ontario to California and Georgia.

CANADA: **British Columbia**: Bear Hill, Grindrod, Sidney. **Ontario**: Prince Edward Co., Toronto, Trenton. USA: **California**: Nevada City. **Connecticut**: Stamford. **Georgia**: Waddington. **Idaho**: Boise, Caldwell, Chilco, Council, Hubbs Butte, Moscow, Murtaugh, Parma, Weippe, Wilder. **Indiana**: Bern, Ft. Wayne, LaFayette, Oakville, Wabash Co. **Maryland**: Hagerstown. **Massachusetts**: Forest Hills. **Michigan**: Agricultural College, Washtenaw. **New Hampshire**: Durham. **New Jersey**: Greenwood Lake, Hackettstown, Hohokus, Irvington. **New York**: Bridgeport, Dundee, Elmyra, Ithaca, Mecklensburg, Newport, Onondaga Co., West Point. **Ohio**: Columbus, Delaware Co., Hartsgrove, Holgate, Lorain Co., Rock Creek, Scotio Co., Westville. **Oregon**: Bethany, Canby, Cornelius, Corvallis, Dayton, Dever, Forest Grove, Marshfield, McMinnville, Molalla, Portland, Ridgeway, Roseburg, Salem, Scio, Sheridan, Scappoose, St. Helens, Taft. **Utah**: Benson, Garden City, Honeyville, Spring Lake in Utah Co., Tremonton. **Washington**: Blaine, Bothell, Cedar Mt., Chase Lake, Conway, Duvall, Evans Creek (King Co.), Gardiner, Loveland, Manchester, Mt. Vernon, Port Townsend, Pullman, Renton, Sutton, Vancouver.

HOSTS.— *Trifolium* spp. preferred, although *Medicago, Melilotus, Lathyrus*, and *Vicia* species are acceptable.

BIOLOGY.— Overwinters as young adults or larvae in infested clover roots in the ground. New adult tunnels are constructed in the spring in unthrifty plants. The galleries are

basically of the biramous type with eggs deposited in niches along the margins. The larvae mine at random through the root tissues. Pupation occurs during late summer. There is one generation each year.

NOTES.— The above treatment was based on 216 American specimens that were compared to several European specimens identified by Eichhoff, Eggers, etc.

## GENUS *HYLESINUS* FABRICIUS

*Hylesinus* Fabricius, 1801, Syst. Eleuth. 2:390 (Type-species: *Hylesinus crenatus* Fabricius, subsequent designation by Westwood, 1838, Synopsis of the genera of British Insects, p. 39)

*Ficicis* Lea, 1910, Proc. Roy. Soc. Victoria, n. s., 22:147 (Type-species: *Ficicis varians* Lea, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:122); Schedl, 1936, Proc. S. Australia Mus. 5:521. *Synonymy*

*Leperisinus* Reitter, 1913, Wiener Ent. Zeit. 32(Beiheft):41 (Type-species: *Bostrichus fraxini* Panzer = *B. varius* Fabricius, subsequent designation by Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):70); Wood, 1978, Great Basin Nat. 37:511. *Synonymy*

*Ficiphagus* Murayama, 1958, Yamaguti Univ. Facul. Agric. Bull. 9:930 (Type-species: *Ficiphagus goliathoides* Murayama = *Hylesinus porcatus* Chapuis, original designation); Schedl, 1962, Beitr. Ent. 12:486. *Synonymy*

DIAGNOSIS.— American species are easily distinguished by the scalelike vestiture and the moderately ascending abdomen. *Alniphagus* is the most closely allied American genus.

DESCRIPTION.— Length 1.8–4.0 mm, 1.8–2.0 times as long as wide; color dark brown, densely clothed by various mixtures of white, tan, brown, or black scales to form characteristic color patterns; frons in male transversely impressed to strongly concave, devoid of median carina, female frons flattened to convex, a median carina often present. Eye oval, anterior margin weakly sinuate. Antennal scape elongate; funicle 7-segmented; club elongate, slightly flattened, slightly asymmetrical, marked by three aseptate sutures. Pronotum wider than long, anterolateral areas usually armed by several crenulations. Scutellum rather small, round. Elytral bases armed by a long row of closely set, overlapping crenulations; striate; declivity convex, moderately steep, abdomen ascending almost halfway to meet apex of elytra. Vestiture largely scalelike.

DISTRIBUTION.— North America to Guatemala; Europe and Asia to Australia; eight species occur in America, about 30 species in the Eastern hemisphere.

BIOLOGY.— The monogamous species cut transverse biramous egg galleries that engrave the wood rather deeply. The larvae mine primarily in the phloem tissues parallel to the grain of the wood. With few exceptions the host plants belong to the genus *Fraxinus*. The winter is passed in the adult stage outside of the brood gallery system in individual feeding and hibernation tunnels constructed in green bark of living trees. Blackman (1922a:63) estimated that as many as three generations may occur in one season.

NOTES.— The genus *Hylesinus* Fabricius has been rather seriously abused in taxonomic literature, primarily because of the extreme diversity of species presently included in it and in several genera closely allied to it. An obvious need for a complete reevaluation of these genera exists.

### Key to the Species of *Hylesinus*

1. Male frons transversely impressed on less than lower half, moderately convex above; setae on propleural area rather slender, usually simple, almost never divided into more than two parts; setae on abdominal sternum 5 long and slender, essentially hairlike ..... 2

— Male frons concavely excavated from epistoma to upper level of eyes; setae on propleural area broad, usually divided into three or more filaments; setae on abdominal sternum 5 stout, largely scalelike (hairlike in *californicus* and *guatemalensis*) ..... 4

2(1). Pronotum devoid of asperities in anterior or anterolateral areas; frontal vestiture very short; North Dakota and Ontario to Vermont and Tennessee; 3.2–4.0 mm ..... 1. ***pruinosus*** **Eichhoff**

— Pronotum armed by several coarse asperities in anterolateral areas, usually supplemented by a row of small submarginal ones in anteromedian area; frontal pubescence moderately long; smaller species ..... 3

3(2). Frons with fine, shallow punctures in both sexes, male entirely devoid of a median carina; discal interstrial crenulations rather fine; discal scales on elytra smaller, averaging one-fourth as wide as interstriae; South Dakota and Kansas to Quebec and New Jersey; 2.0–3.0 mm ..... 2. ***aculeatus*** Say

— Frons with coarse, moderately deep punctures in both sexes, lower half of male frons with a low, poorly developed, median carina; discal crenulations much larger; discal scales on elytra larger, averaging one-third as wide as interstriae; Oregon to California; 2.5–3.3 mm ..... 3. ***oregonus*** (Blackman)

4(1). Smaller; declivital interstriae 2 as wide as 1 or 3, not conspicuously depressed, armed on upper half by a few small granules; median line on female frons weakly impressed; median row of scales on each interstriae not longer, usually not erect anywhere on elytra; Saskatchewan and Colorado to Ontario; 1.9–2.4 mm ..... 4. ***criddlei*** (Swaine)

— Larger; declivital interstriae 2 much narrower than 1 or 3, or strongly impressed or both, devoid of granules; female frons carinate (except *guatemalensis*); median row of scales (or hair) on some interstriae erect and conspicuously longer than ground cover ..... 5

5(4). Scales on mature specimens black and white with a few tan; female frontal carina acute, more than half as long as frons; interstriae 9 and 10 with vestiture scalelike, none noticeably longer than ground cover; declivital interstriae 2 narrowly convex, bearing one row of scales at middle of declivity ..... 6

— Scales on mature specimens brown and tan or white; female frons if carinate, carina very short, subtuberculate, confined to lower half; interstriae 9 and 10 with some slender setae at least twice as long as ground scales; declivital interstriae 2 impressed (slightly convex in some females) bearing at least two staggered ranks of scales ..... 7

6(5). Smaller; scales on basal half of interstriae 9 and 10 more slender, mostly two to four times as long as wide; scales on erect median row of each interstriae only slightly longer than ground cover; black scales usually cover at least 70 percent of elytral surface; Pennsylvania and New Jersey to Missouri; 1.8–2.3 mm ..... 5. ***fasciatus*** LeConte

— Larger; scales on basal half of interstriae 9 and 10 almost as broad as those in other areas, usually less than twice as long as wide; scales on erect median row of each interstriae conspicuously longer than ground cover; black scales usually cover less than 50 percent of elytral surface; SW Texas and Durango to Puebla; 2.3–2.9 mm ..... 6. ***mexicanus*** (Wood)

7(5). Male frons much less strongly concave, female frons more distinctly impressed but not concave, a median carina present on lower half in both sexes; erect interstrial setae on declivity more widely spaced, slender, about four to eight times as long as wide, setae in ground cover on 1–3 similar, erect setae never present on 2; Mexico; *Fraxinus uhdei*; 3.8–4.2 mm ..... 7. ***aztecus*** Wood

— Male frons more strongly concave, never with a median carina, female more distinctly convex, a carina present or not; erect interstrial setae on declivity on 1 and 3 very close, very broad, each about one to four times as long as wide, some erect setae always present on 2 in female (rare in male) ..... 8

8(7). Female frons with a short, rounded, prominent carina just below middle; male frons more narrowly, not uniformly concave; elytral scales in ground cover much larger, about one-third as wide as interstriae; Oregon and North Dakota to Chihuahua and Texas; 2.0–3.1 mm ..... 8. ***californicus*** **(Swaine)**

— Female frons flat, entirely devoid of a median carina; male frons broadly, uniformly concave; elytral scales in ground cover much smaller, about one-fifth as wide as interstriae; Guatemala; 2.4–3.1 mm ..... 9. ***guatemalensis*** **(Wood)**

### 1. *Hylesinus pruinosus* Eichhoff

*Hylesinus pruinosus* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:149 (Syntypes ?; Amerique Boreale; lost with Hamburg Mus.)

DIAGNOSIS.— This species is very closely allied to *aculeatus* Say, but it may be distinguished by the larger size, by the coarser frontal punctures, by the absence of pronotal asperities, and by the very coarse, uniseriate, interstrial crenulations that are consistently as tall as neighboring scales.

MALE.— Length 3.2–4.0 mm, 2.0 times as long as wide; color very dark brown, with a variegated pattern of light and dark scales.

Frons as in *aculeatus* except slightly more convex and punctures distinctly larger. Pronotum as in *aculeatus* except asperities in anterolateral areas small to obsolete. Elytra as in *aculeatus.*

FEMALE.— Similar to male *aculeatus* except differing by characters noted above for male.

DISTRIBUTION.— North Dakota, Ontario, and Vermont to Tennessee and Virginia.

CANADA: **Ontario**: "Ontario"; Ridgeway. USA: **Illinois**: Urbana, 26-IV-08; Webster; "N. Ill." **Indiana**: Columbus, 26-IX-20. **Kentucky**: Lexington, 4-VIII-58. **Michigan**: Detroit. **Missouri**: St. Louis. **New Hampshire**: Webster. **New York**: Bear Mountain, 13-VIII-48; Buffalo; Ellenville, VIII-41, *Fraxinus*; Ithaca. **North Carolina**: Tryon, Hopk. US 2621a, 3631a, 3656a. **North Dakota**: Richland Co., 27-V-71, W. J. Brandvik. **Pennsylvania**: "N. Cumberland"; "Pa." **Tennessee**: "Tenn." **Vermont**: Highgate. **Virginia**: "Va, V-30."

HOSTS.— *Fraxinus.*

NOTES.— The above treatment was based on 30 specimens. Their identity was based on specimens determined by Blackman, Schwarz, and Swaine and on the original description.

This species evidently is rare and poorly represented in collections. It is very similar to some of the variants on the northwestern margins of the distribution of *aculeatus* and it is not at all impossible that it could be nothing more than an extreme morphological variant of *aculeatus.* Additional specimens and field notes are necessary to clarify its taxonomic status.

### 2. *Hylesinus aculeatus* Say

*Hylesinus aculeatus* Say, 1824, J. Acad. Nat. Sci. Philadelphia 3:322 (Syntypes?; Missouri; evidently lost)

*Hylesinus imperialis* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:149 (Syntypes; Wisconsin and Georgia; lost with Hamburg Mus.); Wood, 1973, Great Basin Nat. 33: 178. *Synonymy*

*Lesperisinus cinereus* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1): 15 (Lectotype, female; Hudson, Quebec; Canadian Nat. Coll., designated by Bright, 1967, Canadian Ent. 99:676); Wood, 1957, Canadian Ent. 89:399. *Synonymy*

DIAGNOSIS.— This common, variable, widely distributed eastern species is allied to *varius* (Fabricius), of Europe, to the American *pruinosus* Eichhoff, and to *oregonus* (Blackman). From the two latter species it is distinguished by characters summarized in the above key. From the former it is easily distinguished by the smaller size, by the lighter color, and by the different frontal sculpture in both sexes.

MALE.— Length 2.0–3.0 mm, 1.9 times as long as wide; color dark brown, with a variegated pattern of light and dark scales.

Frons flattened from just below upper level of eyes to just above epistoma, then gradually ascending to epistomal margin, lateral margins weakly elevated on lower third; surface reticulate, almost reticulate-granulate, finely punctured; a very feeble, median carina on lower half; vestiture of coarse, moderately abundant hair of moderate length over entire surface.

Pronotum 0.72 times as long as wide; widest at base, sides arcuately converging to distinct lateral constriction immediately behind broadly rounded anterior margin; crenulations in anterolateral areas moderately large, rarely reduced, a low, submarginal row usually extending to median line; surface minutely reticulate-granulate, punctures moderately large, close, somewhat obscure;

median line indicated one-third pronotum length from base; closely covered by non-overlapping scales, each scale subcircular at base, subtriangular in anterior area; dark scales form diamond pattern on median third from anterior to posterior margins, lateral margins also dark.

Elytra 1.4 times as long as wide, 2.1 times as long as pronotum; sides very feebly arcuate, subparallel on slightly less than basal two-thirds, rather broadly rounded behind; basal margins, each armed by about 15 crenulations, striae narrowly impressed, punctures rather obscure; interstriae twice as wide as striae, base of 2 armed by about a dozen submarginal crenulations, 3 by about 6, 4 by about 3, and 5 by about 2 submarginal crenulations; interstriae each armed by a moderately confused row of narrow, low crenulations, each shorter than length of a scale, general surface obscured by scales. Declivity moderately steep, convex; interstriae 2 impressed but still convex, tubercles on 3 and 9 slightly larger than on disc, 1, 3, 7, and 9 usually appearing slightly elevated. Vestiture scalelike, scales as wide as long, about one-fourth as wide as an interstriae, most of those near and on declivity with an elevated median crest; a median row of scales on interstriae 1 and 3 often erect and very slightly longer (less than 1.5 times) than ground cover; light scales in patches, usually comprising 50 to 60 percent of total, occasionally dark scales entirely absent.

FEMALE.— Similar to male except frons weakly convex, obscure median carina longer; pronotal crenulations usually larger and more numerous.

DISTRIBUTION.— South Dakota and Quebec to eastern Kansas and North Carolina.

CANADA: **Manitoba**: Aweme, Dauphin, Morden, Winnipeg. **Nova Scotia**: Lawrencetown. **Ontario**: Chalk River, Ottawa, Petawawa Res., Prince Edward Co. **Quebec**: Aylmer, Hemmingford, Isle Perrot, Lake Memphremagog, Ste. Anne de Bellevue, St. Hilaire. USA: **Arkansas**: Blythville. **Colorado**: Fort Collins. **Connecticut**: Bethlehem, Chaplin, Cornwall, Stamford. **District of Columbia**: Washington. **Illinois**: Chicago, Macomb. **Indiana**: "Indiana." **Iowa**: Ames, Iowa City. **Kansas**: Ft. Scott, Norton, Partridge, Riley Co., Salina, Topeka. **Louisiana**: Frenier, New Orleans, Tallulah. **Maine**: Lovel, Paris, South Hope, Orono, Wales, Yarmouth. **Maryland**: Plummers Island. **Massachusetts**: Charlemont, Commington, Framingham, Hopedale, Lawrence, Petersham, Stoughton, Westborg. **Michigan**: Detroit, East Lansing, Pittsfield Twp. in Washtesaw Co. **Minnesota**: Buffalo State Park. **Mississippi**: Agricultural College. **Nebraska**: Broken Bow, Omaha. **New Hampshire**: Durham, Webster. **New Jersey**: Boonton, Clemonton, Glen Gardner, Orange Mts., Peterson, South Mountain. **New York**: Buffalo, Cheektown, Ellenville, Ithaca, Ogdensburg, Patchin, Scarsdale, Syracuse, Utica, West Point. **North Carolina**: Tryon. **North Dakota**: Botteneau, Cass Co., Fargo, Regent, Richland Co., Roosevelt N. P. **Ohio**: Bowling Green, Clinton Co., Columbus, Franklin Co., Tiffin. **Oklahoma**: Payne Co. **Pennsylvania**: Castle Rock, Clarks Valley, Easton, Harrisburg, Milford, North Cumberland, Pecks Pond, Philadelphia, Philmont, Swarthmore, Wyoming. **South Carolina**: Batesburg, Clemson, Ferguson. **South Dakota**: McHenry Co. **Tennessee**: Memphis. **Texas**: Dallas. **Virginia**: Falls Church. **West Virginia**: Kanawah Station, Monongalia, Randolph Co.

HOSTS.— *Fraxinus americana* and *F.* spp.

BIOLOGY.— The bole, limbs, and larger branches are selected for attack where transverse, biramous, parental galleries deeply engrave the surface of the wood. According to Blackman (1922a:62) the transverse length of the complete gallery systems he studied in Mississippi varied from 2 to 6 cm and averaged 4 cm. The larval mines follow the grain of the wood and normally do not cross one another. The young adults do little if any feeding before they emerge from the brood host. Evidently feeding tunnels in green bark are not formed between succeeding summer generations, but they are formed by overwintering beetles. About two months were required to complete a generation in Mississippi.

NOTES.— The above descriptions were based on LeConte's series of *aculeatus*, which was either part of Say's series or compared to it; on LeConte's series of *imperialis*, which apparently included an Eichhoff specimen; on the type series of *cinereus* Swaine; on the Schwarz, Hopkins, and Blackman series of *aculeatus*; and on more than 700 other specimens. A specimen labeled "N.Y.; Cornell Lot. 3 Sub. 5; *Hylesinus imperialis* Lec. homotype" (the identification label is in Swaine's hand) is a female of *californicus* and does not match either of LeConte's series. Because the types of both *aculeatus* and *imperalis* apparently were lost, LeConte's specimens appear to be the only existing specimens that were either part of the type series or compared to the types of the Say and Eichhoff descriptions.

### 3. *Hylesinus oregonus* (Blackman)

*Leperisinus oregonus* Blackman, 1943, Proc. U.S. Nat. Mus. 94:396 (Holotype, female; Forest Grove, Oregon; U.S. Nat. Mus., 56574)

DIAGNOSIS.— This species is closely related to *aculeatus* Say, but it may be distinguished by characters summarized in the above key.

MALE.— Length 2.5–3.3 mm, 2.0 times as long as wide; color dark brown, with a variegated pattern of dark brown, yellow, and pale scales, dark scales predominating.

Frons as in *aculeatus* except carina very slightly higher, punctures much larger and deeper, and vestiture finer.

Pronotum 0.73 times as long as wide; as in *aculeatus* except submarginal row of crenulations usually not complete to median line, surface more coarsely, deeply punctured, and scales larger.

Elytra 1.5 times as long as wide, 2.1 times as long as pronotum; as in *aculeatus* except striae very slightly wider, interstrial crenulations averaging slightly less numberous and higher, scales larger, wider, each scale a third as wide as an interstriae, fewer of them strongly keeled; dark brown scales comprise about half of total, yellow and pale scales about equally abundant.

FEMALE.— Similar to male except frons convex on upper three-fourths, carina slightly longer and higher.

DISTRIBUTION.— Oregon to California.

USA: **California**: Hilts, 18-IV-33, Ash, Paul Rice. **Oregon**: Corvallis, 24-IV-31, 6-X-31, 15-VII-41, *Fraxinus oregana*, J. Schuh; Eugene; Forest Grove, 18-I-19, *Fraxinus*; McMinnville; Philomath; McLane; Portland, 26-VII, C. E. Wood, 14-VIII-34, *F. oregona*, F. P. Keen; St. Helens, Hopk. US117, *Fraxinus*, A. D. Hopkins; Scappoose.

HOST.— *Fraxinus latifolia.*

BIOLOGY.— Evidently indistinguishable from *aculeatus.*

NOTES.— The above descriptions were based on the holotype and on 153 other specimens. This appears to be a rare species; its distribution along the Pacific Coast probably is much greater than available records indicate.

### 4. *Hylesinus criddlei* (Swaine)

*Leperisinus criddlei* Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2): 72 (Holotype, male; Aweme, Manitoba; Canadian Nat. Coll., 9251)

DIAGNOSIS.— This is the most distinctive and also the most difficult American species of the genus to characterize. Its small size, the comparatively simple sculpture of the elytral declivity, and the presence of a weak, median, frontal impression, rather than an elevation, serve to distinguish it.

MALE.— Length 1.9–2.4 mm, 2.0 times as long as wide; color dark brown, with a variegated pattern of dark brown, yellowish tan, and pale scales, pale scales usually predominate.

Frons rather abruptly, concavely impressed above epistoma, impression extending to upper level of eyes at least in median area, lateral margins subacutely elevated on lower third; surface minutely reticulate; vestiture consisting of moderately abundant, coarse, rather long, subplumose setae.

Pronotum 0.71 times as long as wide; widest on basal third, sides rather weakly arcuate and converging slightly on basal half, then abruptly rounded and converging to moderate constriction just before broadly rounded, subemarginate anterior margin; surface reticulate, obscurely punctured, with several coarse asperities in anterolateral area, a marginal row of asperities extending almost to median line on anterior margin; scales usually not overlapping, rather large, broad over most of surface, narrower in front, color pattern as in *aculeatus.*

Elytra 1.5 times as long as wide, 2.1 times as long as pronotum; outline as in *aculeatus*; disc as in *aculeatus* except submarginal crenulations smaller, interstrial crenulations narrower, more nearly uniseriate. Declivity convex, moderately steep; interstriae 1, 3, and 9 weakly elevated, 2 almost flat, as wide as 1 or 3 and bearing four indefinite ranks of scales. Vestiture consisting of overlapping interstrial scales, each scale as wide as long, almost a third as wide as interstriae; an occasional scale on declivity erect and slightly longer than ground vestiture; light scales usually predominate, tan scales least abundant.

FEMALE.— Similar to male except frons convex on upper three-fourths, median line weakly impressed; asperities on pronotum slightly larger.

DISTRIBUTION.— Saskatchewan and Colorado to Quebec.

CANADA: **Manitoba**: Aweme, 31-VII-15, Ex. No. 8178, N. Criddle. **Ontario**: Port Colborne, 1-VIII-34, D. Gray; Ridgeway, A. H. Kilman. **Quebec**: Cap Rouge, 15-V-71; Gaspé, 25-VI-37, G. Gautier; Montreal, 12-VII-33, J. I. Beaulne. **Saskatchewan**: St. Hubert Mission, 14-IX-43, *Fraxinus*, P. A. Mullie. USA: **Colorado**: Denver, 3-VI-49, *F. americana*; Ft. Collins, VII-52, *F. americana*, T. O. Thatcher; Laport, 6-III-50, T. O. Thatcher. **Iowa**: Lake Okoboji, 17-VI, L. L. Buchanan. **Kansas**: Riley, VI-17, Popeno. **Michigan**: Detroit. **Minnesota**: Laverne, VIII-37, Ash, H. R. Dodge; Ramsey Co., 8-V-36, H. R. Dodge. **North Dakota**: Emmons Co., McHenry Co., 13-VI-70, trap, A. D. Tagestad; Pierce Co., 10-VI-71; Ramsey Co., 31-VII-70, *F. pennsylvanica*, A. D. Tagestad. **South Dakota**: Millbank, 19-IX-99, *F. americana*, J. M. Aldrich.

HOST.— *Fraxinus americana, F. pennsylvanica.*

BIOLOGY.— Apparently as in *aculeatus*.

NOTES.— The above descriptions were based on the holotype and on 146 other specimens.

### 5. *Hylesinus fasciatus* LeConte

*Hylesinus fasciatus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:170 (Holotype, male; York Co., Pennsylvania; Mus. Comp. Zool., 973)

DIAGNOSIS.— The black and white scale pattern and the uniseriate rows of scales on at least part of declivital interstriae 2 clearly distinguish this species and *mexicanus* (Wood) from other American representatives of the genus. From *mexicanus* it is distinguished by characters summarized in the above key.

MALE.— Length 1.8–2.3 mm, 1.8 times as long as wide; color almost black, with black and white scales, black scales predominating.

Frons rather broadly, deeply concave from epistoma to slightly above upper level of eyes, median line very feebly elevated; lower third of lateral margins rather broadly rounded; surface minutely reticulate-subgranulate, punctures rather fine, obscure; vestiture of moderately abundant, rather short, subplumose setae.

Pronotum 0.70 times as long as wide; widest at base, sides arcuately converging to very broadly rounded anterior margin; surface minutely reticulate-granulate, finely, closely obscurely punctured; anterolateral areas each bearing about a dozen coarse asperities, marginal row on median half obsolete; median line indicated on most of posterior half; scales rather large, broad posteriorly, rather slender anteriorly; white scales largely restricted to posterolateral areas.

Elytra 1.3 times as long as wide, 2.2 times as long as pronotum; outline and basal margins essentially as in *aculeatus*; striae rather narrowly impressed, punctures rather obscure; interstriae slightly less than twice as wide as striae, submarginal crenulations as in *aculeatus* but smaller, rows of discal crenulations or tubercles absent, punctures obscured by vestiture. Declivity convex, rather steep; interstriae 2 impressed but convex, 1 slightly elevated, 3 and 9 not noticeably elevated, tubercles not evident. Vestiture consisting of moderately large, strongly keeled (tripartite) scales in three irregular ranks except uniseriate on declivital interstriae 2, each scale slightly longer than wide; median row on each interstriae distinctly longer than ground cover; color black except small white patches on interstriae 1 and 2 just behind scutellum, on 6 at similar level, on 2 to 5 and 7 at base of declivity, and on apex of 9.

FEMALE.— Similar to male except frons planoconvex, upper three-fourths bearing a rather strongly elevated median carina; fewer elytral scales keeled in ground cover.

DISTRIBUTION.— Pennsylvania and New Jersey to Missouri.

USA: **District of Columbia**: Washington, V-29. **Missouri**: Jefferson City, V-17. **New Jersey**: Clemton, V-20. **Pennsylvania**: Harrisburg, 1923, Ash, Champlain. **West Virginia**: Kanawha Station, *Fraxinus*, A. D. Hopkins; Wood Co., 14-VII-08, A. D. Hopkins.

HOST.— *Fraxinus americana.*

BIOLOGY.— Evidently similar to *aculeatus*.

NOTES.— The above descriptions were based on the holotype and on 187 other specimens.

### 6. *Hylesinus mexicanus* (Wood)

*Leperisinus mexicanus* Wood, 1956, Canadian Ent. 88:249 (Holotype, male; Tecamachalco, Puebla, Mexico; Snow Ent. Coll., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *fasciatus* LeConte by characters summarized in the above key. In addition, the female frontal carina is less strongly elevated, and most specimens have the light colored scales in the declivital ground vestiture tinted yellow.

MALE.— Length 2.3–2.9 mm, 1.8 times as long as wide; color almost black, with patches of black, white, and yellowish tan scales.

Frons as in *fasciatus* except setae slightly longer.

Pronotum as in *fasciatus* except patches of white scales larger, also a patch of white scales just behind anterior margin.

Elytra as in *fasciatus* except uniseriate rows of fine, interstrial tubercles present on basal half of disc; erect, uniseriate, median row of scales longer on disc and on declivity almost twice as long as ground vestiture, pale erect scales white in color, pale ground cover scales at least on declivity usually yellowish tan (in some specimens these also entirely white). Pale scales on basal half of elytra and at base of declivity forming almost continuous, transverse bands of white color, posterior one continued in lateral area to apex and sometimes joining anterior band (color pattern highly variable); pale scales usually comprise at least half of total number.

FEMALE.— Similar to male except frons planoconvex, with a conspicuous median carina, upper half of carina less strongly elevated than in *fasciatus*; only longer, erect, interstrial scales strongly keeled.

DISTRIBUTION.— Durango and SW Texas to Puebla.

USA: **Texas**: Big Bend N. P. in Pulliam Canyon, 17-V-59, 2800 m, H. Howden; Rivers, 27-VI-38, R. I. Sailer; Waco, 2-XI-39, P. A. Glick. MEXICO: **Aguascalientes**: Aguascalientes, 12-VI-65, 2100 m, No. 42, S. L. Wood. **Durango**: Quencame, 23-IV-77, "palo blanco," M. M. Furniss; San Juan del Río, 25-VII-53, 1800 m, S. L. Wood. **Puebla**: Tecamachalco, 2-VII-53, S. L. Wood.

HOST.— A small desert tree (Oleaceae).

BIOLOGY.— The habits apparently are essentially as in *aculeatus*.

NOTES.— The above treatment was based on the holotype and on 56 other specimens.

The specimens from Three Rivers, Texas, and the one from San Juan del Río, Durango, were previously referred by me (Wood 1956:248) to *fasciatus*. It is now recognized that they are small representatives of *mexicanus*, with a higher percentage of black scales than is normal for this species.

### 7. *Hylesinus aztecus* Wood

*Hylesinus aztecus* Wood, 1980, Great Basin Nat. 40:354 (Holotype, male; Chapingo, Mexico, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *californicus* (Swaine) by the larger size, by the presence of a fine, low, median frontal carina in both sexes, by the less strongly concave male frons and less strongly convex female frons, and by differences in the declivital interstrial setae described below.

MALE.— Length 3.8–4.2 mm, 1.8 times as long as wide; vestiture of dark brown and tan scales in a pattern similar to *californicus*.

Frons similar to *californicus* except very shallowly concave from epistoma to upper level of eyes, a low, median carina on lower half, and granules on upper areas of head conspicuously larger.

Pronotum similar to *californicus* except asperities smaller, punctures smaller, less definite, and scales averaging much more slender.

Elytra similar to *californicus* except interstrial crenulations more numerous, smaller, confused (a median row not predominating); declivital interstriae 1 less strongly elevated, 2 wider; ground setae on declivital interstriae 2 in two indefinite ranks (never uniseriate); erect setae always absent on 2, present on 1 and 3, each four to eight times as long as wide, spaced within a row by distances greater (one to four times) than length of a seta.

FEMALE.— Similar to male except frons less strongly, more broadly impressed (irregularly flattened); declivital interstriae 1 less strongly elevated (vestiture not clearly sexually dimorphic).

DISTRIBUTION.— Mexico.

MEXICO: **Mexico**: Chapingo, 12-XII-1978, *Fraxinus uhdei*, T. H. Atkinson.

BIOLOGY.— The habits apparently are as in *aculeatus*.

NOTES.— The above treatment was based on the type series of 14 specimens.

### 8. *Hylesinus californicus* (Swaine)

Fig. 47

*Leperisinus californicus* Swaine, 1916, Canadian Ent. 48:190 (Holotype, female; San Diego, California; Canadian Nat. Coll., 9249)

*Leperisinus hoferi* Blackman, 1943, Proc. U.S. Nat. Mus. 94:394 (Holotype, female; Sabino Canyon, Arizona; U.S. Nat. Mus., 56573); Wood, 1971, Great Basin Nat. 31:147. *Synonymy*

*Leperisinus californicus* Essig, 1957, Insects and Mites of Western North America, p. 519. *Nomen nudum*

DIAGNOSIS.— This is the most common and most widely distributed representative of the

genus in western North America. This species and *guatemalensis* Wood have long, hairlike, erect, bristles on discal interstriae 8 to 10, a larger patch of hairlike setae near the basal margins of the elytra, flattened and impressed interstriae 2 (at least in the male), and the longer, erect interstrial scales on the declivity that indicate a close relationship to

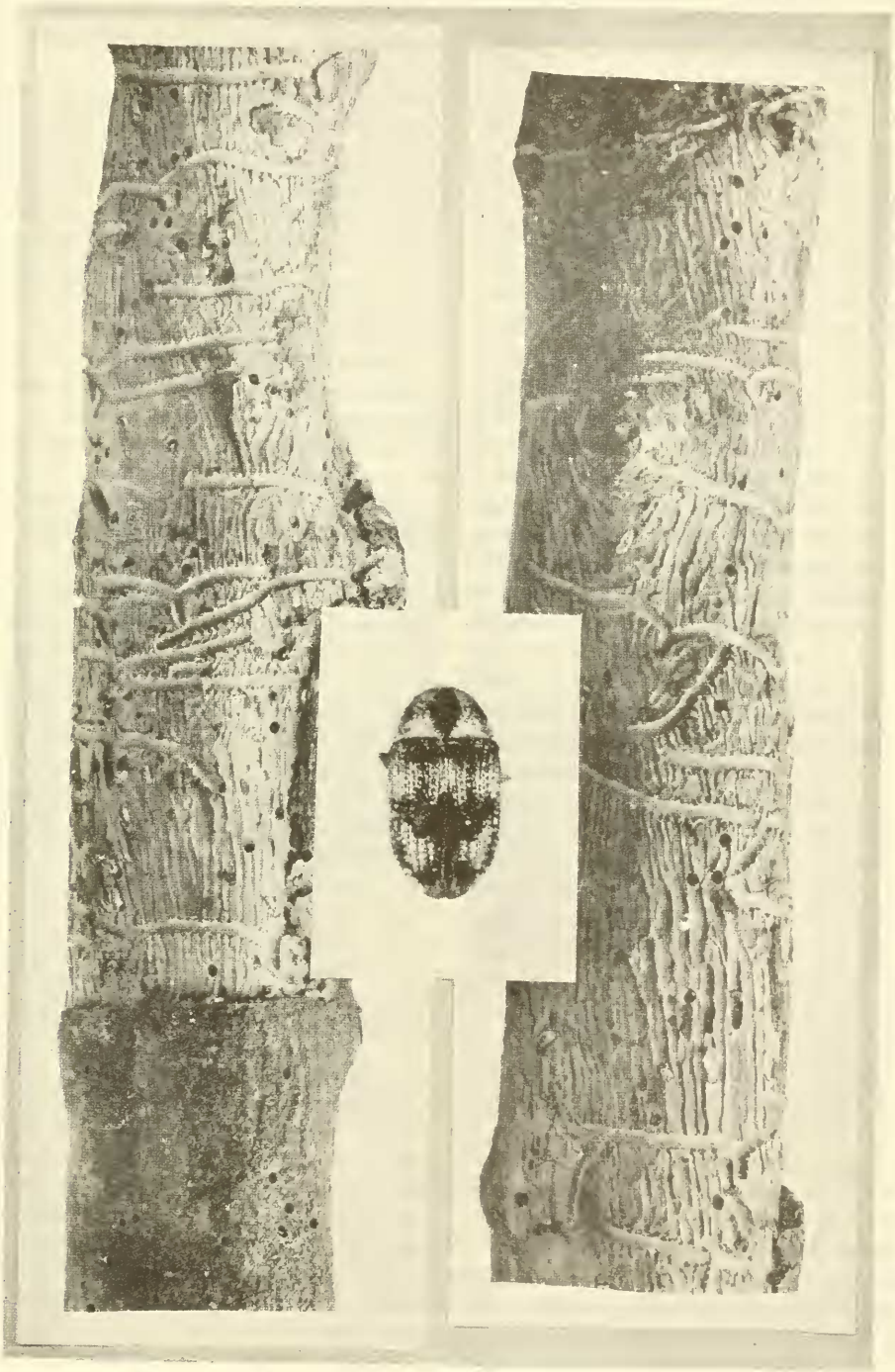


Fig. 47. *Hylesinus californicus*: Adult, dorsal aspect, and galleries. (After Swaine 1916:pl. 8.)

one another. This species is distinguished from *guatemalensis* by characters summarized in the above key, and by the whitish tan color of the pale scales.

MALE.— Length 2.0–3.1 mm, 1.95 times as long as wide; color dark brown, with color pattern formed by dark brown and light tan scales.

Frons concavely impressed on a triangular area from epistomal margin to upper level of eyes; epistomal margin feebly, narrowly elevated, broadly, shallowly emarginate; surface reticulate, finely, rather closely, obscurely punctured except at center of concavity; vestiture rather fine, moderately long, abundant.

Pronotum 0.71 times as long as wide; widest at base, sides arcuately converging to narrow constriction just behind very broadly rounded anterior margin; surface reticulate, punctures large but obscure, on middle third their anterior margins finely asperate, lateral areas each bearing about a dozen and a half coarse asperities, with submarginal row obsolete on median half of anterior margin; scales large, broad in pale areas, in dark areas similar scales supplemented by dark, slender bristles.

Elytra 1.3 times as long as wide, 2.1 times as long as pronotum; sides slightly wider near base, almost straight, converging slightly posteriorly on slightly less than basal two-thirds, rather narrowly rounded behind; anterior margins each armed by about 13 crenulations; striae slightly impressed, punctures moderately large, deep; interstriae slightly less than twice as wide as striae, each with a uniseriate row of narrow crenulations, crenulations increased in number at base, confused, particularly on 2 and 3. Declivity convex, moderately steep; striae not impressed, punctures somewhat reduced; interstriae 1 moderately, 3 and 9 feebly elevated, 2 flat, rather strongly impressed. Vestiture largely of rather large, pubescent or subplumose scales in about three ranks on each interstriae, part of median rank longer, erect; erect setae slender, almost hairlike toward base, becoming scalelike on 1 one-third from base, at margin of declivity on 3 and 4, below middle of declivity on 5; each erect seta at least twice as long as ground scales, much longer on sides; none of scales keeled.

FEMALE.— Similar to male except frons convex on upper two-thirds, a large, short, subtuberculate carina on lower half, above epistoma; epistomal margin not emarginate; erect interstrial scales shorter, less than twice as long as ground scales.

DISTRIBUTION.— Oregon and North Dakota to Chihuahua and Texas.

USA: **Arizona**: Chiricahua Mts., Glendale, Huachuca Mts., Miller Canyon in Huachuca Mts., Oak Creek Canyon, Patagonia, Phoenix, Sabino Canyon, Tucson, Tubao. **California**: Grass Valley, Inyo Co., Mare Island, Merced, Mission Valley in San Diego Co., Palo Alto, San Diego. **Colorado**: Greeley. **New Mexico**: Meek. **North Dakota**: Bottineau Co. **Oklahoma**: Holdenville. **Oregon**: Eugene, Forest Grove, Junction City, McMinnville, Portland, Salem. **Texas**: Brownsville, Cameron Co., Ft. Davis, Hidalgo Co. **Utah**: Moab, Provo, Vernal. MEXICO: **Chihuahua**: Colonia Juárez.

HOSTS.— *Fraxinus americana*, *F. latifolia*, *F. pennsylvanica*, *F. velutina*, and *Olea europeae*.

BIOLOGY.— Evidently indistinguishable from *aculeatus*.

NOTES.— The above descriptions were based on the holotypes of *californicus* and *hoferi* and on 242 other specimens.

Blackman evidently was unfamiliar with the full distribution of this species and based his *hoferi* on minor characters that vary within series. Examination of his type series leaves no doubt that this is a synonym of Swaine's species. Through an error in citing *californicus* the author name was changed from Swaine to a new species designation in the 1957 revision of Essig's book, resulting in a name for which a description was not given or a type specimen designated.

### 9. *Hylesinus guatemalensis* (Wood)

*Leperisinus guatemalensis* Wood, 1967, Great Basin Nat. 27:89 (Holotype, female; Volcan Pacaya, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is very closely allied to *californicus* (Swaine), but it may be distinguished by characters summarized in the above key, by the yellow-orange tint of the pale scales, by the more broadly convex upper half of the male frons, and by the nearly complete submarginal row of asperities on the anterior margin of the pronotum.

MALE.— Length 2.4–3.1 mm, 1.8 times as long as wide; color dark brown, with color

pattern formed by dark brown and light yellowish tan scales.

Frons broadly concave from epistoma to upper level of eyes; epistomal margin feebly elevated and broadly, very shallowly emarginate; surface reticulate, punctures fine, obscure; vestiture fine, rather short, rather sparse.

Pronotum as in *californicus* except submarginal row of asperities almost complete to median line, and slender setae in median, dark area obsolete; dark scales arranged in a large median and two smaller lateral diamond patterns, median one reaching both anterior and posterior margins.

Elytra as in *californicus* except scales smaller, each about one-fourth as wide as an interstriae, and slender, erect bristles replaced on interstriae 1 to 4 by erect scales, slender bristles on bases of 5 and 6 and more extensively on 7 to 10; pale scales with a distinct yellow-orange tint.

FEMALE.— Similar to male except frons convex above, flattened on lower half, entirely devoid of a carina or tubercle, epistoma not at all emarginate; erect interstrial setae shorter, but at least twice as long as ground scales.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán Pacaya, 1-VI-64, 1300 m, No. 661, S. L. Wood. From three host tree species, none of which resembled *Fraxinus*.

BIOLOGY.— Evidently very similar to *aculeatus*.

NOTES.— The above treatment was based on the type series of 92 specimens.

## GENUS *ALNIPHAGUS* SWAINE

*Alniphagus Swaine*, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):73 (Type-species: *Hylesinus aspericollis* LeConte, monobasic)

*Hylastinoides* Spessivetsev, 1919. Ent. Mon. Mag. 55:249 (Type-species: *Hylastes alni* Niisima); Swaine, 1919, Rept. Canadian Arc. Exp. 3E:279. *Synonymy*

DIAGNOSIS.— From American Hylesinini this genus is distinguished by the elongate antennal scape, by the 7-segmented funicle, by moderately flattened, very slightly asymmetrical antennal club with three sutures, the first of which is partly septate, by the armed anterolateral areas of the pronotum, by the shallowly emarginate eye, by the widely separated anterior coxae, and by the broad, emarginate third tarsal segments.

DESCRIPTION.— Length 2.1–3.4 mm, 2.0–2.1 times as long as wide. Frons very slightly dimorphic, male frons weakly impressed, female more strongly convex. Eye elongate, shallowly emarginate; finely granulate. Antennal scape elongate, attaining posterior margin of eye; funicle 7-segmented; club moderately flattened, very slightly asymmetrical, marked by three sutures, first partly septate. Pronotum wider than long, anterolateral angles armed by several asperities. Scutellum small, depressed. Elytral bases armed by a long row of overlapping crenulations; declivity convex, rather steep, conservatively sculptured, costal margins not ascending behind. Vestiture hairlike.

DISTRIBUTION.— Western North America and Japan; three species are known; two are from western North America and one is from Japan. Two species recently added to this genus by Schedl (1963:259) appear to be incorrectly placed.

BIOLOGY.— These monogamous species attack the lower bole of alder trees, where they construct unbranched, uniramous, more or less longitudinal egg galleries in the phloem tissues. The larval mines wander in the general direction away from the parental tunnel and may cross one another repeatedly. According to Chamberlin (1958:100) the female constructs the entrance tunnel and is later joined by a male. Two generations per year evidently are normal. Special hibernation tunnels are constructed in the outer bark to pass the winter.

### Key to the Species of *Alniphagus*

1. Declivital ground vestiture very short, scalelike, much shorter than on disc; serrations of interstriae 9 and 10, as seen from dorsal aspect, form an almost continuous sawlike lateral profile from base to apex of elytra; larger, darker, with shorter, less abundant pubescence and larger, more numerous interstrial crenulations and tubercles; Alaska to California and Utah; 2.6–3.4 mm ..... 1. ***aspericollis*** **(LeConte)**

— Crenulations on discal interstriae much smaller, less abundant; ground vestiture on declivity stout, elongate, as on disc; serrations of interstriae 9 and 10 usually visible from dorsal aspect only at base and in declivital area; smaller, lighter in color, with slightly longer, more abundant pubescence and much smaller, less numerous discal crenulations and declivital tubercles; British Columbia to California; 2.1–2.8 mm ..... 2. ***hirsutus*** **Schedl**

### 1. *Alniphagus aspericollis* (LeConte)
Figs. 48, 96

*Hylesinus aspericollis* LeConte, 1876, Proc. Amer. Philos. Soc. 15:380 (Lectotype, male; California, evidently Santa Barbara; Mus. Comp. Zool., 975, present designation)

*Alniphagus aspericollis*: Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):73.

DIAGNOSIS.— In addition to the characters summarized in the above key, this species is more slender and has very slightly shorter elytral setae than *hirsutus* Schedl.

MALE.— Length 2.6–3.4 mm, 2.1 times as long as wide; color dark brown, elytra usually slightly lighter.

Frons convex, median area on lower two-thirds weakly impressed, a narrow, transverse impression just above epistoma; surface mostly reticulate, shining, punctures moderately coarse, very shallow, close; vestiture of sparse, fine, rather short, inconspicuous hair.

Pronotum 0.79 times as long as wide; widest a fourth of length from base, sides moderately arcuate from base, converging slightly, very broadly rounded, almost subemarginate in front; surface smooth and shining with very close, moderately deep punctures of irregular, small to moderately large size, somewhat reticulate anteriorly; anterolateral angles armed by one to three coarse asperities, several smaller asperities scattered in anterolateral areas, including median area near anterior margin; vestiture of stout, hairlike setae, each about equal in length to diameter of largest punctures.

Elytra 1.55 times as long as wide, 2.2 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; basal margins each armed by 13 low crenulations; striae weakly impressed, punctures rather coarse, deep; interstriae wider than striae, each armed by a somewhat uniseriate row of coarse crenulations, most at least half as wide as interstriae, supplemental fine punctures rather obscure. Declivity convex, steep; interstriae 1, 3, 5, 7, and 9 moderately elevated, 1 and 3 each armed on upper two-thirds by six to eight pointed tubercles. Vestiture of stout, recumbent, interstrial hair on disc equal in length to diameter of a strial puncture, shorter, scalelike on declivity, and erect rows of sparse, interstrial, hairlike setae, each one-third as long as distance between rows.

FEMALE.— Similar to male except frons more nearly convex; lateral asperities on pronotum evidently very slightly larger; declivital tubercles extend to apex.

DISTRIBUTION.— Alaska to California and Utah.

ALASKA: Hollis. CANADA: **British Columbia**: Agassiz, Barkerville, Bowser, Boyston, Cowichan, Goldstream, Haspencolls on Goat River, Massett on Queen Charlotte Islands, Metlakatla, Pender Harbor, Terrace, Vaseaux, Victoria. USA: **California**: Bass Lake, Eureka, Fieldbrook, Hat Creek, Haviah, Marin Co., Mt. Tamalpais, Placer R. S. in Madera Co., Placerville, Scotia, Taylorville, Ventura, Yosemite N. P. **Idaho**: Deary, Kassel. **Oregon**: Astoria. Colestein, Corvallis, Dever, Forest Grove, Gardner, Gold Lake in Willamette N. F., Hood River, Newport, Neil Creek, Otis, Portland, Santiam N. F. **Utah**: American Fork Canyon. **Washington**: De Moines, Hoquiam, Miller Lake, Puyallup, Quinault, Seattle.

HOSTS.— *Alnus rhombifolia*, *A. rubra*, and *A. tenuifolia*.

BIOLOGY.— As described for the genus.

NOTES.— The above descriptions were based on LeConte's syntypes and on 310 other specimens.

Inasmuch as a type has not been designated from the five syntypes in the LeConte collection, I here designate the first specimen, a male, as the lectotype for the species as cited above.

### 2. *Alniphagus hirsutus* Schedl
Figs. 49–50

*Alniphagus hirsutus* Schedl, 1949, Canadian Ent. 81:236 (Holotype, male; Copper Mountain, British Columbia; Schedl Coll.)

DIAGNOSIS.— This species is very closely related to *aspericollis* (LeConte) but can be distinguished, with difficulty, by the characters summarized in the above key, by the

stouter body, and by the slightly longer elytral setae.

MALE.— Length 2.1–2.8 mm, 2.0 times as long as wide; color of pronotum reddish brown, elytra usually somewhat yellowish brown.

Frons as in *aspericollis*.

Pronotum 0.75 times as long as wide; as in *aspericollis* except sides more strongly arcuate; punctures less definite but more uniform in size, vestiture longer, each seta more than twice as long as diameter of a large puncture.

Elytra 1.40 times as long as wide, 2.1 times as long as pronotum; outline as in *aspericollis*, but stouter; basal margins each armed by 11 crenulations; striae feebly impressed, punctures large, rather indistinctly impressed; interstriae wider than striae, each armed by fine, low crenulations, each usually less than one-third as wide as interstriae, supplemented by moderately large punctures. Declivity as in *aspericollis* except alternate interstriae less strongly elevated, tubercles much smaller, less than four on each interstriae. Vestiture with ground vestiture slightly longer, not scalelike on lower declivity, erect setae longer, at least half as long as distance between rows.

FEMALE.— Similar to male except frons more nearly convex; pronotal asperities larger.

DISTRIBUTION.— British Columbia to California.

CANADA: **British Columbia**: Copper Mountain, 22-V-29, *Alnus sitchensis*, G. S. Smith; Lorna, 21-VI-25, 17202 lot 3556, *Pinus contorta* (error, beating record only); 7 miles N Oliver, 18-V-58, H. Howden. USA: **California**: Cliff Lake, Siskiyou Co., 28-VII-39, *Alnus tenuifolia*, W. D. Bedard. **Oregon**: Corvallis, 1-VIII-39, *Alnus*, J. Schuh; Gold Lake, Willamette N. F., 16-VI-61, *Alnus tenuifolia* and *A. sinuata*, S. L. Wood.

HOSTS.— *Alnus sinuata* and *A. tenuifolia*.

BIOLOGY.— Essentially as in *aspericollis* as mentioned for the genus.

NOTES.— The above descriptions were based on the holotype and on 45 other specimens.

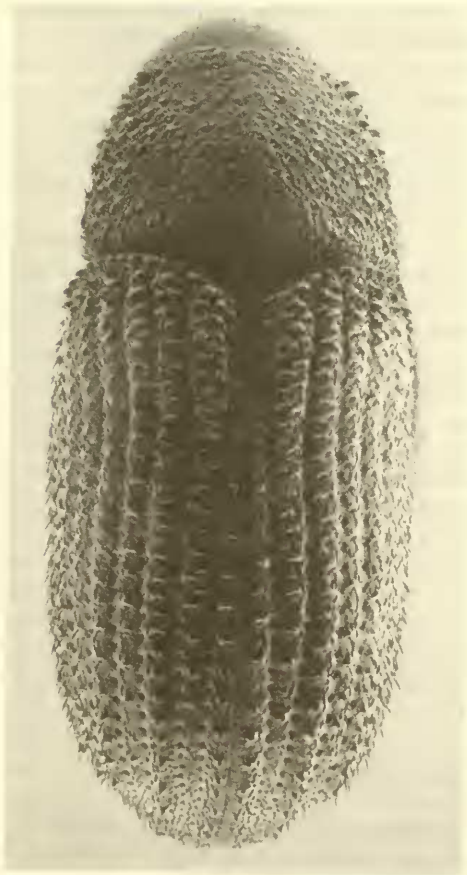


Fig. 48. *Alniphagus aspericollis*: Dorsal aspect. (After Bright 1976:207.)

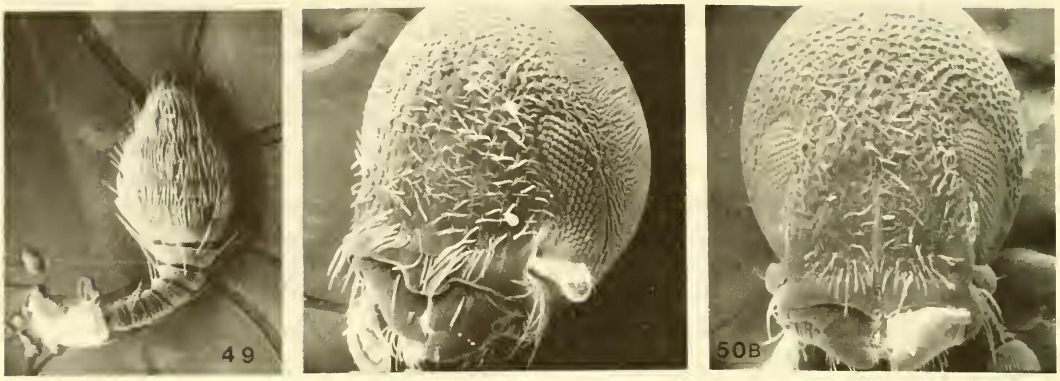
## GENUS *PHLOEOBORUS* ERICHSON

*Phloeoborus* Erichson, 1836, Archiv Naturgesch. 2(1):54 (Type-species: *Phloeoborus rudis* Erichson, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:126)

*Phloeotrupes* Erichson, 1836, Archiv Naturgesch. 2(1):53 (Type-species: *Phloeotrupes grandis* Erichson, subsequent designation by Hopkins 1914, Proc. U.S. Nat. Mus. 48:127); Wood, 1978, Great Basin Nat. 38:383. *Synonymy*

DIAGNOSIS.— This genus is not closely allied to any other in the American fauna. It is distinguished by the very large size, by the stout body form, by the entire eye, by the 7-segmented antennal funicle and distinctive club, by the near absence of crenulations on the basal margins of the elytra, by the widely separated front coxae, and by the presence of a large propleural fovea in the female.

DESCRIPTION.— Length 4.6–13.0 mm, 1.6–1.9 times as long as wide; color dark brown to black. Frons at least partly concave in male, convex in female, usually with a median carina below; eyes large, entire, varying from widely separated to contiguous above. Antennal scape elongate, funicle 7-




Figs. 49–50. *Alniphagus hirsutus*: 49, Antenna, 50A, male head; B, female head.

segmented; club ovate, moderately, symmetrically compressed, with two straight sutures, minutely, rather densely pubescent. Pronotum wider than long, with or without asperities. Scutellum visible, small. Crenulations on elytral bases poorly developed to absent; striae impressed, punctures usually small; interstriae usually crenulate; declivity convex, conservatively sculptured. Vestiture almost obsolete; minute hair visible on some species. Anterior coxae rather widely separated; third tarsal segments broad, pubescent. Propleura with a large fovea on anterior half, often ornamented with hairlike setae.

DISTRIBUTION.— Southern Mexico to Argentina; about a dozen valid species are known; five of them occur in Mexico and Central America.

BIOLOGY.— The species of this genus are occasionally attracted to light. They breed in moist or wet tropical forests in cut or broken limbs or logs larger than 20 cm in diameter. The male bores on the underside of the log directly, deeply into the wood on a radial plane, forming an unbranched tunnel with a turning niche near the entrance. The female then extends the tunnel, frequently adding one or more branches. The eggs are deposited and packed individually in niches that are randomly distributed on all sides of the tunnel. The larvae form long, wandering mines through the wood. Pupation occurs rather deep in the wood near the end of the one-year life cycle. The adult flight period evidently is confined to the latter part of the dry season. Apparently fungi are associated with the beetles and cause a rapid decay of the wood near the tunnels; pupal cells usually are lined by the spore-forming hyphae. Apparently the fungus is not used as food directly; it evidently modifies the hard wood, thereby increasing the nutritional value of those tissues.

NOTES.— Until recently *Phloeotrupes* Erichson was recognized as a separate genus. However, the characters of the tibiae, antennae, and palpi on which the separation was made vary to such an extent that no combination of characters will separate the two. Although the name *Phloeotrupes* has page priority, I exercised the option of the first revisor, above, and selected *Phloeoborus* because it applies to a larger group of species and is more widely known.

The nomenclature of species in this genus is in chaos. The individual variability, sexual dimorphism, and unavailability of adequate series have resulted in the description of numerous synonyms. A thorough revision of the group is needed.

## Key to the Species of *Phloeoborus*

1. Male frons deeply excavated to slightly impressed above upper level of eyes; eyes separated by about twice width of an eye; body stout, 1.6 times as long as wide; sculpture of pronotum irregular, anterolateral angles elevated and each armed by three basally contiguous, coarse asperities, a row of smaller, marginal and one of submarginal asperities more strongly elevated than numerous low

asperities covering anterior half of pronotum; antennal club with suture 1 subangulate (at least in male); Veracruz to Brazil; 5.6–9.0 mm ..... 1. ***asper*** Erichson

— Male frons shallowly excavated on lower half, never approaching upper level of eyes; body usually more slender; pronotal asperities, when present, of more or less uniform size (except some males of *scaber* armed on anterolateral angles); sutures of antennal club, when visible, straight; spacing of eyes variable ..... 2

2(1). Eyes separated by almost three times width of an eye; body stout, 1.6 times as long as wide; declivital interstriae 2 unarmed, crenulations on all interstriae rather sparse; female pronotum smooth, punctured, male finely asperate on anterior half; Mexico (Veracruz?) to Brazil; 4.6–8.1 mm ..... 2. ***punctatorugosus*** Chapuis

— Eyes narrowly separated by a distance equal to less than width of an eye; declivital crenulations more abundant, continuing on all interstriae to declivital apex (except on 2 in *belti*); body usually more slender ..... 3

3(2). Declivital interstriae 1 and 3 convex and tuberculate, 2 impressed and unarmed; Nicaragua; 7.6 mm ..... 3. ***belti*** Blandford

— Declivital interstriae 2 not impressed, armed by tubercles as on 1 and 3 ..... 4

4(3). Strial punctures very small, their diameters about one-fifth width of an interstriae; surfaces dull, deeply reticulate on pronotum and elytra; finely asperate on anterior three-fourths of pronotum; Veracruz to Brazil; 6.3–9.5 ..... 4. ***scaber*** Erichson

— Strial punctures larger, their diameters one-third width of an interstriae; surface shining, smooth on pronotum, superficially reticulate on parts of elytra; pronotal asperities restricted to lateral areas on anterior half, often obscure; Guatemala to Brazil; 7.5–11.7 mm ..... 5. ***rudis*** Erichson

### 1. *Phloeoborus asper* Erichson

*Phloeoborus asper* Erichson, 1836, Archiv Naturgesch. 2(1):55 (Holotype, male; Brazil; Zool. Mus. Berlin)

*Phloeoborus imbricornis* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:148 (Holotype, male; Mexico; presumably lost with Hamburg Mus.); Chapuis, 1869, Synopsis des Scolytides, p. 8. *Synonymy*

*Phloeoborus ovatus* Chapuis, 1869, Synopsis des Scolytides, p. 15 (Lectotype, male; Cayenne; Brussels Mus., present designation); Wood, 1973, Great Basin Nat. 33:180. *Synonymy*

*Phloeoborus rugatus* Blandford, 1897, Biol. Centr. Amer., Coleop. 4(6):153 (Lectotype, female; Chontales, Nicaragua; British Mus. Nat. Hist., present designation); Wood, 1973, Great Basin Nat. 33:180. *Synonymy*

DIAGNOSIS.— This species is unique among Central American *Phloeoborus*. It may be distinguished from other species in the area by the male frontal concavity that extends above the upper level of the eyes, by the widely separated eyes, by the prominent elevated asperities on the anterolateral angles of the pronotum, and by the subangulate, glabrous, basal, pseudosegment of the antennal club (evidently a male character).

MALE.— Length 5.6–9.0 mm, 1.6 times as long as wide; color almost black.

Frons concave from epistomal margin to above upper level of eyes, much wider on lower third, lower half bearing an acute, rather high median carina, lateral margins subacute, upper two-thirds not continuous with lower third; surface reticulate, a few fine punctures and stout setae on lateral areas; eyes separated above by twice width of an eye.

Pronotum 0.73 times as long as wide; widest at base, sides arcuately convergent to anterolateral angles, median two-thirds very broadly rounded; anterior half or more finely asperate to subasperate, with anterolateral angles elevated and each armed by three basally contiguous, coarse asperities, anterior margin armed on median half by a row of basally contiguous asperities, a similar transverse row of asperities one-fourth pronotum

length from anterior margin; posterior fourth grading from subasperate to punctate; areas between asperities and within punctures very minutely reticulate-granulate. Vestiture sparse, largely limited to marginal areas, consisting of short, stout bristles.

Elytra 1.07 times as long as wide, 1.9 times as long as pronotum; widest one-third from base, sides weakly arcuate and almost parallel on less than basal half, then arcuately convergent to broadly rounded posterior margin; scutellum set in a V-shaped notch three times as wide as scutellum; basal margins abruptly precipitous, marginal crenulations poorly formed, largely indefinite; striae very narrowly, deeply impressed, punctures very small, obscure; interstriae about four times as wide as striae, minutely reticulate-granulate, armed by abundant, closely set, confused, transverse crenulations, each crenulation subacute, usually narrower than half width of an interstriae. Declivity steep, convex, confined to posterior third; strial puncture slightly larger and more distinct than on disc; sutural interstriae weakly elevated, on left side strongly narrowed; crenulations on all interstriae uniseriate, low, decreasing in size posteriorly, obsolete on lower third; interstriae 9 strongly, acutely elevated on sides behind junction with 10, weakly convex on posterior half of declivity. Vestiture consisting of very short, stout, recumbent hair, each shorter than distance equal to an adjacent strial puncture.

FEMALE.— Similar to male except frons convex and eyes more broadly spaced.

DISTRIBUTION.— Veracruz to Brazil.

MEXICO: Veracruz: Lago Catemaco, 1–3-V-69, D. E. Bright; Santecomapan, 10-VI-69, H. Howden. Chiapas: Palenque Ruins, 22-VI-69, D. E. Bright. NICARAGUA: Chontales. OTHER COUNTRIES: Brazil, British Guiana, Trinidad, Venezuela.

BIOLOGY.— The hosts and habits have never been recorded.

NOTES.— The above description was based on the male holotype of *asper*, on the male holotype of *imbricornis*, on the male syntypes of *ovatus*, on the female syntypes of *rugatus*, and on 35 other specimens.

Of the three Chapuis male syntypes of *ovatus* the first is here designated as the lectotype of *ovatus* Chapuis; of the two female syntypes of *rugatus* Blandford the Chontales specimen now in the British Museum (Natural History) is here designated as the lectotype of *rugatus* Blandford, as cited above.

### 2. *Phloeoborus punctatorugosus* Chapuis
Fig. 51

*Phloeoborus punctatorugosus* Chapuis, 1869, Synopsis des Scolytides, p. 14 (Holotype, male; Nouvelle Grenade; Mus. Roy. Nat. Belge)

*Phloeoborus breviusculus* Chapuis, 1869, Synopsis des Scolytides, p. 14 (Holotype, male; Cayenne; Mus. Roy. Nat. Belge); Wood, 1977, Great Basin Nat. 37:208. *Synonymy*

*Phloeoborus nitidicollis* Chapuis, 1869, Synopsis des Scolytides, p. 14 (Lectotype, female; Nova Fribourg, Río de Janeiro, Brazil; Brussels Mus., present designation); Eggers, 1942, Arb. Morph. Taxon. Ent. Berlin-Dahlem 9:267. *Synonymy*

DIAGNOSIS.— The widely separated eyes, the stout body form, the very sparsely

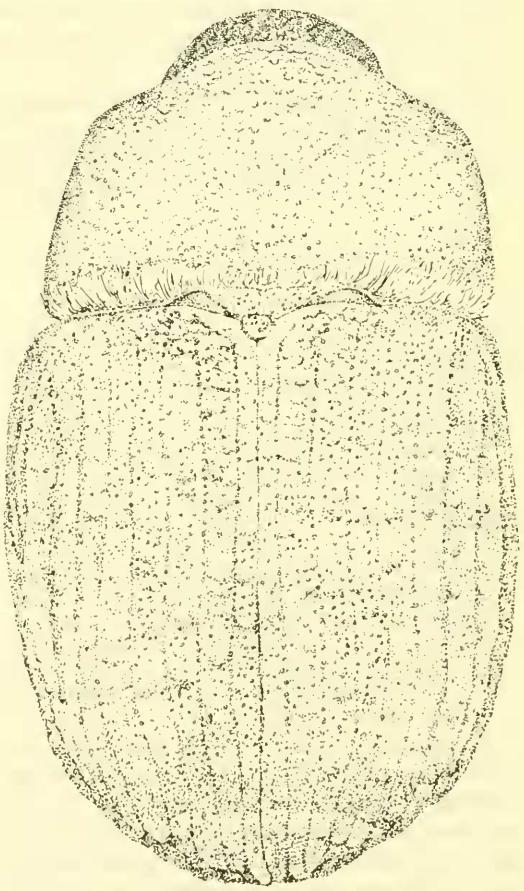


Fig. 51. *Phloeoborus punctatorugosus*: Male, dorsal aspect.

crenulate interstrial asperities, and the sexually dimorphic pronotum distinguishes this species from other Central American representatives of the genus.

MALE.— Length 4.6–8.1 mm, 1.6 times as long as wide; color very dark brown, almost black.

Frons convex above, a rather shallow, triangular, concave impression extending from epistomal margin about three-fourths of distance to upper level of eyes; a weak median carina in impressed area; surface minutely reticulate, dull; area below upper level of eyes except in concavity bearing low, isolated, transverse tubercles; vestiture restricted to concavity, of minute hair, longer toward epistoma.

Pronotum 0.68 times as long as wide; widest at base, sides feebly arcuate, converging on posterior four-fifths, then abruptly narrowed to very broadly rounded anterior margin; surface minutely reticulate, dull, anterior two-fifths rather finely asperate, anterolateral angles unarmed; posterior two-fifths with sparse, shallow, somewhat reniform punctures. Glabrous.

Elytra 1.1 times as long as wide; sides almost straight and parallel on basal half, rather broadly rounded behind; scutellar notch not wider or deeper than scutellum; basal margins abrupt, feebly elevated, crenulations not distinguishable; striae very narrowly, moderately impressed, punctures very small distinct; interstriae at least four times as wide as striae, minutely reticulate, dull, with minute, sparse, indistinct punctures and sparse, low, rounded crenulations, fewer than a dozen crenulations on each interstriae. Declivity steep, convex, confined to slightly more than posterior third; strial punctures very slightly larger and deeper than on disc; interstriae 1 weakly elevated, 1 and 3 with two or three fine, low crenulations near upper margin, minute punctures uniseriate except moderately confused on 1 and 3; interstriae 9 narrowly, strongly elevated from junction with 10 to middle of declivity, weakly convex behind. Glabrous.

FEMALE.— Similar to male except frons convex, subshining, rather coarsely, shallowly, closely punctured, tubercles entirely absent; pronotal reticulaion almost obsolete, shining, entire surface sparsely, finely, rather deeply punctured, asperities entirely absent; small, subacute interstrial crenulations on elytral disc much more abundant, often exceeding three dozen.

DISTRIBUTION.— Southern Mexico to Brazil.

MEXICO: Presumably Veracruz. COSTA RICA: San José, San José, 22-X-63, 1300 m, *Psidium guava*, S. L. Wood; Turrialba, 9-III-64, 700 m, at light, S. L. Wood, 20-X-53, *Coffea arabica*.

HOSTS.— *Coffea arbica*, *Lecythis costaricensis*, *Psidium guajava*; also from *Inga* in Colombia.

BIOLOGY.— Adult beetles entered on the under side of large guava logs in shady places in a coffee plantation. They bored through the bark into sound wood on the underside of the log, where they introduced fungal growth that caused a very rapid white rot. The adult tunnels formed no definite pattern, but wandered and branched at random. Egg niches were formed along growth rings, either in rings around the tunnel if it cut across the grain, or in rows along the sides if the tunnel paralleled the grain. The old egg tunnels were all stained black. The larvae made very long, winding tunnels through the decaying wood. Both larvae and young adults in their pupal cells were inactive during the climax of the Costa Rican rainy season in November. The age of the tunnels and inactivity of the brood suggested only one generation per year. Some decayed logs that could be crumbled by hand still contained a few living young adults.

NOTES.— The above descriptions were based on the holotypes of *punctatorugosus* and *breviusculus* and on 62 other specimens. Three female syntypes of *nitidicollis* were examined and the first of these in the Brussels Museum is here designated as the lectotype of *nitidicollis* Chapuis as cited above; however, I am not entirely convinced that Chapuis' Brazilian species is the same as *punctatorugosus* that occurs from Veracruz to Colombia.

### 3. *Phloeoborus belti* Blandford

*Phloeoborus belti* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):151 (Holotype, female; Chontales, Nicaragua; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *rudis* Erichson by the reticulate vertex region of the head, by the more deeply

subcrenulately punctured pronotum, by the smaller strial punctures, by the higher interstrial crenulations, and by the impressed, unarmed declivital interstriae 2.

FEMALE.— Length 7.6 mm, 1.7 times as long as wide; color dark reddish brown. Frons as in *scaber* Erichson.

Pronotum as in *rudis* except punctures deeper, surface in lateral and basal areas irregular, subcrenulate, with a few irregular short, confluent grooves near base; surface almost smooth, a very obscure reticulation indicated on both interspaces and punctures.

Elytra 1.2 times as long as wide; interstriae rather deeply impressed, punctures small, mostly distinct; interstriae obscurely reticulate, rather strongly convex, about three to four times as wide as striae, crenulations high, not more than half as wide as an interstriae, uniseriate on posterior half of 1, 2, and 4, staggered to confused on all of 3 and on basal half of 2 and 4. Declivity broadly convex, rather steep, more strongly reticulate; interstriae 2 flat, unarmed, rather narrow, 1 convex, with a row of narrow tubercles decreasing slightly in size toward apex, 3 similar to 1 except tubercles slightly larger, apex of 5 joins 3; lateral areas as in *rudis*.

DISTRIBUTION.— Nicaragua.

NICARAGUA: Chontales, T. Belt.

NOTES.— The above treatment was based on the holotype.

### 4. *Phloeoborus scaber* Erichson

*Phloeoborus scaber* Erichson, 1836, Archiv Naturgesch. 2(1):55 (Lectotype, female; Bahia, Brazil; Berlin Mus., present designation)

*Phlocotrupes caelatus* Blanchard, 1846, In Brulle, Insectes de l'Amerique Meridiconale recueillis par Alcide d'Orbigny 2:204 (Syntypes; Bolivia; Paris Mus.); Eggers, 1933, Ent. Nachrbl. 7:17. *Synonymy*

*Phlocoborus sericeus* Chapuis, 1869, Synopsis des Scolytides, p. 13 (Lectotype, male; Cayenne; Brussels Mus., present designation); Eggers, 1942, Arb. Morph. Taxon. Ent. Berlin-Dahlem 9:267. *Synonymy*

*Phlocoborus opacithorax* Schedl, 1940, Arb. Morph. Taxon. Ent. Berlin-Dahlem 7:20 (Syntypes, female; Panzos, Guatemala; Instit. Pflanzenschutzforschung Kleinmachnow); Wood, 1974, Great Basin Nat. 34:285. *Synonymy*

DIAGNOSIS.— The rather narrowly separated eyes, the finely asperate pronotum, the coarsely crenulate elytra with the entire surface reticulate-granulate, the declivital sculpture, and the sculpture of the male frons distinguish this species from other Central American representatives of the genus.

MALE.— Length 6.4–7.5 mm, 1.7 timès as long as wide; color dark reddish brown.

Frons broadly, deeply impressed on lower two-thirds of area below eyes, this area with an acute median carina to epistomal margin; a very slight median impression continuing to upper level of eyes, convex above eyes; surface reticulate, rather coarsely punctured except impressed area obscurely punctured; vestiture of sparse, short, stout, yellow bristles in impressed area. Eyes elongate, separated above and below by about one-half to three fourths width of an eye. Scape reaching middle of eye.

Pronotum 0.68 times as long as wide; widest about middle, sides moderately arcuate, basal and anterior margins about equally, very broadly rounded; anterolateral angles rather coarsely asperate, asperities gradually decreasing in size posteriorly on anterior two-thirds, then coarsely, closely, subasperately punctured to base; surface reticulate except apices of asperities; vestiture consisting of sparse, very short, stout bristles.

Elytra 1.2 times as long as wide, 2.1 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; basal margins abruptly precipitous, marginal crenulations indefinite, scutellar notch very shallow, indistinct; striae rather strongly impressed, punctures small, distinct; interstriae convex, at least five times as wide as striae, crenulations coarse, close, usually confused, each about one-fourth to two-thirds as wide as interstriae. Declivity convex, steep; strial punctures deeper than on disc; crenulations less than one-fifth as wide as interstriae, becoming uniseriate and decreasing in size until often obsolete on lower third. Vestiture consisting of minute, stout bristles, their length usually not exceeding diameter of a strial puncture.

FEMALE.— Similar to male except larger, 7.5–9.5 mm, 1.8 times as long as wide; frons convex, with a slight, transverse impression above epistoma, carina present; pronotal asperities higher and more acute; anterior half of propleura bearing a large, hemispherical

cavity with a marginal fringe of long, yellow hair.

DISTRIBUTION.— Veracruz to Brazil.

MEXICO: Veracruz: Orizaba, Salle; Cordoba, Salle and Höge; Santecomapan, 10-VI-69, H. Howden. GUATEMALA: Pantaleon, Champion. BRITISH HONDURAS: Stan Creek District in Middlesex, 7-V-63, E. C. Welling. NICARAGUA: Chontales, Janson. COSTA RICA: Tilarán, Guanacaste, VII-66, leguminous log, J. B. Karren. PANAMA: Barro Colorado Island, Canal Zone, 15-II-64, L. J. Bottomer; Bugaba and Volcán de Chiriquí, Champion. OTHER COUNTRIES: Brazil, Colombia, Jamaica, Trinidad, Venezuela.

BIOLOGY.— The only biological data relating to this species was supplied by J. B. Karren, who took two males and three females that were walking on or just beginning tunnels in a fallen leguminous tree. Most specimens in collections were attracted to light.

NOTES.— The above descriptions were based on the syntypes of *scaber*, *sericeus*, and *opacithorax* and on 40 other specimens from Central America. Of the four females specimens in the Zoologisches Museum at Berlin only the first two appear to be syntypes; the first of these is here designated as the lectotype of *scaber* Erichson, as cited above. Of seven male syntypes now in the Chapius collection at Brussels, the third is here designated as the lectotype of *sericeus* Chapuis, as cited above, because it was listed first in the original description.

Central American specimens have the elytral crenulations smaller and more numerous than those from South America. Many South American specimens, particularly the males, have the crenulations almost uniseriate on the disc and often as wide as the interstriae. Except for this character, specimens from the two areas do not appear to differ significantly. In general, but by no means consistently, the Central American representatives have been treated under *scaber* and the South American specimens under *cristatus* Chapuis (=*radulosus* Blandford and *aspericollis* Stromeyer), although the types of these names may be different species. Until the types are available for study, *lunulatus* Eggers and *opacithorax* Schedl are also tentatively treated here as variants of *scaber*. The syntypes of *opacithorax* fall well within the range or variability of this species.

### 5. *Phloeoborus rudis* Erichson

*Phloeoborus rudis* Erichson, 1836, Archiv Naturgesch. 2(1):55 (Lectotype, female; Brazil; Zool. Mus. Berlin, present designation)

*Phloeoborus elongatus* Chapuis, 1869, Synopsis des Scolytides, p. 13 (Holotype, male; Brazil; Brussels Mus.); Wood, 1973, Great Basin Nat. 33:180. *Synonymy*

*Phloeoborus rugipennis* Eggers, 1942, Arb. Morph. Taxon. Ent. Berlin-Dallem 9:271 (Holotype, female; San Salvador; U.S. Nat. Mus.); Wood, 1973, Great Basin Nat. 33:180. *Synonymy*

DIAGNOSIS.— This very large species has the enlarged tibiae and other features used to characterize *Phloeotrupes*. In addition to those features this species has the pronotum almost smooth and shining, except for the punctures, and other characters summarized in the above key that distinguish it from other Central American species.

FEMALE.— Length 10.2–11.7 mm, 1.8 times as long as wide; color very dark reddish brown to black.

Frons shallowly impressed on lower half of area below eyes, convex above; impressed area with a median carina to epistomal margin; surface smooth, shining, punctures rather sparse, moderately large, deep; vestiture of fine, short hair confined to impressed area. Eyes subcontiguous above, separated by a distance about equal to one-third width of eye. Scape not reaching middle of eye.

Pronotum 0.68 times as long as wide; widest one-third length from base, sides rather weakly arcuate, feebly converging anteriorly, very broadly rounded in front; anterolateral angles with a few subasperate elevations indicated, remainder of surface smooth, shining except feeble reticulation indicated anteriorly, punctures moderately large, rather deep, irregular but close in most areas; a few minute bristles in anterior and lateral areas. Propleura with a large cavity on anterior half as in other *Phloeoborus*.

Elytra 1.3 times as long as wide, 2.1 times as long as pronotum; scutellar notch well developed, about five times as wide as scutellum; basal margins abrupt, crenulations obscurely indicated; striae impressed, punctures coarse, shallow; interstriae less than three times as wide as striae, convex, rather feebly reticulate, crenulations rather low, staggered, each about one-fourth to two-thirds as wide as interstriae. Declivity convex, steep; striae

deeper but not narrower than on disc, only slightly narrower than interstriae; interstriae reticulate, uniseriate crenulations extended to apex. Vestiture consisting of minute, interstrial bristles, each distinctly shorter than diameter of a strial puncture.

MALE.— Smaller, about 7.5–8.8 mm, lower frons more strongly, more broadly impressed.

DISTRIBUTION.— Guatemala to Brazil.

GUATEMALA: Trece Aguas, Alta Verpaz, O. F. Cook; Cayuga, IV-15, W. Schaus. EL SALVADOR: San Salvador, 1-V-57, P. A. Berry. COSTA RICA: Turrialba, Cartago, 13-V-51, O. L. Cartwright; Las Mercedes, F. Nevermann; Eggers adds Hamburgfarm on Río Reventazon, Limon, at light F. Nevermann, and Hacienda Pehlke, Colombia, by Pehlke. PANAMA: Barro Colorado Island, Canal Zone, 10–17-V-64, W. D. and S. S. Duckworth; La Chorrera, 18-V-12, A. Busck.

BIOLOGY.— As described for the genus.

NOTES.— The above description was based on the Erichson series of *rudis*, on the holotypes of *rugipennis* and *elongatus*, and on 18 other specimens. Of the series of three females and two males now in the Zoologisches Museum in Berlin, it appears that only the first two, both females, were in the original series. The first specimen has been regarded as the type and is here designated as the lectotype of *rudis* Erichson, as cited above. The third specimen, a male, bears Eggers' identification label saying "*Phloeoborus rudis* Er. ♂ = *elongatus* Chap." The Erichson and Chapuis specimens were compared directly to one another and to my female topotypic homotype of *rugipennis*.

## Tribe TOMICINI

Tomicidae Thomson, 1859, Skandinaviens Coleoptera Synoptiskt Bearbetade 1:145 (Type-genus: *Tomicus* Latreille, 1802/3)

Hylurgini LeConte, 1876, Proc. Amer. Philos. Soc. 15:373 (Type-genus: *Hylurgus* Latreille, 1807)

Dendroctonides Nüsslin, 1912, Naturwiss. Zeitschr. Forst- und Landwirtschaft 1912:273 (Type-genus: *Dendroctonus* Erichson, 1836)

Xylechinides Nüsslin, 1912, Naturwiss. Zeitschr. Forst- und Landwirtschaft 1912:273 (Type-genus: *Xylechinus* Chapuis, 1869)

Anatomical features.— The frons is weakly sexually dimorphic, the eye is entire, the antennal funicle is 5- to 7-segmented, the club is symmetrical and feebly to moderately flattened, with sutures indicated, the procoxae are contiguous to narrowly separated, the precoxal costa on the prosternum is absent, the pronotum is unarmed (obscurely asperate in a few South American forms), the metascutellar area is separated from the postnotum by a distinct suture, and the sutural groove on the mesal surface at the base of the elytra continues to the base without a series of interlocking nodules and cavities.

Biological features.— All species are monogamous and phloeophagous. The parental tunnels are either biramous or, if monoramous, there is a conspicuous turning niche near the entrance tunnel. Eggs are placed in niches, except some *Dendroctonus* form grooves in which numerous eggs are placed. Larval mines usually follow a definite independent course without crossing, except some *Dendroctonus* feed in congress, thereby forming extensive, tabular chambers in the cambium region. Symbiotic relationships with fungi occur, but are not of a mycetophagous type.

Taxonomy.— This tribe apparently shares the same ancestry with the Hylesinini, but exhibits several more advanced characters. All the genera appear to have an American origin; all are more closely allied to the South American fauna than to that from other areas (except that the Eurasian *Xylechinus pilosus* (Ratzeburg) apparently was derived from North America rather recently). The tribe was not fully separable from the Phloeosinini until the fusion of the postnotum to the scutellar area of the metanotum was discovered. The American genera of Tomicini are easily distinguished from one another; those from other parts of the world may be distinguished with difficulty.

### Genus *PSEUDOHYLESINUS* Swaine

*Pseudohylesinus* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):11 (Type-species: *Pseudohylesinus grandis* Swaine = *Hylurgus sericeus* Mannerheim, original designation)

Diagnosis.— This genus is very closely related to *Xylechinosomus* Schedl, but it is distinguished by the less strongly impressed male frons, and by the simple sculpture of the elytral declivity. It is also allied to *Xylechinus* Chapuis, but *Pseudohylesinus* has seven segments in the antennal funicle.

Description.— Length 2.2–5.8 mm, 2.1–2.5 times as long as wide; color dark brown to almost black, with abundant light and dark hairlike and scalelike setae.

Frons convex, with an arcuate, transverse impression at or just below middle, a median carina on lower half. Antennal scape elongate, shorter than 7-segmented funicle; club conical to slightly flattened. Eye entire, elongate; rather finely granulate. Pronotum 0.7–1.3 times as long as wide; sides strongly constricted just behind anterior margin; surface punctate, variously clothed by hair and scales. Scutellum small, depressed. Elytra 1.2–1.9 times as long as wide; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; basal margins each armed by about 10–15 overlapping

crenulations; striate, interstriae tuberculate; declivity convex, rather steep, alternate interstriae often weakly elevated. Vestiture of ground cover of abundant scales and rows of longer, erect, interstrial bristles. Tibiae essentially as in *Xylechinus*.

DISTRIBUTION.— Western North America; 11 species are known.

BIOLOGY.— These monogamous beetles attack limbs, bole, and roots of weakened or felled coniferous hosts, where they construct biramous parental galleries in the cambium region. According to Bright (1969), the female initiates the attack before the male arrives at the new host. Eggs are deposited in individual niches in the phloem. Larval mines are moderately long, more or less straight, and almost entirely in the phloem. They radiate approximately at right angles from the parental tunnels. The flight period begins as early as March and continues at a relatively high level until September. One generation apparently is the rule in Canada, with up to two and a partial third generation in the southwestern United States. Individual parents may reemerge to produce a second or even a third brood. There are three larval instars.

NOTES.— Schedl (1966) indicated that *Pseudohylesinus* Swaine, 1917, and *Xylechinosomus* Schedl, 1963, are both junior subjective synonyms of *Pteleobius* Bedel, 1888. Although the first two genera are very closely related and, perhaps, doubtfully distinct from one another, they are fundamentally distinct from and quite unrelated to *Pteleobius*. The relationship to *Xylechinus* is much closer.

Key to the Species of *Pseudohylesinus*
(Modified from Bright 1969:15)

1. Frontal rectangle (Blackman 1942:29) 0.9–1.0 times as long as wide; body 2.1–2.4 times as long as wide; segment 1 of antennal club little if any longer than 2 ..... 2
— Frontal rectangle 1.0–1.3 times as long as wide; body 2.0–2.2 (2.2–2.4 in *granulatus*) times as long as wide; segment 1 of antennal club conspicuously longer than 2 ..... 8

2(1). Crenulations on elytral bases from striae 5 to humeral angle high, acutely pointed; declivital interstriae 9 usually moderately elevated, commonly more strongly serrate; interstrial hairlike setae finer, short; parental galleries longitudinal ..... 3
— Crenulations on elytral bases usually not higher or more acutely pointed in lateral areas; declivital interstriae 9 usually less strongly elevated, less coarsely serrate; interstrial hairlike setae rather short, coarse; parental galleries transverse ..... 4

3(2). Declivital interstriae 1 and 3 weakly or not at all elevated, 2 as wide as 1 or 3, 1–3 equally armed by fine granules; British Columbia and Alberta to California and Chihuahua; *Pseudotsuga menziesii*, *Tsuga*; 2.3–2.9 mm ..... 1. ***nebulosus nebulosus*** **(LeConte)**
— Declivital interstriae 1 and 3 moderately elevated, finely serrate, 2 impressed, devoid of granules, narrower than 1 or 3; S California; *Pseudotsuga macrocarpa*; 3.0–3.5 mm ..... 2. ***nebulosus serratus*** **Bruck**

4(2). Declivital interstriae 2 devoid of granules and hairlike setae; interstrial bristles about half as long as distance between rows ..... 5
— Declivital interstriae 2 armed by a few small granules and by a row of hairlike bristles; interstrial bristles almost as long as distance between rows ..... 6

5(4). Color pattern of pale and light brown scales, less commonly (northern areas) with some dark brown patches, pale scales often predominate, in patches or not; S Oregon to California; Abies; 2.8–3.7 mm ..... 3. ***dispar dispar*** **Blackman**

— Color pattern predominantly of dark brown scales, with small patches of pale scales; Washington to central Oregon; *Abies procera*; 2.6–3.7 mm ..... 4. ***dispar pullatus*** **Blackman**

6(4). Inner surface of large strial punctures reticulate; interstrial scales very small, predominantly dark; pronotum densely punctured; Michoacán; *Abies religiosa*; 4.4–5.8 mm ..... 5. ***magnus*** **Wood**

— Strial punctures small, inner surface smooth; interstrial scales moderately large, predominantly pale or light brown; pronotal punctures close, deeper; smaller ..... 7

7(6). Smaller; submarginal crenulations near bases of interstriae 5 and 6 almost always uniseriate, less crowded; lower frons more coarsely, more deeply punctured; interstrial tubercles on declivity averaging higher, more acutely pointed; Utah to Arizona and New Mexico; *Abies concolor*; 2.7–3.8 mm ..... 6. ***maculosus*** **Blackman**

— Larger; submarginal crenulations at bases of interstriae 5 and 6 crowded, usually confused; lower frons finely, more shallowly punctured; interstrial granules on declivity not as high, more broadly rounded; Michoacán to Tlaxcala and Oaxaca; *Abies religiosa*; 3.4–4.5 mm ..... 7. ***variegatus*** **(Blandford)**

8(1). Female pronotal setae hairlike, male also with slender scales; interstrial bristles very fine (except *granulatus*), shorter, submarginal interstrial crenulations more numerous, confused in both sexes; mostly slightly larger ..... 9

— Female pronotal setae hair- and scalelike, male scales rather broad; interstrial bristles slightly longer, stout; subcrenulate interstrial granules uniseriate (except *sericeus*), occasionally slightly confused at base in female; mostly somewhat smaller ..... 10

9(8). Larger; pronotal punctures averaging slightly larger, deeper, most specimens with lateral margins of lateral punctures granulate to subasperate; strial punctures usually larger, deeper, striae often as wide as interstriae; interstrial bristles rather coarse; body 2.2–2.4 times as long as wide; Alaska to California; *Abies*; 4.0–5.4 mm ..... 8. ***granulatus*** **(LeConte)**

— Smaller; pronotal punctures averaging smaller, less strongly impressed, rarely with their lateral margins granulate; strial punctures usually smaller; striae narrower than interstriae; interstrial bristles more slender; body stouter, 2.0–2.1 times as long as wide; Alaska to California; *Tsuga*, *Abies*; 2.6–4.0 mm ..... 9. ***tsugae*** **Swaine**

10(8). Interstrial subcrenulate granules more abundant and confused at bases; female discal interstrial scales each one to two times as long as wide; arcuate transverse frontal impression poorly developed in both sexes, frontal rectangle 0.95 (female) – 1.06 (male) times as long as wide ..... 11

— Interstrial granules usually not more abundant or confused toward bases (confused in some female *sitchensis*); female discal interstrial scales more than twice as long as wide; transverse frontal impression well developed in both sexes, frontal rectangle 1.03 (female) – 1.20 (male) times as long as wide ..... 12

11(10). Female pronotal scales (except near scutellum), slender, varying from almost hairlike to about eight times as long as wide, their apices subacute not divided except near scutellum; male pronotal scales two to six times as long as wide; Washington, Oregon; 2.7–3.8 mm ..... 10. ***nobilis*** **Swaine**

— Female pronotal scales stouter, varying from two to six times as long as wide; if appearing more slender, apices palmately divided; male pronotal scales one to about four times as long as wide; Alaska to California and Idaho; 2.5–3.5 mm ..... 11. ***sericeus*** **(Mannerheim)**

12(10). Pronotal scales more slender, 4–8 times as long as wide in female, 2–3 in male; interstrial granules averaging larger; frontal rectangle 1.0 times as long as wide in female, male 1.2 times as long as wide; Alaska to California; *Picea sitchensis*; 2.5–3.1 mm ..... 12. ***sitchensis* Swaine**

— Pronotal scales stouter, 2–5 times as long as wide in female, subcircular in male; interstrial granules averaging smaller; frontal rectangle 1.06 times as long as wide in female, male 1.4 times as long as wide; British Columbia to California; *Pinus*; 2.2–2.8 mm ..... 13. ***pini* Wood**

### 1. *Pseudohylesinus nebulosus nebulosus* (LeConte)

Figs. 22, 52, 53

*Hylesinus nebulosus* LeConte, 1859, Proc. Acad. Nat. Sci. Philadelphia 5:285 (Holotype, male; Table Mountain, California; Mus. Comp. Zool., 1019)

*Pseudohylesinus nebulosus*: Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):75

*Pseudohylesinus nebulosus nebulosus*: Bright, 1969, Univ. California Pub. Ent. 54:16.

DIAGNOSIS.— This is the smallest (except *pini*), most slender, and most widely distributed species in the genus; additional distinguishing characters are included in the above key.

MALE.— Length 2.3–2.9 mm, 2.3–2.4 times as long as wide; color very dark brown, with a variegated surface pattern formed by dark and light scales and hair.

Frons broadly convex, a weak transverse impression just above epistoma, a second weak, transversely arcuate impression near middle; lower half with a low, acutely elevated, median carina; surface shining, punctures close, rather deep, moderately fine on lower half, coarse above, devoid of granules; frontal rectangle 1.1 times as long as wide; vestiture of fine, short, moderately abundant hair.

Pronotum 0.83 times as long as wide; widest near middle, sides on basal half weakly arcuate, almost parallel, abruptly narrowed anteriorly to strong constriction on anterior fourth, rather broadly rounded in front; surface shining, with dense, moderately deep punctures; interspaces about one-third as wide as diameter of a puncture. Vestiture of erect, sparse hair and recumbent scales; scales on disc mostly as long as wide.

Elytra 1.7 times as long as wide; sides almost straight and parallel on less than basal two-thirds, gradually converging on posterior two-thirds, median third at apex very broadly rounded; anterior margin armed by about 11 rather coarse crenulations, extreme lateral one or two larger and pointed, a few submarginal crenulations on interstriae 2–6; striae weakly impressed, punctures moderately coarse, deep; interstriae almost twice as wide as striae, each with a central row of uniseriate granules of moderate size, remaining surface with numerous, fine, confused, very slightly crenulate punctures. Declivity convex, moderately steep; interstriae 1 and 3 feebly, 9 more strongly, convex, 2 narrower than 1 and 3, feebly depressed, tubercles on 1 and 3 as on disc, evidently smaller on 2 or 4–8, a row of rather coarse, pointed denticles on 9. Densely clothed by a ground cover of scales, each slightly longer than wide, narrowly rounded at their apices; interstriae each with a uniseriate row of erect, short, slender, bristles, each bristle shorter than distance between rows.

FEMALE.— Similar to male except frontal rectangle 0.80 times as long as wide; pronotal scales more elongate, subpalmately subplumose; apices of elytral scales usually acuminately angulate; color pattern less well defined.

DISTRIBUTION.— S British Columbia and Alberta to Chihuahua, except S California.

CANADA: **Alberta**: Banff, Jasper, Maycroff, Waterton Lakes. **British Columbia**: Aspen Grove, Cherry Ck., Chilcotin, Columbia Lake, Cowishan Lake, Duncan's, Genoa Bay, Hotel Lake at Pender Harbor, Indian Meadows and Merritt at Midday Valley, Kaslo, Massett, Momich Ck., Nelson, Peachland, Vancouver, Vangard, Vernon, Wellington, West Lake on Nelson Isl., Williams Lake. USA: **Arizona**: Chiricahua Mts., Flagstaff, Hannagan Camp in Greenlee Co., Jacob's Lake, Miller Canyon in Huachuca Mts., Pinaleno Mts., Prescott N. F., San Francisco Mts., Santa Catalina Mts., Walker, Williams. **California**: Big Spring in Plumas Co., Calistoga, Carville, Cascade House, Costella, Crescent City, Cypress Ridge in Marin Co., Del Norte, Dutch Flat in Placer Co., Ft. Seward, Georgetown in El Dorado Co., Gasquet, Happy Camp, Mill Valley, Mt. Tamalpais, Monterey, Orick, Oreleans, Plantation, San Francisco, Shingleton, Trinity. **Colorado**: Colorado Springs, Dolores, Durango, Estes Park, Foxton, Rist Canyon in Larimer Co. **Idaho**: Cedar Mt., Centerville, Coeur d'Alene, Franklin Basin Road in Cache N. F., Grimes Pass,

Hailey, Moscow Mt., Placerville, Sand Point. **Montana**: Bear Paw Mts., Columbia Falls, Helena, Rocky Boy Indian Res. in Hill Co. **New Mexico**: Capitan, Cloudcroft, Las Vegas Hot Springs, Sandia Mts. **Oregon**: Numerous localities from every county in the state. **Utah**: Alta, Beaver Canyon in Beaver Co., Bryce Canyon N. P., Henry Mts., Logan Canyon, Mt. Timpanogos. **Washington**: Numerous localities from every county in the state. MEXICO: **Chihuahua**: La Magdalena, San Juanito.

HOST.— *Pseudotsuga menziesii*, less commonly in *Tsuga heterophylla*.

BIOLOGY.— The bole and limbs of recently cut, injured, or unthrifty trees are selected for attack. The longitudinal parental galleries are mostly in the phloem. Larval mines wander erratically and may be unusually long. The winter may be passed either as larvae or adults in Utah.

NOTES.— The above treatment was based in the male holotype and on 712 other specimens.

### 2. *Pseudohylesinus nebulosus serratus* Bruck

*Pseudohylesinus serratus* Bruck, 1936, Bull. So. California Acad. Sci. 35:37 (Holotype, male; West Fork of San Gabriel Canyon, Los Angeles Co., California; Ohio State Univ. Coll.)

*Pseudohylesinus nebulosus serratus*: Bright, 1969, Univ. California Pub. Ent. 54:18

DIAGNOSIS.— This subspecies is distinguished as indicated in the above key.

MALE.— Length 3.0–3.5 mm, 2.4 times as long as wide.

Essentially as in *n. nebulosus* except declivital interstriae 1 and 3 rather strongly elevated, 2 depressed and distinctly narrower than 1 or 3, tubercles on 1, 3, 5, 7, and 9 averaging larger.

FEMALE.— Similar to male but differing much as in female *n. nebulosus* except that elytral scales appear subpalmately subplumose.

DISTRIBUTION.— Coastal California from Santa Barbara County southward.

USA: **California**: Big Pines, 14-II-57, D. E. Bright; "S. Madre" in Santa Barbara Co.; Henniger Flats, 22-VI-40, *Pseudotsuga macrocarpa*, C. R. Bruck; Lytle Ck. in San Bernardino Co.; Switzers Camp, San Gabriel Mts., Santa Barbara Co., 18-IV-62, *P. macrocarpa*, D. E. Bright; Santa Monica; West Fork, San Gabriel Canyon, Los Angeles Co., 29-XII-34, *P. macrocarpa*, R. Kessinger.

HOST.— *Pseudotsuga macrocarpa*.

BIOLOGY.— Evidently as in *n. nebulosus*.

NOTES.— The above treatment was based on the holotype, allotype, seven paratypes, and 11 other specimens.

The anatomical differences between *n. nebulosus* and *n. serratus* are greater than between most species of the genus. In all probability they are specifically distinct. However, when all factors are considered, particularly the hosts and distribution, it appears best to follow Bright and treat them as subspecies until additional information is available.

### 3. *Pseudohylesinus dispar dispar* Blackman

*Pseudohylesinus dispar* Blackman, 1942, U.S. Dept. Agric. Misc. Publ. 461:11 (Holotype, female; Veronia, Oregon; U.S. Nat. Mus., 54026)

*Pseudohylesinus dispar dispar*: Bright, 1969, Univ. California Publ. Ent. 54:20

DIAGNOSIS.— This species is distinguished from *n. nebulosus* (LeConte) by the larger average size, by the less strongly developed, less pointed lateral crenulations at the bases of the elytra, by the less strongly elevated,

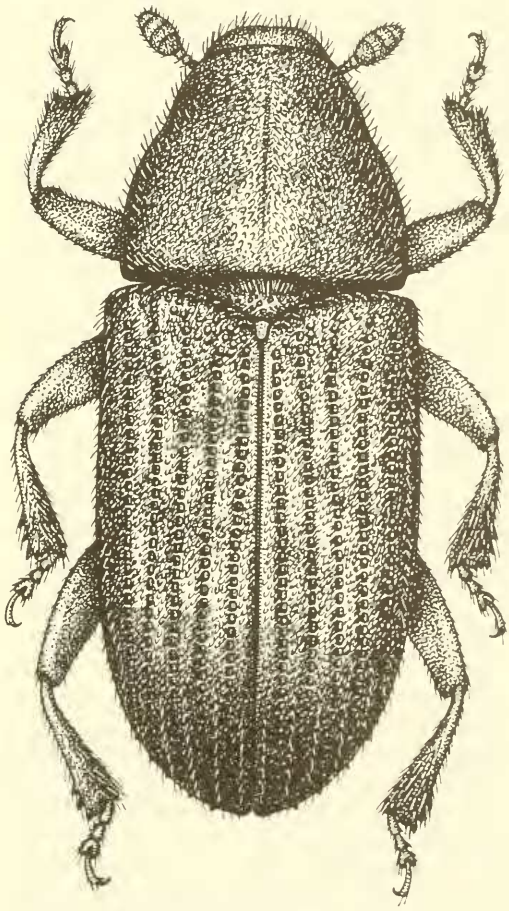


Fig. 52. *Pseudohylesinus n. nebulosus*: Dorsal aspect. (After Bright and Stark 1973:149.)

less strongly serrate declivital interstriae 9, by the shorter interstrial bristles, by the hosts, and by the transverse parental galleries.

MALE.— Length 2.8–3.7 mm, 2.2 times as long as wide; color very dark brown, with a variegated surface pattern formed by light and dark scales, light colored scales predominating.

Frons essentially as in *n. nebulosus* except transverse impression just above epistoma slightly deeper; frontal rectangle 1.0 times as long as wide. Pronotum essentially as in *n. nebulosus* except pale scales more evident.

Elytra 1.6 times as long as wide; outline as in *n. nebulosus* except more broadly rounded behind; basal crenulations not higher laterally or pointed; sculpture essentially as in *n. nebulosus* except interstrial tubercles more nearly transversely crenulate, declivity somewhat more broadly convex, with interstriae 1, 3, and 9 more feebly elevated; declivital tubercles on interstriae 3, 5, and 7 evidently averaging slightly larger; interstriae 2 as wide as 1 or 3, usually not impressed. Erect interstrial bristles short, their length equal to about half distance between rows of bristles. Pale scales predominate over tan and occasional darker scales.

FEMALE.— Similar to male except frons more strongly convex; frontal rectangle 0.90 times as long as wide; pronotal scales up to twice as long as wide, their margins tending to be fringed; elytral scales more elongate, distinctly less than twice as long as wide, their margins fringed.

DISTRIBUTION.— S Oregon to California.

USA: California: Numerous records from the counties of Amador, Eldorado, Fresno, Lassen, Madera, Mariposa, Modoc, Placer, Plumas, Shasta, Siskiyou, Tuolumne. Nevada: Washoe Co.

Intermediate specimens were from counties in **Oregon**: Harney, Jackson, Klamath.

HOSTS.— *Abies amabilis*, *A. concolor*, *A. grandis*, *A. maganifica*, and *Tsuga mertensiana*.

BIOLOGY.— Transverse parental galleries are constructed in the bole and larger limbs. One sample was taken from large roots.

NOTES.— The above treatment was based on 339 specimens.

There appears to be a clinal gradient in the color of this species beginning at the south end of the distribution where scales are a mixture of pale (almost white) and light tan. Toward northern California the patches of white scales become smaller in size as the tan scales increase in number and intensity of color, some of them being rather dark brown. In material from southern Oregon, the tan scales have entirely been replaced by dark brown scales. Specimens from central Oregon to Washington have the white scales reduced to smaller patches, with dark scales covering the remaining areas. Bright (1969:21), apparently arbitrarily, placed all specimens from *Abies procera* in a northern subspecies, *d. pullatus*, and all other material in a southern subspecies, *d. dispar*. His distribution map (p. 19), however, shows such extensive overlap, with almost no exclusive range for the northern race, that his argument for their continued recognition is virtually eliminated. However, as stated by Bright (p. 21), the northern and southern extremes are so strikingly different some recognition should be given to them. In view of the material before me, I follow Bright's division of the species and recognize all California specimens as *d. dispar*. Specimens from the southern third of Oregon exhibit a transition in pattern and color in which many individuals are not clearly assignable to either race. Specimens from central Oregon northward I assign to *d. pullatus*, although occasional specimens in a series are not as dark as one making an identification might wish.

4. *Pseudohylesinus dispar pullatus* Blackman

*Pseudohylesinus pullatus* Blackman, 1942, U.S. Dept. Agric. Misc. Publ. 461:9 (Holotype, female; Mount Rainier Nat. Pk., Washington; U.S. Nat. Mus., 54025)

*Pseudohylesinus dispar pullatus*: Bright, 1969, Univ. California Publ. Ent. 54:21.

DIAGNOSIS.— For distinguishing characters refer to the above key and to the taxonomic notes under *d. dispar* Blackman.

MALE.— Length 2.6–3.7 mm, 2.2 times as long as wide; color very dark brown, with surface color pattern of predominantly dark brown scales with small scattered patches of white scales.

As in *d. dispar* except for the scale color pattern.

FEMALE.— Similar to male except differing as female *d. dispar* differs from male.

DISTRIBUTION.— Central Oregon to British Columbia.

CANADA: **British Columbia**: Vancouver. USA: **Oregon** counties: Baker, Benton, Clackamas, Columbia, Douglas, Hood River, Lane, Linn, Umatilla. **Washington** counties: Pierce, Skamania.

HOSTS.— *Abies amabilis*, *A. grandis*, and *A. procera*.

NOTES.— The above treatment was based on the holotype, on several paratypes, and on 54 other specimens. The status of this subspecies is discussed under *d. dispar*.

### 5. *Pseudohylesinus magnus* Wood

*Pseudohylesinus magnus* Wood, 1956, Canadian Ent. 88:247 (Holotype, female; 25 miles or 40 km W Ciudad Hidalgo, Michoacán, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— The large size, the black color, and the rugose-reticulate inner surface of the strial punctures distinguish this species from other representatives of the genus.

MALE.— Length 4.4–5.8 mm, 2.3 times as long as wide; color black, with surface pattern of predominantly black scales and small patches of white scales.

Frons broadly, evenly convex above, lower half more nearly flattened below weak, arcuately, transversely impressed line, rather strongly, transversely impressed just above epistoma; a fine, subacutely elevated median carina on lower half; vestiture of rather short, coarse, moderately abundant hair, on upper half intermixed with scales; frontal rectangle 1.0 times as long as wide. Segment 1 of antennal club only slightly longer than 2 or 3.

Pronotum 0.82 times as long as wide; widest at base, sides weakly arcuate, converging only slightly before rather strong constriction just behind broadly rounded anterior margin; surface with dense, small, moderately deep punctures, except subgranulate on anterior fifth, partly obscured by scales. Vestiture of moderately abundant black scales, with small patches of white scales toward base; each scale about twice as long as wide.

Elytra 1.6 times as long as wide, 2.4 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather broadly rounded behind; anterior margins each armed by about 12 low crenulations; striae rather weakly impressed, punctures moderately large, deep, their interiors conspicuously rugose-reticulate; interstriae about one and one-half times as wide as striae, crenulations much as in other species but small, narrow, punctures small, deep, rather abundant. Declivity convex, steep; interstriae 1, 3, and 9 weakly convex toward apex, otherwise essentially as on disc. Interstriae covered by abundant scales, each scale about twice as long as wide; erect interstrial bristles rather stout, half as long as distance between rows.

FEMALE.— Similar to male except frons less strongly convex, scales absent from upper frons but present on vertex; scales evidently always absent from pronotal disc; elytral scales slightly smaller, evidently more abundant.

DISTRIBUTION.— Michoacán.

MEXICO: **Michoacán**: 25 miles or 40 km W Ciudad Hidalgo, 15-VII-53, 2900 m, *Abies religiosa*, S. L. Wood; 33 miles or 53 km E Morelia, 14-VI-65, 3000 m, No. 48, *A. religiosa*, S. L. Wood.

HOST.— *Abies religiosa*.

BIOLOGY.— The lower bole of very large trees is selected for attack. This species is aggressive and probably is capable of killing overmature trees. The transverse parental galleries are straight and longer than in other species. After this species was well established it was joined by the less aggressive *variegatus* (Blandford). Larval mines evidently wander as in other species; only first instar larvae were observed.

NOTES.— The above treatment was based on two female paratypes and on 34 other specimens.

### 6. *Pseudohylesinus maculosus* Blackman

*Pseudohylesinus maculosus* Blackman, 1942, U.S. Dept. Agric. Misc. Publ. 461:12 (Holotype, female; Chiricahua Mts., Arizona; U.S. Nat. Mus., 54027)

DIAGNOSIS.— This species superficially resembles *sericeus* (Mannerheim), to which it is not closely related; it is distinguished by characters presented in the above key.

MALE.— Length 2.7–3.8 mm, 2.2 times as long as wide; color dark brown, with a variegated surface pattern of pale, tan, and brown scales.

Frons with general contours as in *magnus* Wood except lower half slightly more convex; surface shining, punctures rather coarse, close, deep, only slightly smaller on lower half; vestiture of short, moderately abundant hair; frontal rectangle 1.0 times as long as

wide. Antennal club similar to but more elongate than in *dispar* Blackman.

Pronotum 0.82 times as long as wide; outline and surface about as in *magnus* except disc more convex, median line evident; scales large, moderately abundant, each about twice as long as wide.

Elytra 1.6 times as long as wide, 2.4 times as long as pronotum; outline as in *magnus*; basal margins each armed by 12 crenulations, lateral ones slightly higher; striae slightly impressed, punctures rather large, deep; interstriae about one and one-half times as wide as striae, crenulations coarse, high, those at bases of 2–4 larger, confused, uniseriate on bases of 5 and 6, punctures fine, deep, rather abundant. Declivity rather steep, convex; interstriae about equally, weakly convex except 9 slightly higher, 2 slightly depressed; crenulations modified to slender, rather widely spaced denticles, denticles slightly larger on odd-numbered interstriae. Vestiture of ground cover of abundant scales, each only slightly longer than wide, pale and brown about equal in numbers, arranged in irregular patches, a few tan scales on some specimens; bristles short, rather stout, each about half as long as distance between rows, bristles present on declivital interstriae 2.

FEMALE.— Similar to male except frons more strongly convex; pronotal scales less abundant, each about four times as long as wide, many of them subpalmately subplumose.

DISTRIBUTION.— Utah to Arizona and New Mexico.

USA: Arizona: Grand Canyon N. P., 30-V-69, *A. lasiocarpa*, W. G. Harwood; Jacob's Lake, 31-V-69, *A. concolor*, *A. lasiocarpa*, W. G. Harwood; Graham Mts., 28-VII-33, lot 64, Parker; Grand Canyon; Mt. Lemon, Pima Co., 5-VIII-68, *A. lasiocarpa*, D. E. Bright; Rustler's Pk, Chiricahua Mts., 7-VI-69, *A. concolor*, S. L. Wood; Miller Canyon, Huachuca Mts., 7-VI-69, *A. concolor*, S. L. Wood. Pinaleno Mts., 15-VII-68, *A. concolor*, D. E. Bright; Santa Catalina Mts., 5-VIII-68, *A. concolor*, D. E. Bright. New Mexico: Cloudcroft, 2-VI-69, 2900 m, No. 58, *A. concolor*, S. L. Wood. Utah: Payson Canyon, 25-VII-62, *Abies concolor*, S. L. Wood; Beaver, 22-IV-50, *A. concolor*, S. L. Wood.

HOSTS.— *Abies concolor*, rare in *A. lasiocarpa*.

BIOLOGY.— The bole of fallen, cut, or unthrifty trees is selected for attack. Parental tunnels are transverse. They are found most commonly at the butt of dying standing trees. They can reproduce in Alpine fir, but probably cannot sustain a breeding population in it.

NOTES.— The above treatment was based on the holotype and on 124 other specimens.

Bright (1969:22) treated *maculosus* as a synonym of *variegatus* (Blandford), but included (p. 37) a note from my observations suggesting a need for further study of these forms. In view of the very slight anatomical differences presented above, including the distinctly smaller average size, and the difference in larval habits, I prefer to recognize them as specifically distinct. The larval mines in *maculosus* are always exposed at the cambium on the surface of peeled bark; they are comparatively short and wander rather indiscriminantly.

### 7. *Pseudohylesinus variegatus* (Blandford)

*Hylastes variegatus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):145 (Holotype, female, erroneously said to have come from Volcán de Chiriquí, Panama; British Mus. Nat. Hist.)

*Pseudohylesinus mexicanus* Blackman, 1942, U.S. Dept. Agric. Misc. Pub. 461:13 (Holotype, female; Distrito Federal, Mexico: U.S. Nat. Mus., 54028); Bright and Stark, 1973, Univ. California Pub. Ent. 54:22. *Synonymy*

DIAGNOSIS.— This species is very similar to *maculosus* Blackman, but it is distinguished by the larger average size, by the more abundant, confused, submarginal crenulations at the bases of interstriae 5 and 6, by the more finely, more shallowly punctured lower half of the frons, by the slightly smaller, more rounded interstrial tubercles on the declivity, and by the xylophagous mining habit of the larger larvae.

MALE.— Length 3.4–4.5 mm, 2.2 times as long as wide; color dark brown, with a variegated surface pattern of pale to tan and dark brown scales.

In addition to characters mentioned in the above diagnosis, this species differs from *maculosus* in having some scalelike setae on upper half of frons; and more dark brown scales present on elytra.

FEMALE.— Similar to male except frons more strongly convex; scalelike setae absent from upper half of frons; pronotal scales mostly abraded, each about four times as long as wide, mostly subpalmately

subplumose; interstrial scales largely abraded,more slender, mostly subplumose.

DISTRIBUTION.— Michoacán to Tlaxcala and Oaxaca.

MEXICO: **Hidalgo**: El Chico, Pachuca. **Mexico**: 6 km W Río Frío, 14-VII-53, *Abies religiosa*, S. L. Wood. **Michoacán**: 33 miles or 53 km E Morelia, 14-VI-65, 3000 m, No. 48, *A. religiosa*, S. L. Wood. **Nuevo León**: Cerro Potosí, 3-V-71, 3300 m, *Abies*, D. E. Bright. **Oaxaca**: 53 miles or 85 km S Valle Nacional, 24-V-71, *Abies religiosa*, D. E. Bright. **Tlaxcala**: 18 km N Tlaxco, 2900 m, No. 21, *A. religiosa*, S. L. Wood.

HOST.— *Abies religiosa.*

BIOLOGY.— This species was common in the bole of large fallen, cut, and unthrifty trees. The parental galleries are transverse and rather long. Larval mines are almost straight, very long and parallel to the grain of wood; for about half their length they are visible in the phloem on the surface of peeled bark, then they turn abruptly into the wood. The remaining half of their length is about 1 cm below the wood surface and parallel to the fibers; pupation occurs in the wood.

NOTES.— The above treatment was based on 123 specimens.

The holotype is labeled Volcan de Chiriqui, Panama, but *Abies* does not grow south of Honduras. This specimen probably came from southern Mexico or Guatemala.

### 8. *Pseudohylesinus granulatus* (LeConte)

*Hylastes granulatus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:175 (Holotype, male; blue disk signifying Oregon; Mus. Comp. Zool., 956)

*Pseudohylesinus granulatus*: Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14 (2):74

DIAGNOSIS.— This species is distinguished from *tsugae* Swaine by the larger size, by the larger, deeper, subasperate, pronotal punctures, and by the more slender body form.

MALE.— Length 4.0–5.4 mm, 2.2–2.4 times as long as wide; color dark brown, with a sparse covering of light and dark scales.

Frons about as in *maculosus* Blackman except more elongate, punctures somewhat coarser, impressed area above epistoma slightly stronger and more extensive; frontal rectangle 1.1 times as long as wide. Segment 1 of antennal club as long as 2 and 3 combined.

Pronotum 0.88 times as long as wide; widest just behind middle, sides on basal two-thirds rather strongly arcuate, rather strongly constricted on anterior third, broadly rounded in front; surface shining, rather coarsely, closely, deeply punctured, lateral margins of most punctures at least weakly subasperate. Vestiture of sparse, short, rather stout hair; a few scales at base, each about four times as long as wide.

Elytra 1.6 times as long as wide, 2.2 times as long as pronotum; outline about as in *maculosus*; striae weakly impressed, punctures rather coarse, very deep, smaller toward base; interstriae about as wide as striae, weakly convex, each armed by a row of coarse, tuberculate crenulations, crenulations confused toward base on 2–5, punctures fine, subgranulate, confused, moderately abundant. Declivity steep, convex; interstriae 1, 3, and 9 rather weakly convex, 2 depressed, fine tubercles on odd-numbered interstriae. Vestiture of sparse, slender scales, each about four times as long as wide, more abundant on declivity; erect bristles rather short, stout, each about half as long as distance between rows, absent on 2 on declivity.

FEMALE.— Similar to male except frons more strongly convex; pronotum devoid of scales; scales on elytral disc largely abraded.

DISTRIBUTION.— Alaska to California.

ALASKA: "Nauacin." CANADA: **British Columbia**: Bowser, Nonausco, Steelhead, 12 miles or 19 km S Tofino. USA: **California**: Alpine Lake, Badger Pass, Carmel, Chester, Cisco, Eldorado Co., Eureka, Facht, Fallen Leaf Lake, Fieldbrook, Giant Forest in Tulare Co., Humboldt Co., Kaweah, King's River in Fresno Co., Meadow Valley in Plumas Co., Mendocino Co., Philips, Placer Co., Sequoia N. P., Shingletown, Trinidad, Tuolumne Co., Yosemite Valley. **Idaho**: Couer d'Alene, Moscow. **Oregon**: Blue Mts., Bly, Branden, Cannon Beach, Corvallis, Hood River, Mary's Peak, Odell Lake, Prineville, Santiam Junction, Stayton, Sweet Home in Linn Co. **Washington**: Carlyon Beach, Clear Lake, Kanaskut, La Grande, Lyman, Mineral, Moclips, Mt. Rainier, Seattle, Satsop.

HOSTS.— *Abies amabilis, A. grandis, A. lasiocarpa, A. magnifica, A. procer,* and *Tsuga Heterophylla.*

BIOLOGY.— This species constructs transverse parental galleries at the base of unthrifty standing trees or near the ground in large cut or fallen trees.

NOTES.— The above treatment was based on the male holotype and on 94 other specimens.

### 9. *Pseudohylesinus tsugae* Swaine

*Pseudohylesinus tsugae* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):11 (Holotype, female; Vancouver, British Columbia; Canadian Nat. Coll., 9338)

*Pseudohylesinus obesus* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):15 (Holotype, female; Inverness, British Columbia; Canadian Nat. Coll., 9341); Bright, 1969, Univ. California Publ. Ent. 54:25. *Synonymy*

*Pseudohylesinus keeni* Blackman, 1942, U.S. Dept. Agric. Misc. Publ. 461:17 (Holotype, female; Cannon Beach, Oregon; U.S. Nat. Mus., 20569); Bright, 1969, Univ. California Publ. Ent. 54:25. *Synonymy*

*Pseudohylesinus similis* Blackman, 1942, U.S. Dept. Agric. Misc. Publ. 461:18 (Holotype, female; Paradise Valley, Washington; U.S. Nat. Mus., 54030); Bright, 1969, Univ. California Publ. Ent. 54:25. *Synonymy*

DIAGNOSIS.— This species is allied to *granulatus* (LeConte), but it is distinguished by the smaller size, by the stouter body, by the smoother, more finely punctured pronotum, by the narrower striae, and by the slender interstrial bristles.

MALE.— Length 2.6–4.0 mm, 2.0–2.1 times as long as wide; color dark reddish brown, with an obscure surface pattern of pale and dark cinereus scales.

Frons more broadly convex than in *granulatus*, with transverse, arcuate impression near middle stronger, carina higher; frontal rectangle 1.1 times as long as wide. Segment 1 of antennal club much longer than either 2 or 3.

Pronotum 0.76 times as long as wide; widest near base, sides moderately arcuate on posterior two-thirds, strongly constricted on anterior fourth, broadly rounded in front; surface shining, punctures moderately small, dense, rather deep, their lateral margins usually not at all granulate. Vestiture of very slender, pale scales, each at least eight times as long as wide, and slightly longer, suberect hair of about equal abundance.

Elytra 1.5 times as long as wide, 2.2 times as long as pronotum; outline about as in *maculosus* Blackman; striae distinctly impressed, punctures rather small, very deep; interstriae twice as wide as striae, distinctly convex, crenulations rather fine, confused toward base on 2–7, punctures minute, confused, subgranulate, rather abundant. Declivity steep, convex; essentially as in *granulatus*. Vestiture of abundant ground cover of small scales, each about twice as long as wide, mostly pale, with darker areas; interstrial bristles fine, length very slightly more than half as great as distance between rows.

FEMALE.— Similar to male except frons slightly more strongly convex; pronotum devoid of scales except for a few palmately pulmose scales at base; elytral scales much less abundant (usually abraded), each about four to six times as long as wide.

DISTRIBUTION.— S Alaska to N California.

ALASKA: Juneau. CANADA: **British Columbia**: Bowser, Duncan, Emerald Mine, Grouse Mt., Inverness, Mt. Mahleach, Nanaimo, Stanley Park, Steelhead, Vancouver, Victoria, Whonnock Lake. USA: **California**: Crescent City, Fieldbrook. **Oregon**: Astoria, Batterson, Boyer, Cannon Beach, Clatsop, Corvallis, Crater Lake, Gold Lake, Marchfield, Marion Forks, Mary's Peak, Mohler, Reedsport, Waldport. **Washington**: Concrete, Glacier, Hoquiam, Mountlake Terrace, Naselle, Paradise Valley, Sappho, White River.

HOST.— *Tsuga heterophylla*, *T. mertensiana*, and less commonly in *Abies procera*.

BIOLOGY.— The parental galleries are basically transverse. These beetles attack the bole and limbs as small as 5 cm in diameter. They normally attack cut, broken, or fallen trees.

NOTES.— The above treatment was based on the holotypes of *tsugae*, *obesus*, *similis*, and *keeni*, and on 126 other specimens.

### 10. *Pseudohylesinus nobilis* Swaine

*Pseudohylesinus nobilis* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):12 (Lectotype, female; Santiam N. F., Oregon; Canadian Nat. Coll., 9340, designated by Bright, 1967, Canadian Ent. 99:679)

*Pseudohylesinus furnissi* Blackman, 1942, U.S. Dept. Agric. Misc. Publ. 461:21 (Holotype, female; Mount Rainier N. P., Washington; U.S. Nat. Mus., 54031); Bright, 1969, Univ. California Publ. Ent. 54:27. *Synonymy*

DIAGNOSIS.— This species is distinguished from *sericeus* (Mannerheim) by the more slender scales on the pronotum.

FEMALE.— Length 2.7–3.8 mm, 2.1 times as long as wide; as in *sericeus* except pronotal scales slender, varying from almost hairlike to about eight times as long as wide, except stouter near scutellum; strial punctures tending to be larger (not consistent).

MALE.— Similar to male *sericeus* except pronotal scales two to six times as long as wide, their apices usually not palmately divided.

DISTRIBUTION.— Oregon and Washington. USA: **Oregon**: Bandon, *Abies amabilis*; Crater Lake N. P., *A. amabilis*; Gold Lake, Willamette N. F., 16-VI-61, *A. amabilis*, S. L. Wood; Lost Lake, Hood River Co., 25-VII-64, *A. amabilis*, D. E. Bright; Mary's Peak, Siuslaw N. F., 19-VI-61, *A. procera*, S. L. Wood; Mt. Hood; Santiam Pass, Linn Co., 19-VI-61, *A. amabilis*, S. L. Wood. **Washington**: Easton; Longmire, 23-V-35, Hopk. U.S. 20579-A, *A. amabilis*, F. P. Keen; Mt. Rainier N. P., *A. procera*; Spirit Lake, *A. amabilis*; White Pass, Yakima Co., 20-VIII-62, *A. grandis*, D. E. Bright; White River; Yakima Park.

HOSTS.— *Abies amabilis*, and *A. procera*.

BIOLOGY.— Basically as in *sericeus*, but the parental galleries vary from transverse to subvertical.

NOTES.— This species is exceedingly difficult to distinguish from *sericeus*. Both species vary considerably and often cannot be recognized unless series are available for study. The above treatment was based on the holotype of *nobilis*, on my homotype, on two specimens from Blackman's series, on four from Bright's series, and on 209 other specimens. At the time the holotype of *furnissi* was examined I did not regard *nobilis* as a distinct species; consequently, I rely on Bright's (1969:28) synonymy for treatment of this name.

### 11. *Pseudohylesinus sericeus* (Mannerheim)

*Hylurgus sericeus* Mannerheim, 1843, Moskov. Obshch. Isp. Prirody, Otd. Biol. Biul. (Bull Soc. Imp. Nat. Moscou) 16(2):296 (reprint p. 124) (Holotype, female; Sitka, Alaska; Univ. Zool. Mus., Helsinki)

*Pseudohylesinus sericeus*: Wood, 1969, Great Basin Nat. 29:116, 31:69

*Pseudohylesinus grandis* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):13 (Lectotype, female; Saanichton, British Columbia; Canadian Nat. Coll., 9339, designated by Bright, 1967, Canadian Ent. 99:679); Wood, 1969, Great Basin Nat. 29:116. *Synonymy*

*Pseudohylesinus yasumatsui* Nobuchi, 1971, Bull. Gov. For. Expt. Sta., Tokyo 238:160 (Holotype, male; Takanishi, Nagano, Japan; Gov. For. Expt. Sta., Tokyo); Wood, 1977, Great Basin Nat. 37:387. *Synonymy*

DIAGNOSIS.— This species is distinguished from *sitchensis* Swaine by the broader frontal rectangle in both sexes, with the arcuate, transverse impression poorly developed, by the much stouter, discal, interstrial scales on the female, and by the more numerous, confused, interstrial crenulations at the base of the elytra. It is distinguished from *nobilis* Swaine by the stouter pronotal scales.

MALE.— Length 2.4–3.3 mm, 2.1 times as long as wide; color dark brown, with a variegated surface pattern of pale and of dark brown scales.

Frons broadly convex above, somewhat flattened below, but not impressed on arcuate line; surface very slightly more rugose than *granulatus* (LeConte) or *tsugae* Swaine; vestiture of moderately coarse, rather short hair. Segment 1 of antennal club as long as 2 and 3 combined.

Pronotum 0.77 times as long as wide; essentially as in *maculosus* Blackman; scales on disc about one and one-half times as long as wide; much more slender near anterior margin.

Elytra 1.5 times as long as wide, 2.2 times as long as pronotum; outline essentially as in *maculosus*; striae rather narrowly impressed; punctures moderately coarse, deep; interstriae about twice as wide as striae, moderately convex, crenulations rather small, subtuberculate, at bases of 2–4 rather crowded, confused. Declivity as in *maculosus* except interstriae 1, 3, and 9 usually more strongly convex, 2 somewhat depressed and devoid of tubercles and bristles. Scales ovate to subcircular, each slightly longer than wide, abundant; bristles stout, half as long as distance between rows.

FEMALE.— Similar to male except frons more strongly convex, frontal rectangle 0.95 times as long as wide; pronotal scales about two to six times as long as wide, mostly subpalmately subplumose; elytral scales one and one-half to two times as long as wide (up to four times as long as wide near suture on basal half of disc), widest at or beyond their middle, their apices broadly rounded.

DISTRIBUTION.— Alaska to central California.

ALASKA: "Sitka." CANADA: **British Columbia**: Bear Lake near Pender Harbor, Dog Lake near Penticton, Garibaldy Park near Haney, Grouse Mt. near Vancouver, Lake Cowichan, Massett, Matacatla, Mission City, Pender Harbor, Queen Charlotte Islands, Saanichton, Sidney, Stanley Park, Steelhead, Vancouver, Wellington. USA: **California**: Carson Ck. in Marin Co., Crescent City, Duncan Mills, Facht, Ferndale, Ft. Bragg, Gasquet, Grassy Lake Humboldt Co., Inverness, Klamath, Lagunitas, Lake Pilarcitas in San Mateo Co., Mt. Tamalpais, Noyo River in Mendocino Co., Orick, Paraiso Hot Springs, San Francisco, Santa Cruz Mts., Warner Mts., in Modoc Co. **Oregon**: Alsea, Ashland, Astoria, Bear Springs, Bly, Boyer, Cannon Beach, Corvallis, Crater Lake N. P., Diamond Lake, Florence,

Glenada, Junction City, Lake of the Woods, Lost Lake, Marshfield, Mary's Peak, McMinnville, Myrtle's Point, Otis, Pinehurst, Pistol River in Curry Co., Santiam Junction, Santiam N. F., Santiam Pass, Scio, Taft, Waldport, Willamette Pass. **Washington**: American Lake, Bruce Port, Chase Lake, Clear Lake, Forks, Lake Crescent, Longimire, Loveland, Mt. Rainier N. P., Nancotta, Naselle, Puget, Puyallup, Quinault, Seattle.

HOSTS.— *Abies amabilis*, *A. grandis*, *A. procera*, *Pseudotsuga menziesii*, and *Tsuga heterophylla*.

BIOLOGY.— The somewhat variable transverse parental tunnels are cut in the limbs and bole of unthrifty, cut, or fallen trees.

NOTES.— The above treatment was based on the holotypes, on my homotypes of *sericeus*, *grandis*, *furnissi*, and *yasumatsui*, and on 319 other specimens.

Confusion concerning the identity of this species resulted when the specimen, not a type, under this name in the LeConte collection was thought to be correctly determined. The LeConte specimen and the species treated as *sericeus* by Swaine (1917, 1918), Blackman (1942), and Bright (1969) were transferred to *pini* Wood (1969, 1971).

### 12. *Pseudohylesinus sitchensis* Swaine
Fig. 54

*Pseudohylesinus sitchensis* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):12 (Holotype, male; Menzies Bay, Vancouver Island, British Columbia; Canadian Nat. Coll., 9342)

DIAGNOSIS.— This species is distinguished from *sericeus* (Mannerheim) by the less crowded basal crenulations that are almost always uniseriate to the base on interstriae 2, 4, and 5, by the much more slender, nonplumose (except on extreme basal margin) setae on the female pronotum, by the more slender interstrial scales in the female, by the stronger, transverse, frontal impression, and by the narrower frontal rectangle.

MALE.— Length 2.5–3.1 mm, 2.2 times as long as wide; color as in *sericeus*.

Frons as in *sericeus* except transverse impression near middle of frons much stronger; frontal rectangle 1.20 times as long as wide.

Pronotum 0.86 times as long as wide; as in *sericeus* except scales about two to three times as long as wide on disc, more slender near anterior margin.

Elytra as in *sericeus* except crenulations at bases of interstriae 2, 4, and 5 almost always uniseriate; scales on disc two to three times as long as wide; interstrial bristles almost as long as distance between rows.

FEMALE.— Similar to male except frontal rectangle 1.03 times as long as wide; pronotal scales very slender, about eight or more times as long as wide, not subplumose except near basal margin; interstrial scales on disc each about four times as long as wide, widest near its base and tapered toward its apex.

DISTRIBUTION.— Alaska to N California.






Fig. 53. *Pseudohylesinus n. nebulosus*: Antenna of female.

Fig. 54. *Pseudohylesinus sitchensis*: Antenna of male.

ALASKA: Afognak Isl., Juneau, Prince of Wales Isl. CANADA: **British Columbia**: Menzies Bay, Port Renfrew. USA: **California**: Crescent City, Delnorte, Eureka, Klamath, Trinidad. **Oregon**: Cannon Beach, Mt. Hood, Marshfield, Otis, Seaside. **Washington**: Hoquiam.

HOST.— *Picea sitchensis.*

BIOLOGY.— The parental galleries are longitudinal and lack a nuptial chamber. The bole of cut and fallen trees is selected for attack.

NOTES.— The above treatment was based on the holotype and on 79 other specimens.

### 13. *Pseudohylesinus pini* Wood

*Pseudohylesinus pini* Wood, 1969, Great Basin Nat. 29:122 (Holotype, female; Pacific Grove, California, Wood Colk)

DIAGNOSIS.— This species is very similar to *sitchensis* Swaine, but it is distinguished by scale characters presented in the following description.

MALE.— Length 2.2–2.8 mm, 2.2 times as long as wide; color dark brown with a variegated surface pattern of pale and or dark brown scales.

Frons as in *sitchensis* except transverse impression stronger; frontal, rectangle 1.4 times as long as wide. Pronotum as in *sitchensis* except scales broadly oval, each very slightly longer than wide. Elytra as in *sitchensis* except interstrial crenulations slightly smaller, discal scales subcircular, each about one to one and one-half times as long as wide.

FEMALE.— Similar to male except frontal impression less well developed; frontal rectangle 1.06 times as long as wide; discal interstrial scales each one and one-half to two times as long as wide, widest at their middle, apical end rather broadly rounded.

DISTRIBUTION.— British Columbia to central California.

CANADA: **British Columbia**: Massett; Metlaktla. USA: **California**: Albion, 9-VI-62, *Pinus muricata*; Carmel, 5-IV-25, *P. radiata*, F. O. Ballon; Carson Ck. in Marin Co.; Cypress Ridge in Marin Co.; Mendocino; Monterey, 2-IX-30, *P. radiata*; Pacific Grove, 12-XII-23, *P. radiata*; San Francisco; San Mateo; 14 miles N and 18 miles N Santa Cruz, *P. radiata*. **Oregon**: Florence, 20-VI-64, *P. contorta*, D. E. Bright; Glenada; Lane Co., *P. contorta*; Newport; Sand Lake; Seaside. **Washington**: Westport.

HOSTS.— *Pinus contorta*, *P. muricata*, and *P. radiata*.

BIOLOGY.— The longitudinal parental galleries normally have a nuptial chamber. Presumably they attack the same types of host material as *sitchensis*.

NOTES.— The above treatment was based on the type series of 4 specimens and on 46 other specimens. Prior to 1969 it was treated under the name *sericeus*.

## GENUS *HYLURGOPINUS* SWAINE

*Hylurgopinus* Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):74 (Type-species: *Hylastes rufipes* Eichhoff, monobasic)

DIAGNOSIS.— This genus is allied to *Pseudohylesinus* and *Dendroctonus*, from which it is easily distinguished by septate sutures 1 and 2 in the antennal club, by the long, straight, transversely elevated epistomal process above the premandibular lobe, by the small size, and by many other characters.

DESCRIPTION.— Length 2.2–2.5 mm, 2.3 times as long as wide; color dark brown. Frons convex; epistomal process broad, overriding epistomal margin. Eye elongate-oval, entire. Antennal scape rather short, not reaching posterior margin of eye; funicle 7-segmented; club conate, slightly flattened, sutures 1 and 2 septate, sutures 1, 2, and 3 marked by rows of setae. Scutellum small, transversely oval. Elytral bases armed by a row of moderately high, overlapping crenulations; elytra striae conservatively sculptured. Vestiture of stout, almost scalelike ground setae and a row of erect bristles on each interstriae. Fore coxae rather widely separated; precoxal lateral ridge of prothoracic sternum obsolete. Third tarsal segments broad, somewhat bilobed. Declivital armature poorly developed.

DISTRIBUTION.— One species occurs east of the Rocky Mountains in temperate North America.

BIOLOGY.— Cut or dying boles and limbs of various elms are selected for attack. The biramous parental galleries usually are transverse or primarily so; they are primarily in the phloem tissues but may engrave the wood slightly. The larval mines are also in the phloem and are exposed on peeled bark; they tend to follow the grain of the wood.

### *Hylurgopinus rufipes* Eichhoff
Fig. 55

*Hylastes rufipes* Eichhoff, 1868 (May), Berliner Ent. Zeitschr. 12:147 (Lectotype, sex?; Carolina; U.S. Nat. Mus., 53824, present designation)

*Hylesinus opaculus* LeConte, 1868 (September), Trans. Amer. Ent. Soc. 2:170 (Two syntypes; Pennsylvania; Mus. Comp. Zool.); Schwarz, 1896, Proc. U.S. Nat. Mus. 18:606. *Synonymy*

*Hylurgops rufipes*: LeConte, 1876, Proc. Amer. Philos. Soc. 15:390.

*Hylurgopinus rufipes*: Swaine, 1918, Dom. Canada Dept. Agr. Ent. Br. Tech. Bull. 14(2):74

DIAGNOSIS.— Although not closely related, this species frequently is confused with *Hylastinus obscurus* (Marsham). This species is easily distinguished from it by the long, straight, elevated epistomal process that partly overlays the epistomal margin and by the absence of an elevated ridge between each prothoracic coxa and the anterior margin of the pronotum.

FEMALE.— Length 2.2–2.5 mm, 2.3 times as long as wide; color dark brown.

Frons convex from vertex to weak transverse impression immediately above epistomal process; epistomal process smooth, slightly elevated, straight; premandibular median epistomal lobe large, depressed below level of epistomal process, its lateral extremities overridden by or merged with epistomal process; surface smooth, shining between punctures, coarsely, very closely, rather shallowly punctured, flattened inner surface of punctures with obscure indications of reticulation; vestiture fine, short, inconspicuous, hairlike, except a conspicuous tuft along lower margin of epistomal process.

Pronotum 0.84 times as long as wide; widest toward base, sides almost parallel on basal half but weakly arcuate, narrowed, and moderately constricted just behind rather broadly rounded anterior margin; surface unarmed, smooth, shining, punctures coarse, very close, deep, interspaces not wider than half diameter of a puncture; vestiture consisting of short, semirecumbent, stout, almost scalelike setae, and slightly longer, erect bristles.

Elytra 1.5 times as long as wide, 2.0 times as long as pronotum; sides almost straight and parallel on basal two-thirds to declivital base, rather broadly rounded behind; striae slightly impressed, punctures coarse, deep; interstriae slightly narrower than striae, convex, punctures coarse, deep; interstriae slightly narrower than striae, convex, punctures tuberculate (narrow crenulations), uniseriate except somewhat confused on basal half of 3; two or three tubercles at base of each interstriae (except 1) enlarged to form small submarginal crenulations. Declivity convex, steep; striae wider than on disc, interstriae more strongly convex, with tubercles larger, pointed. Vestiture consisting of short, stout, almost scalelike setae each about five or six times as long as wide, and rows of stout erect bristles each about twice as long as ground vestiture; both types of setae extend to base.

MALE.— Apparently identical to female except for differences in posterior abdominal terga.

DISTRIBUTION.— SE Manitoba, S Quebec, and Maine to Kansas, Mississippi, and Alabama.

CANADA: SE Manitoba, S Ontario, S Quebec. USA: Alabama, Connecticut, Delaware, District of Columbia, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Pennsylvania, Rhode Island, Tennessee, Vermont, Virginia, West Virginia.

HOSTS.— *Ulmus* spp.; records also exist from *Fraxinus*, *Prunus*, and *Tilia*, although these attacks undoubtedly resulted from abnormal conditions.

BIOLOGY.— Cut or dying limbs or bole of the host are selected for attack. They overwinter either as larvae or adults that complete development and emerge in the spring. They emerge in May and fly to living trees, where they feed briefly before seeking a

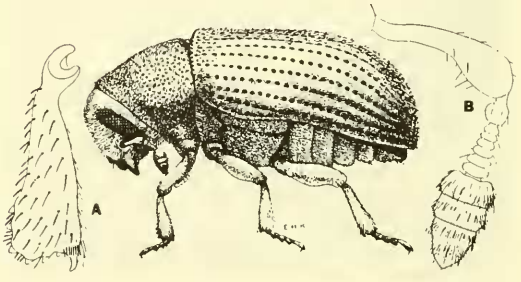



Fig. 55. *Hylurgopinus opaculus*: Lateral aspect of adult; A, anterior face of left protibia; B, posterior face of left antenna. (After Kaston 1936:614.)

dying tree. The monogamous beetles construct transverse or somewhat oblique, biramous tunnels in the cambium region, scoring the wood lightly. The eggs are deposited in niches along margins of the egg galleries and the larvae radiate out from them in the general direction away from the parental tunnels and parallel to the grain of the wood. There appear to be up to two generations each year in the south, but only one in the north. This species is not aggressive in its attacks and had limited economic importance prior to the introduction of Dutch Elm disease. Since then it has been studied rather intensively.

NOTES.— Because the loss of the Hamburg Museum evidently destroyed all other syntypes, the syntype labeled with a small blue paper triangle, with "rufipes, Carolina, Germar," with "no. 4," with a red "cotype" label no. "53824," and with "Hylastes rufipes Eichhoff, type, = Hylastes opaculus" in the U.S. National Museum, is here designated as the lectotype of this species. In addition to the lectotype of *rufipes*, the two syntypes of *opaculus* and 321 other specimens were used to prepare the above treatment.

The priority of the name *opaculus* over *rufipes* was pointed out by Blandford (1898:5) and Wood (1979). Rabaglia and Lanier (1981), in an attempt to correct the error in priority, contributed additional confusion. The name *rufipes* was validated in May 1868, *opaculus* in September 1868.

## GENUS *XYLECHINUS* CHAPUIS

*Xylechinus* Chapuis, 1869, Synopsis des Scolytides, p. 36 (Type-species: *Hylesinus pilosus* Ratzeburg, monobasic)

DIAGNOSIS.— This genus is very closely allied to *Pseudohylesinus* Swaine and *Xylechinosoma* Schedl, but it may be distinguished by the 5-segmented antennal funicle and by the shallowly emarginate eye; it also exhibits prothoracic precoxal ridges, although these are obscure in the North American and European species.

DESCRIPTION.— Length 1.5–3.5 mm, 2.0–2.4 times as long as wide; frons flat to weakly convex, sculpture simple, usually with a median carina on lower half. Eye distinctly sinuate to shallowly emarginate; elongate. Antennal scape rather short, not extending to posterior margin of eye; funicle 5-segmented; club rather small, symmetrical to slightly asymmetrical, slightly flattened, distinctly longer than wide, with three sutures marked by rows of setae. Pronotum unarmed, punctured. Scutellum small, round; elytral margins armed by one row of rather coarse crenulations; elytra striate, punctures coarse; interstriae variously punctured; declivity convex, rather simply sculptured. Vestiture consisting of an abundant ground cover of small scales and rows of longer, erect bristles. Prothoracic precoxal ridge varying from prominent to absent. Third tarsal segments bilobed.

DISTRIBUTION.— Worldwide. More than 20 species have been described, about two-thirds of them from tropical America; 2 species occur in Canada and the United States, 8 species occur in Mexico and Central America.

BIOLOGY.— All the species treated here are monogamous and cut transverse, biramous, parental tunnels in the cambium region of the host tree, engraving the wood rather deeply. The larval tunnels are almost entirely in the phloem tissues, where they appear to wander at random.

### Key to the Species of *Xylechinus*

1. Declivital interstriae 2 narrowed, impressed, bearing a row of low tubercles on its lateral side, and devoid of row of bristles; Guatemala; 3.0 mm ..... 1. ***scabiosus*** **Blandford**

– Declivital interstriae 2 similar to 1 and 3, usually bearing similar bristles ..... 2

2(1). Base of discal interstriae 2 to 5 each bearing two or more submarginal crenulations; row of elytral bristles of setae not longer than distance between rows; Costa Rica; *Oreopanax nubigenus*; 2.4–3.3 mm ..... 2. ***avarus*** **Wood**

– Discal interstriae devoid of submarginal crenulations; either elytral bristles considerably longer than distance between rows or body shorter than 2.0 mm ..... 3

3(2). Striae at least as wide as interstriae, punctures very deep, close; erect interstrial bristles spaced within each row by distances averaging about equal to length of a bristle; Canada and the United States; in *Picea*; 2.3–2.7 mm ..... 4

— Striae not wider than interstriae, punctures rather small, not strongly impressed or close; erect interstrial bristles spaced within each row by distances averaging two or more times length of a bristle; tropical species in *Oreopanax* ..... 5

4(3). Discal interstriae as wide as striae, strial punctures distinctly smaller; erect interstrial bristles more slender, about 8 to 10 times as long as wide; Ontario to Maine; *Picea glauca*; 2.3–2.4 mm ..... 3. ***americanus*** **Blackman**

— Discal interstriae distinctly narrower than striae, strial punctures very coarse; erect interstrial bristles stout, about four to six times as long as wide; *Picea engelmannii*; Alaska and Saskatchewan to California and New Mexico; 2.3–2.7 mm ..... 4. ***montanus*** **Blackman**

5(3). Erect elytral bristles much longer, equal in length to twice width of interstriae, distance between bristles within a row often two to four times width of interstriae; striae more narrowly, deeply impressed; patches of dark and light scales about equal ..... 6

— Elytral bristles shorter, usually not longer than distance equal to width of one interstriae, spaced within a row by one to two times this distance; striae more feebly impressed, wider; dark and light patches less definite, light scales usually predominant ..... 7

6(5). Size much larger; erect elytral bristles much longer, finer, and much more closely spaced; sides of pronotum on anterior half strongly, arcuately constricted; longer pronotal setae slender, almost hairlike; Guatemala; 3.2 mm ..... 5. ***irrasus*** **Blandford**

— Size smaller; erect elytral bristles stouter, more widely spaced, none longer than twice distance between rows; longer pronotal setae short, stout; Oaxaca to Guatemala; 1.7–2.0 mm ..... 6. ***tessallatus*** **Blandford**

7(5). Larger; striae distinctly narrower than interstriae; declivital bristles a little more slender and distinctly shorter than distance between rows of bristles; Costa Rica and Panama; 1.9–2.2 mm ..... 7. ***fuliginosus*** **Blandford**

— Smaller; striae wider, almost as wide as interstriae; declivital bristles coarser, fully as long as distance between rows of bristles ..... 8

8(7). Pronotum with some scalelike setae; pronotum stouter, more regularly sculptured; interstrial bristles stouter, slightly shorter; strial punctures smaller; Guatemala; 1.5–1.8 mm ..... 8. ***marmoratus*** **Blandford**

— Pronotum without scalelike setae; pronotum more slender, more irregularly sculptured; interstrial bristles longer, more slender; strial punctures larger; Chiapas; 1.6–1.9 mm ..... 9. ***mexicanus*** **Wood**

### 1. *Xylechinus scabiosus* Blandford

*Xylechinus scabiosus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):158 (Lectotype, female; Volcán de Agua, 8500–10,500 ft, Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished from *irrasus* Blandford by the more strongly impressed declivital interstriae 2, which has on its lateral half a series of about 10 closely set, rounded tubercles, by the reticulate surface of the elytral declivity, and by the much shorter vestiture.

FEMALE.— Length 3.0 mm, 2.0 times as long as wide; color very dark brown, with an indistinct pattern of dark and light scales.

Frons convex above, flattened to slightly impressed on lower two-thirds, a sharply elevated, low median carina on impressed

area; surface minutely granulate, small punctures obscurely indicated; vestiture hairlike, fine, sparse, moderately long.

Pronotum 0.86 times as long as wide; widest slightly in front of middle, sides on posterior half very feebly arcuate, abruptly rounded in front, then constricted just before rather narrowly rounded anterior margin; surface evidently rather coarsely, deeply, closely punctured, obscured by rather abundant scales (encrusted, character of scales not clear).

Elytra 1.35 times as long as wide, 2.0 times as long as pronotum; sides almost straight and parallel on basal two-thirds, narrowly rounded behind; basal margins each armed by about 12 small crenulations, submarginal crenulations evidently absent; striae weakly impressed, punctures coarse, deep; interstriae as wide as striae, evidently slightly irregular but not granulate (obscured by an incrustation). Declivity steep, convex; striae about as on disc; interstriae 1 moderately and 3 slightly elevated, 2 narrowed, impressed, its lateral margins rather coarsely granulate, about 10 low, rounded granules present, 9 moderately elevated on posterior half. Vestiture of abundant, short scales (encrusted) and interstrial rows of longer bristles, each bristle about equal in length to distance between rows, closer within a row; bristles absent on declivital interstriae 2.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán de Agua, 8500–10,500 ft, by G. C. Champion.

NOTES.— The first female in Blandford's series of four female syntypes has been regarded as the type. It was used to prepare the above description and it is here designated as the lectotype for this species.

### 2. *Xylechinus avarus* Wood

*Xylechinus avarus* Wood, 1968, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):1 (Holotype, female; Volcán Irazu, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— Of the species known to me, this one is perhaps more closely allied to *fuliginosus* Blandford, although the relationship is remote. The large body size, the stout form, the submarginal crenulations on the elytral bases, the elevated declivital interstriae 1 and 3, and the fine, low, frontal carina serve to distinguish this species.

FEMALE.— Length 2.4–3.3 mm, 2.1 times as long as wide; body color brown, usually covered by an incrustation.

Frons convex, with a feeble, transverse impression just below upper level of eyes, a low, acutely elevated, median carina extending from this impression to epistomal margin; entire surface coarsely reticulate, punctures fine, inconspicuous; vestiture short, sparse, inconspicuous.

Pronotum 0.93 times as long as wide; sides widest and almost parallel on middle half, strongly constricted one-fourth length from anterior margin, rather broadly rounded in front; surface finely granulate and with rather sparse, round, small, vulcanate punctures; vestiture consisting of short, rather stout, moderately abundant bristles.

Elytra 1.2 times as long as wide, 1.8 times as long as pronotum; sides almost straight, very slightly wider at declivital base, narrowly rounded behind; striae impressed, punctures deeply, not sharply impressed; interstriae about one and one-half times as wide as striae, irregular, punctures fine, abundant, confused, with a median row of larger, marginally granulate punctures, crenulate toward base on interstriae 1 to 5. Declivity convex, rather steep; striae impressed; interstriae 2 impressed, strongly narrowed, ending before apex, 1, 3, and 9 elevated, about half as high as wide, 3 and 9 join apically, the elevation continued to 1; granules not as large as on disc. Vestiture of short, rather abundant, stout setae, and interstrial rows of long bristles, spacing between bristles within a row and between rows equal to length of a bristle.

MALE.— Similar to female except frons flattened on lower half, and ground vestiture of pronotum and elytra evidently more abundant.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Irazu, Cartago, 26-X-63, 2300 m, *Oreopanax nubigenus*, S. L. Wood.

BIOLOGY.— Specimens were taken from biramous, transverse, parental galleries in limbs 7–20 cm in diameter in a host that was parasitic on a felled oak tree. Larval mines were not fully developed.

NOTES.— The type series of 207 specimens was available for preparing the above treatment.

### 3. *Xylechinus americanus* Blackman

*Xylechinus americanus* Blackman, 1922, New York St. Coll. For. Tech. Pub. 16:117 (Holotype, male; Orono, Maine; U.S. Nat. Mus., 26630)

DIAGNOSIS.— This species is distinguished from the very closely allied *pilosus* (Ratzeburg) by the more strongly impressed, much wider striae.

FEMALE.— Length 2.3–2.4 mm, 2.5 times as long as wide; color medium to dark brown, pronotum slightly darker.

Frons convex, transversely impressed just above epistoma; epistomal margin slightly elevated, epistomal lobe small; surface finely, subgranulately punctured, a fine median carina extending from just below upper level of eyes to base of epistomal lobe; vestiture hairlike, short, moderately abundant, longer and more conspicuous toward epistoma.

Pronotum 1.04 times as long as wide; widest at base, sides weakly arcuate and converging slightly on posterior two-thirds to a prominent constriction, rather broadly rounded in front; surface rather finely, closely punctured, narrow interspaces smooth, with a few points; vestiture covering entire surface, consisting of short, rather slender scales, rather abundant.

Elytra 1.7 times as long as wide, 2.0 times as long as pronotum; sides almost straight and parallel on basal two-thirds to base of declivity then narrowly rounded behind; crenulations at elytral bases narrow and high, submarginal crenulations almost totally absent; striae slightly impressed, punctures rather coarse, deep; interstriae convex, as wide as striae except slightly wider at base of declivity, punctures moderately small, granulate on anterior margin, in irregular median rows, with small, supplemental, simple punctures along margins. Declivity convex, moderately steep; striae deeper and narrower than on disc; interstriae 1, 3, and 9 very weakly elevated. Vestiture consisting of rather abundant, short, narrow, almost scalelike, interstrial setae, and median rows of erect, stout bristles, each bristle about twice as long as scales and six to eight times as long as wide.

MALE.— Similar to female except frons less convex, almost flat on median half.

DISTRIBUTION.— Ontario to Maine.

CANADA: **Ontario**: "Near" Ottawa. **Quebec**: Chelsea, 17-V-54, *Picea glauca*, S. L. Wood; Great Whale River, 30-VI-49, J. R. Vockeroth. USA: **Maine**: Camp Caribou, Hopk. U.S. 332a, *Picea*; Orono, 13-X-19, M-171, *P. glauca*, M. W. Blackman. **New York**: Cranberry Lake, 17-VII-21, M. W. Blackman.

HOSTS.— *Picea glauca*.

BIOLOGY.— Usually small, suppressed, shaded out, standing trees less than 15 cm in diameter are selected for attack. The attacks most commonly are within 1 m of the ground. Occasionally they attack shaded out branches of dominant trees. The habits basically are as outlined above under the generic treatment.

NOTES.— The above treatment of the female was based largely on Blackman's

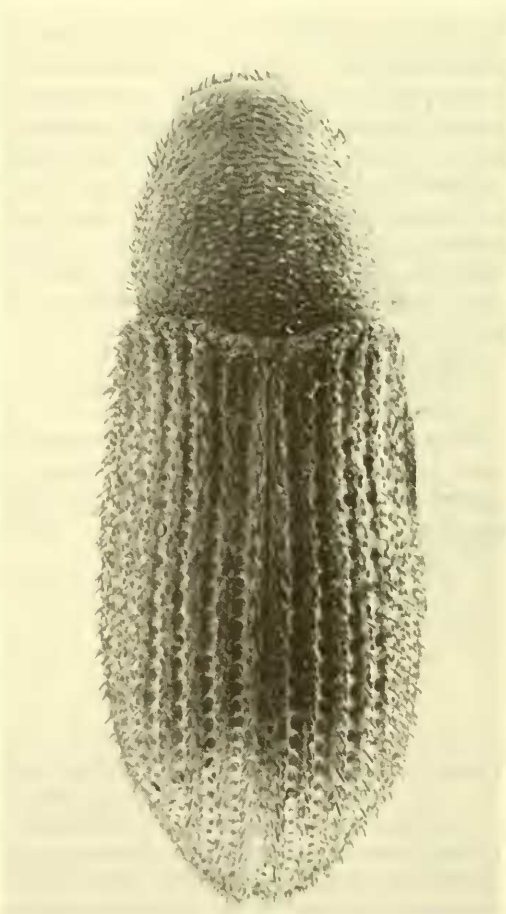


Fig. 56. *Xylechinus montanus*: Dorsal aspect. (After Bright 1976:206.)

allotype, the male was based on the holotype; 81 other specimens were also studied.

### 4. *Xylechinus montanus* Blackman
Fig. 56

*Xylechinus montanus* Blackman, 1940, Proc. Ent. Soc. Washington 42:123 (Holotype, female; Sula, Montana; U.S. Nat. Mus., 54024)

DIAGNOSIS.— This species is distinguished from *americanus* Blackman as indicated in the above key and in the description.

FEMALE.— Length 2.3–2.7 mm, 2.5 times as long as wide.

Frons and pronotum as in *americanus* except in most specimens punctures not as close, their interspaces obscurely reticulate to minutely rugose.

Elytra as in *americanus* except strial punctures distinctly larger, interstriae distinctly narrower than striae, about half to two-thirds as wide; interstrial ground vestiture less abundant; erect interstrial bristles much stouter, each about four to six times as long as wide.

MALE.— Similar to female except frons less distinctly convex, almost flat on median half.

DISTRIBUTION.— Alaska and Saskatchewan to California and New Mexico.

ALASKA: Kenai Peninsula, 14-21-VI-74, M. M. Furniss. CANADA: **Alberta**: Banff, Waterton. **British Columbia**: Lorna. **Saskatchewan**: Cypress Hills. USA: **Colorado**: Cross Creek in Rio Grande N. F., Dolores Peak in Uncompahgra N. F., Newcastle. **Montana**: Anaconda, Blackfeet N. F., Columbia Falls. **Nevada**: Charleston Mt. **Oregon**: Gold Lake in Willamette N. F., Suttle Lake, Toll Gate. **Utah**: Logan Canyon.

HOST.— *Picea engelmannii.*

BIOLOGY.— As in *americanus.*

NOTES.— The above treatment was based on the holotype and on 117 other specimens.

### 5. *Xylechinus irrasus* Blandford

*Xylechinus irrasus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):157 (Lectotype, male; Volcán de Agua, 8500–10,500 ft, Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished from *scabiosus* Blandford by the less strongly impressed declivital interstriae 2 which has not more than three or four minute, widely spaced tubercles, by the smooth, declivital surface, and by the much longer vestiture.

MALE.— Length 3.2 mm, 2.1 times as long as wide; color dark brown, with a variegated pattern of light and dark setae.

Frons broadly impressed from epistoma to level of antennal insertion, then broadly concave to upper level of eyes; epistomal lobe large, flat; median carina on lower half acute, obsolete above, a pair of lateral calluses just above level of antennal insertion; surface reticulate, becoming granulose above, with fine, sparse punctures; vestiture of long, coarse bristles laterally, shorter in other areas.

Pronotum 0.77 times as long as wide; widest near middle, sides diverge rather strongly from base, rather strongly arcuate in front of middle and converging to constriction just before rather broadly anterior margin; surface at least partly shining, punctures close, rather fine, at least some of those in summit area feebly vulcanate; median line acutely elevated in area of indefinite summit; vestiture of rather abundant, moderately short bristles (almost scalelike) and must less abundant, very long bristles, each up to five times as long as ground setae.

Elytra 1.4 times as long as wide, 2.4 times as long as pronotum; sides somewhat straight and parallel on basal two-thirds, rather narrowly rounded behind; basal margins each armed by about 10 small crenulations, submarginal crenulations absent; striae weakly impressed toward declivity, punctures moderately coarse, deep; interstriae slightly wider than striae, weakly convex at least posteriorly, punctures close, confused, mostly very fine, a few larger punctures intermixed, none granulate. Declivity steep, convex; strial punctures deeper; interstriae more nearly convex, 2 not as high as 1 or 3, all devoid of granules. Vestiture consisting of rather abundant, short, scalelike bristles and less abundant, very long, interstrial bristles, long bristles in indefinite rows, up to twice as long as distance between rows, separated within a row by about half that distance.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán de Agua, between 8500 and 10,500 ft elevation, by G. C. Champion.

NOTES.— The above description was prepared from the male of Blandford's two syntypes. It is here designated as the lectotype for this species.

### 6. *Xylechinus tessellatus* Blandford

*Xylechinus tessallatus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):159 (Holotype, female;

Volcán de Agua, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is of the same general size and sculpture as *fuliginosus* Blandford, but it is distinguished by the much longer, more widely spaced erect, elytral bristles, and by other characters mentioned in the above key.

FEMALE.— Length 1.7–2.0 mm, 2.1 times as long as wide; body color dark brown, with a dense mottled covering of dark and light scales, dark and light areas almost equal in extent.

Frons convex with a weak, transverse impression immediately above level of ocular emargination; narrowly, transversely impressed just above the weakly elevated epistomal margin; epistomal lobe large; an acutely elevated carina extending from midfrontal impression to base of epistomal lobe; surface coarsely reticulate, with a few fine punctures on lower third toward margins, a few fine granules toward center; vestiture fine, inconspicuous.

Pronotum 0.88 times as long as wide; widest at middle, sides on basal half almost straight, diverging very slightly to middle then strongly arcuate to rather strong constriction just behind very broadly rounded anterior margin; surface finely, closely punctured, obscured by scales; vestiture consisting of scales of two sizes, smaller ones more abundant, very short, rather narrow, larger ones but little longer at base, becoming two or more times as long anteriorly.

Elytra 1.4 times as long as wide, 2.0 times as long as pronotum; sides almost straight and parallel on basal two-thirds to declivital base, rather narrowly rounded behind; striae narrowly, rather strongly impressed, punctures small, somewhat obscure; interstriae twice as wide as striae, convex, closely covered by squamiferous punctures. Declivity convex, steep; interstriae 1–3 equally convex, 9 more strongly elevated, angle between 3 and 9 somewhat impressed, granules not evident. Vestiture consisting of abundant small scales and interstrial rows of erect bristles to base; bristles widely spaced, mostly spaced at least by three or more times distance between rows, bristles on declivity mostly one and one-half to two times as long as distance between rows, except slightly shorter on interstriae 2.

MALE.— Similar to female except lower half of frons flat, transverse impression somewhat stronger.

DISTRIBUTION.— Oaxaca to Guatemala.

MEXICO: **Chiapas**: Mt. Tzontehuitz, 19-V-69, J. M. Campbell. **Oaxaca**: 83 km N Oaxaca, 17-V-71, D. E. Bright; 64 km S Valle Nacional, 25-V-71, H. F. Howden. GUATEMALA: Volcán Zunil, Quezaltenango, 27-V-64, 1000 m, *Oreopanax*, S. L. Wood; Volcán de Agua, G. C. Champion.

BIOLOGY.— The small, terminal branches of living host trees were attacked. Often these branches would break and fall to the ground and, although appearing largely decayed, sometimes contained large numbers of specimens. The galleries were as described above under the generic treatment.

NOTES.— The unique type was examined and compared directly to my Volcán Zunil homotypes. The above treatment was prepared from the four homotypes and 74 other specimens.

The original description gives the length of the type as 2.3 mm; actually it is 2.0 mm long.

### 7. *Xylechinus fuliginosus* Blandford

*Xylechinus fuliginosus* Blandford, 1897, Biol. Centr.-Amer., Coleopt. 4(6):158 (Holotype, female; Volcán de Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— Characters summarized in the above key distinguish this species from allied forms.

FEMALE.— Length 1.9–2.2 mm, 2.1 times as long as wide; color dark brown, with abundant dark and light scales, dark scales usually predominating.

Frons as in *tessallatus*. Pronotum as in *marmoratus* except stout scales almost twice as long as small ones, only slightly longer anteriorly.

Elytra 1.4 times as long as wide, 1.9 times as long as pronotum; outline as in *marmoratus*; striae moderately impressed, punctures small, rather obscure; interstriae about twice as wide as striae, punctures small, confused, some of median ones granulate toward base. Declivity as in *marmoratus* except interstriae less strongly elevated or convex. Vestiture consisting of abundant small scales and interstrial rows of erect, rather slender bristles to base; each declivital bristle as long as distance between rows and separated within rows by about twice this distance.

MALE.— Similar to female except frons flattened on lower half.

DISTRIBUTION.— Costa Rica and Panama.

COSTA RICA: Volcán Irazu, Cortago, 28-VI-63, 2,800 m, and 26-IX-63, 2300 m, *Oreopanax xalapense*, S. L. Wood. PANAMA: Volcán de Chiriquí, G. C. Champion; Cerro Punta, Chiriqu i, 11-I-64, 1800 m, *Oreopanax*, S. L. Wood.

HOST.— *Oreopanax xalapense.*

BIOLOGY.— Terminals of shaded-out branches on standing trees or cut branches up to about 10 cm in diameter were attacked. The gallery systems were as described above for the genus.

NOTES.— The unique holotype was compared directly to 2 of my homotypes; from these 2 and 96 other specimens the above treatment was prepared.

### 8. *Xylechinus marmoratus* Blandford

*Xylechinus marmoratus* Blandford, 1897, Biol Centr. Amer., Coleopt. 4(6):159 (Lectotype, female; Capetillo, Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This is the smallest Central American representative of the genus; it is also the one most closely allied to *americanus.* It may be distinguished by its small size and by other characters mentioned in the above key.

FEMALE.— Length 1.5–1.8 mm, 2.4 times as long as wide; color dark brown, with abundant dark and light scales, dark ones usually predominate.

Frons weakly convex, with a rather prominent transverse impression just above the slightly elevated epistomal margin; epistomal lobe well developed; surface minutely granulate above, with fine punctures; vestiture of short coarse bristles.

Pronotum 0.98 times as long as wide; outline and sculpture as in *tessellatus* except posterior half of sides more nearly arcuate; vestiture but little longer anteriorly, abundant, consisting of slender and stout bristle-like scales, stout ones only slightly longer.

Elytra 1.5 times as long as wide, 1.9 times as long as pronotum; outline as in *tessellatus*; striae weakly impressed, punctures rather coarse, deep; interstriae almost one and one-half times as wide as striae, rather weakly convex, punctures fine, squamiferous. Declivity convex, moderately steep; interstriae 1, 3, and 9 weakly elevated, 2 feebly impressed. Vestiture consisting of abundant small scales and interstrial rows of erect, stout bristles to base; each bristle as long as distance between rows, separated within rows by twice that distance.

MALE.— Similar to female except lower half of frons flattened.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán de Agua, 19-V-64, 1,000 m, *Oreopanax*, S. L. Wood; Volcán Pacaya, 1-VI-64, 1300 m, *Oreopanax*, S. L. Wood; Panajachel, Sololá, G. C. Champion.

HOSTS.— *Oreopanax* spp.

BIOLOGY.— Small, shaded out branches are selected for attack. The habits appeared to be as described in the above treatment of the genus.

NOTES.— Blandford's series of four syntypes and 44 other specimens were used to prepare the above treatment. From Blandford's four syntypes a female from Capetillo was selected and is here designated as the lectotype of the species.

### 9. *Xylechinus mexicanus* Wood

*Xylechinus mexicanus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):7 (Holotype, male; Yerba Buena, 32 km or 20 miles N Bochil, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *marmoratus* Blandford by the more slender, more irregularly sculptured pronotum that lacks scalelike setae, by the slightly coarser strial punctures, and by the much more slender interstrial bristles.

MALE.— Length 1.6–1.9 mm, 2.7 times as long as wide; color brown, vestiture pale.

Frons as in *marmoratus* but broader, vestiture finer, without scales.

Pronotum 1.0 times as long as wide; about as in *marmoratus* but anterior constriction not as strong; surface shining, irregular throughout, punctures fine, shallow, most subvulcanate. Vestiture of short, coarse hair of moderate abundance; scales absent.

Elytra 1.7 times as long as wide; as in *marmoratus* except bases of interstriae 2–5 each bearing 1–4 submarginal crenulations, strial punctures very slightly larger. Ground vestiture shorter than in *marmoratus*, apparently less abundant, much more slender on sutural interstriae than elsewhere; erect bristles slender, blunt or pointed, their length and spacing as in *marmoratus.*

FEMALE.— Similar to male except submarginal crenulations at bases of elytra mostly absent.

DISTRIBUTION.— Chiapas.

MEXICO: Chiapas: Yerba Buena 32 km or 20 mi N Bochil, 21-V-69, 2600 m, D. E. Bright.

NOTES.— The above treatment was based on the type series of seven specimens.

## GENUS *DENDROCTONUS* ERICHSON

DENDROCTONUS Erichson, 1836, Archiv Naturgesch. 2(I):52 (Type-species: *Bostrichus micans* Kugelann, subsequent fixation by the International Commission on Zoological Nomenclature, 1963:276)

DIAGNOSIS.— This genus is related to *Hylurgus* Latreille and *Tomicus* Latreille, of Europe and Asia, to *Pachycotes* Sharp, of Australia and New Zealand, and to *Hylurgonotus* Schedl, of South America, but it may be distinguished by the 5-segmented antennal funicle, by the unique epistomal process, by the total absence of a male frontal impression, and by the more strongly flattened antennal club. Among North and Central American genera it is related to *Pseudohylesinus* Swaine and *Hylurgopinus* Swaine, but may be easily distinguished by characters summarized in the above key to genera.

DESCRIPTION.— Length 2.5–9.0 mm, 2.3–2.6 times as long as wide; body color dark brown to black, some species with reddish brown elytra. Frons convex, usually modified by grooves, elevations, or tubercles; sexual dimorphism pronounced in some species. Eye ovate, entire. Antennal scape rather long; funicle 5-segmented; club rather strongly flattened, subcircular in outline, three weakly procurved, aseptate sutures indicated by setae. Pronotum wider than long, unarmed, punctate. Scutellum small. Elytra more than twice as long as pronotum, basal margins armed; striate, interstriae variously crenulate; declivity steep, variously, conservatively sculptured, sexually dimorphic in some species. Vestiture hairlike. Fore coxae contiguous; precoxal prothoracic ridges absent. Third tarsal segments bilobed.

DISTRIBUTION.— Arctic North America to northwestern Nicaragua (16 species), northern Europe and Asia (2 species).

BIOLOGY.— These monogamous beetles breed in coniferous hosts larger than six inches in diameter. Collectively they are the most destructive natural biological agent in American coniferous forests. Most species breed only in standing trees, although endemic populations of *rufipennis* (Kirby) and *murrayanae* Hopkins may breed in prostrate trees. All species, with the possible exception of *approximatus* Dietz, are capable of killing healthy, vigorous trees.

The entrance tunnel is formed by the female; the male joins her when the tunnel is about 1–7 cm long. The attraction of the male and of other females to the host tree is by pheromones released by the female. The egg galleries may be either sinuate or longitudinal and are characteristic of the species. Eggs are deposited individually in niches, in small clusters, or in rows in long grooves. The larval mines of most species are individual and radiate from the parental mine, or the larvae may feed in congress for part or all of their development. They pupate in individual cells and emerge through separate exit holes. The length of the life cycle varies within the genus; ordinarily it occupies one year, but in arctic regions it may be extended to two or more years, or in tropical areas be shortened to as little as three or four months in certain species.

Apparently all species are associated with symbiotic fungi that modify host physiology and greatly accelerate the rate at which host resistance to attack can be overcome. It is this factor that has made them so tremendously successful as agents of destruction.

NOTES.— Since my previous treatment of this genus (Wood 1963), a great deal of information pertaining to it has accumulated. Pheromone and karyology studies have been made, the types of *rufipennis* and *parallelocollis* were located, all types in the genus except *terebrans* (Olivier) were reexamined, and additional field data of taxonomic significance has been gathered. This has resulted in a number of modifications presented below, including the removal of *jeffreyi* Hopkins and *mexicanus* Hopkins from synonymy.

The Chinese *armandi* Tsai and Li was omitted from the following key; it is a unique species very different from the remainder of the genus that compromises characters of species in couplets 14 to 16 of the key.

Key to the Species of *Dendroctonus*
(Modified from Wood 1963)

1. Frons with a rather deep, narrow, median groove extending from just above epistomal process to upper level of eyes; if median impression obscure in male, then lateral areas of frons rather strongly protuberant and usually armed by one or two tubercles (except *adjunctus*); if protuberance obscure in female, then anterior constriction of pronotum with a transverse elevated callus laterally and dorsally (obscure laterally in *adjunctus*); epistomal process very broad with the lateral margins prominently raised; smaller species 2.5–7.4 mm, in *Pinus* ..... 2

— Frons without a median groove or impression below upper level of eyes; lateral elevations of frons and transverse elevated callus of pronotum never present in either sex; epistomal process usually narrower and less prominent, lateral margins raised or not; larger species 5.0–9.0 mm (rarely as small as 3.7, or even 3.4 in *simplex*), in *Pinus* and other conifers ..... 7

2(1). Punctures and/or granules of declivital interstriae 2 more abundant, confused; declivital interstriae 2 as wide as 1 and 3, not constricted apically; smaller species, 2.5–5.0 mm ..... 3

— Granules of declivital interstriae 2 rather sparse, uniseriate; declivital interstriae 2 narrower than 1 and 3 or strongly constricted apically; larger species, 3.8–7.4 mm ..... 6

3(2). Declivital pubescence rather abundant and uniformly short, not longer than a distance equal to half width of an interstriae; transverse discal rugae on posterior half of discal interstriae almost never longer than half width of an interstriae; declivital striae usually not impressed, obscure; punctures of declivital interstriae more abundant and feebly if at all granulate; British Columbia to Chihuahua and W Texas; *Pinus ponderosa*, *P. coulteri*; 2.5–5.0 mm ..... 1. ***brevicomis*** **LeConte**

— Declivital pubescence less abundant, at least some hairs twice as long as width of an interstriae; at least a few rugae on posterior half of elytral disc as wide as an interstriae; declivital striae usually impressed, punctures larger and distinct from those of interstriae; punctures of declivital interstriae less abundant and more coarsely granulate ..... 4

4(3). Lateral thirds of pronotum with punctures finer, closer, their diameters rarely equal to more than twice diameter of a facet of eye, usually with several tubercles, posterolateral areas with at least one-third of area granular, granulation often obliterating punctures; male epistomal process wider, its lateral arms more strongly elevated; male frontal tubercles less numerous, smaller; elytral crenulations, particularly on declivity, smaller; mature color almost black; Guatemala; 2.6–4.6 mm ..... 2. ***vitei*** **Wood**

— Lateral thirds of pronotum with punctures larger, not as close, some punctures equal in diameter to at least three times diameter of facet of eye, tubercles and granulation inconspicuous or absent; male epistomal process slightly narrower; male frontal tubercles more numerous, larger; elytral crenulations averaging larger; mature color dark brown; smaller species ..... 5

5(4). Female frons more finely punctured, area immediately above epistomal process flat, male arms of epistomal process less strongly elevated; strial grooves on disc usually wider, strial punctures larger and without crenulate tubercles

between strial punctures; interstrial crenulations averaging smaller and less numerous; mature color light brown to medium brown; Oklahoma and Pennsylvania to Arizona, New Mexico, E Texas, Florida, and Honduras; *inus*; 2.2–3.2 mm ..... 3. ***frontalis*** **Zimmermann**

— Female frons more coarsely punctured, area immediately above epistomal process concave (due to elevation of lateral arms), male arms of epistomal process more strongly elevated; strial grooves on disc usually narrower, punctures usually smaller or obsolete, their anterior margins finely crenulate; interstrial crenulations usually averaging larger; mature color medium brown to black; Chihuahua to Honduras; *Pinus*; 2.4–3.7 mm ..... 4. ***mexicanus*** **Hopkins**

6(2). Granules on declivital interstriae 1 and (usually) 3 more abundant, confused; transverse elevation of female pronotum very prominent laterally; male frons with prominent lateral tubercles; stouter, 2.5 times as long as wide; central Utah and Colorado to Honduras; *Pinus*; 4.5–7.4 mm ..... 5. ***approximatus*** **Dietz**

— Granules on declivital interstriae 1 and 3 sparse, uniseriate; transverse callus on female pronotum obscure laterally; male frons without lateral tubercles; more slender, 2.65 times as long as wide; central Utah and Colorado to Guatemala; 3.8–6.0 mm ..... 6. ***adjunctus*** **Blandford**

7(1). Declivital interstriae dull (minutely rugulose) or shining, if shining punctures virtually all granulate in both sexes and strial punctures distinct and larger; epistomal process rather broad, distance between eyes not more than 2.2 times its basal width; episternal area of prothorax more coarsely granulate; punctures obscure or absent ..... 8

— Declivital interstriae smooth and shining, most punctures impressed, a few of them granulate in female; epistomal process rather narrow, distance between eyes three or more times its basal width; episternal area of prothorax punctate, granules minute or entirely absent ..... 12

8(7). Surface of declivity dull (usually rugulose); declivital interstriae 2 impressed, usually flat, interstriae 1 strongly and 3 weakly elevated; declivital interstriae usually uniseriately granulate and with scattered fine punctures ..... 9

— Surface of declivity usually shining, interstriae 2 not impressed and sutural interstriae weakly if at all elevated; virtually all of rather numerous punctures on declivital interstriae granulate, granules close, confused ..... 10

9(8). Punctures on pronotum rather coarse, close, separated by distances averaging less than diameter of a puncture, inner floor of a puncture usually flat or bearing a granule; California specimens averaging conspicuously smaller, 96 percent of them smaller than 5.0 mm; S British Columbia and W South Dakota to Baja California and New Mexico; *Pinus*; 3.7–7.5 mm ..... 7. ***ponderosae*** **Hopkins**

— Punctures on pronotum usually minute, separated by distances averaging at least twice diameter of a puncture, inner floor of puncture usually concave and without a granule; S Oregon to Baja California; *Pinus jeffreyi*; 5.0–7.5 mm (6 percent are smaller than 5.0 mm) ..... 8. ***jeffreyi*** **Hopkins**

10(8). Epistomal process broad, flat, its margins not elevated; strial punctures rather small and obscure, rugae of discal interstriae very coarse, many as wide as interstriae, a few crossing striae; frons strongly, evenly convex; pronotum gradually narrowed anteriorly, without an abrupt constriction; Chihuahua and Sinaloa to Honduras; *Pinus*; 5.2–6.9 mm ..... 9. ***parallelocollis*** **Chapuis**

— Epistomal process broad, transversely concave, margins strongly elevated; strial punctures larger, never traversed by smaller discal rugae; frons irregularly, less strongly convex; pronotum feebly if at all narrowed anteriorly, with an abrupt constriction just behind anterior margin ..... 11

11(10). Body color of mature specimens black; punctures on disc of pronotum rather coarse, those near lateral margin much larger; declivital tubercles usually larger, apparently more numerous; E Massachusetts to E Texas and Florida; *Pinus*; 5.0–8.0 mm ..... 10. ***terebrans*** **(Olivier)**

– Body color of mature specimens reddish brown; punctures of pronotum not as coarse, those near lateral margin similar to those on disc; declivital tubercles usually smaller, apparently less numerous; Northwest Territories and Nova Scotia to Honduras; *Pinus*, rarely other conifers; 5.4–9.0 mm (see also 12. ***rhizophagus*** **Thomas & Bright**) ..... 11. ***valens*** **LeConte**

12(7). Declivital striae weakly if at all impressed, 2 apically curved toward sutural striae; declivital interstriae 1 feebly elevated, 2 as wide or wider than 1 or 3 (except near apex); discal striae less than half as wide as interstriae; epistomal process usually transversely concave (except *micans*), rather broad, lateral margins moderately oblique (less than 55 degrees from horizontal) ..... 13

– Declivital striae strongly impressed, 2 straight; declivital interstriae 1 strongly elevated, 2 weakly impressed and narrower than 1 or 3; discal striae almost as wide as interstriae; epistomal process flat or convex, narrow, its lateral margins strongly oblique (about 80 degrees from horizontal) ..... 16

13(12). Frons smooth and polished, with deep close punctures, but almost entirely without granules between punctures; strial punctures on declivity rather large, three or more times as large as those of interstriae ..... 14

– Frons rather finely granulate between close, deep punctures (granules sometimes obscure in *murrayanae*); strial punctures on declivity usually minute, seldom more than twice as large as those of interstriae ..... 15

14(13). Epistomal process flat; body stouter, 2.3 times as long as wide; strial punctures more strongly impressed; northern Europe and Asia; 6.0–8.0 mm ..... ***micans*** **(Kugelann)**

– Epistomal process shallowly, transversely concave; more slender, 2.4 times as long as wide; strial punctures shallowly impressed; Alaska and Alberta to New York and West Virginia; *Picea*; 5.4–6.5 mm ..... 13. ***punctatus*** **LeConte**

15(13). Frons coarsely, distinctly punctured, granules between punctures usually isolated from one another, often very sparse; male genitalia distinctive; British Columbia and Ontario to Utah, Colorado, and Michigan; *Pinus banksiana, P. contorta*; 5.0–7.3 mm ..... 14. ***murrayanae*** **Hopkins**

– Frons very closely, more coarsely granulate, punctures usually obscure in central area; male genitalia distinctive; Alaska and Newfoundland to Arizona, New Mexico, and Pennsylvania; *Picea*; 4.4–7.0 mm ..... 15. ***rufipennis*** **(Kirby)**

16(12). Frons moderately protuberant, smooth, with rather coarse, deep punctures; punctures of pronotum rather large; discal interstriae with fine punctures interspersed with small rugae; Alaska and NE British Columbia to Newfoundland and West Virginia; *Larix*; smaller, 3.4–5.0 mm ..... 16. ***simplex*** **LeConte**

– Frons strongly protuberant, irregular, granulate, with rather fine, deep punctures; punctures of pronotum rather small; discal interstriae without fine punctures dispersed among rugae; S British Columbia and SW Alberta to California and Chihuahua; *Pseudotsuga, Larix*; 4.7–7.0 mm ..... 17. ***pseudotsugae*** **Hopkins**

1. *Dendroctonus brevicomis* LeConte
Figs. 1, 3, 4, 57, 58

*Dendroctonus brevicomis* LeConte, 1876, Proc. Amer. Philos. Soc. 15:386 (Holotype, female; middle California; Mus. Comp. Zool.)

*Dendroctonus barberi* Hopkins, 1909, U.S. Dept. Agric. Bur. Ent. Tech. Bull. 17(1):85 (Holotype, female; Williams, Arizona; U.S. Nat. Mus., 7444); Wood, 1963, Great Basin Nat. 23:31. *Synonymy*

DIAGNOSIS.— This species is distinguished from the closely related *frontalis* Zimmermann by the uniformly short declivital pubescence, by the less strongly impressed declivital striae, by the more numerous, more finely granulate punctures of the declivital interstriae, by the larger average size, and, in part, by the distribution.

MALE.— Length 2.0–4.7 mm (average about 3.5 mm), 2.2 times as long as wide; mature color very dark brown.

Frons convex, a pair of lateral elevations on median half just below upper level of eyes separated by a deep median groove, summits of elevations armed at their dorsomedian margins by one or two prominent, somewhat dorsomedially oriented granules; epistomal margin elevated, its surface smooth and shining; epistomal process half (0.50 times) as wide as distance between eyes, its arms oblique (about 40 degrees from horizontal) and elevated, horizontal portion about half its total width, transversely concave, overlapping and ending just above epistomal mar gin and bearing under its distal margin a dense brush of conspicuous yellowish setae; surface granulate-punctate above eyes, more deeply punctured and subgranulate below. Vestiture, except epistomal brush, short, sparse, inconspicuous.

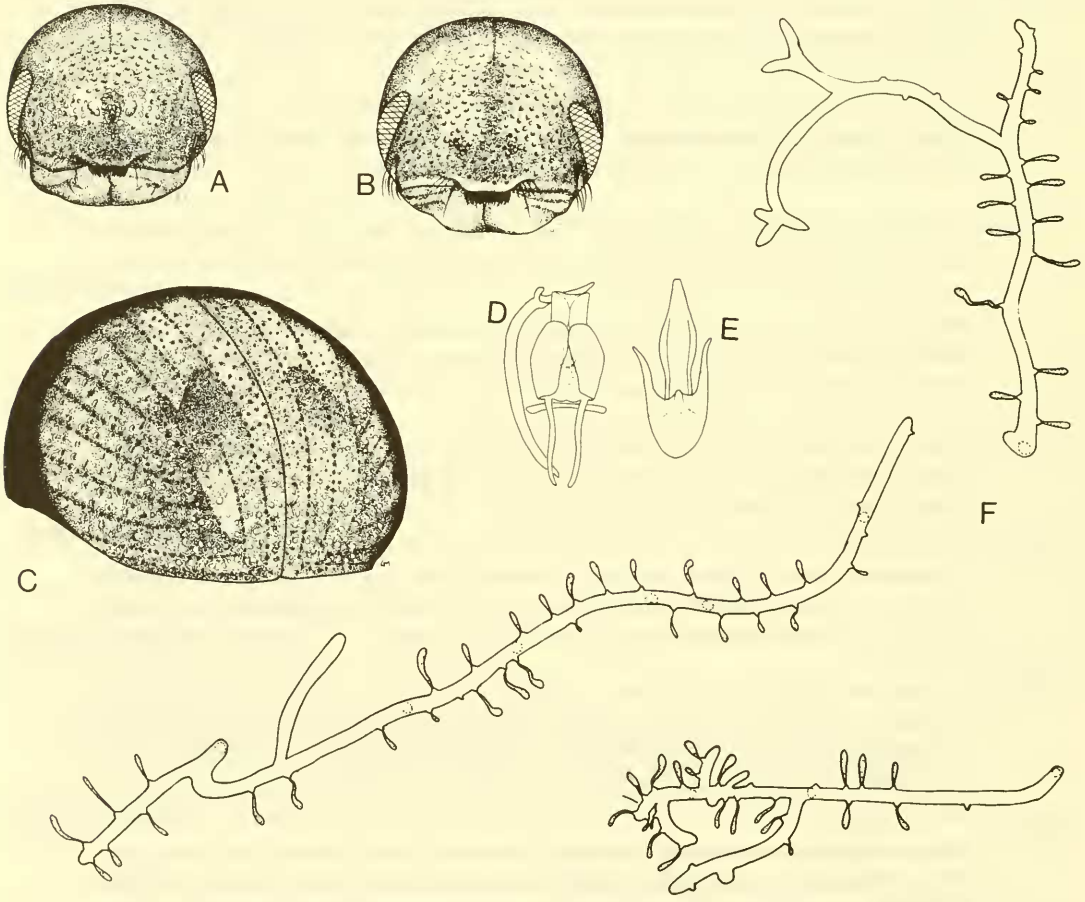



Fig. 57. *Dendroctonus brevicomis*: A, male head; B, female head; C, elytral declivity; D, male genital capsule; E, male seminal rod; F, egg galleries.

Pronotum 0.70 times as wide as long, widest on basal third; sides rather strongly arcuate on basal three-fourths, rather strongly constricted just behind broadly, shallowly emarginate anterior margin; surface smooth with rather fine, shallow, close punctures on median third, becoming more finely punctured laterally; an indistinct median line apparent. Vestiture very short, rather sparse, inconspicuous.

Elytra 1.5 times as long as wide, 2.2 times as long as pronotum; sides straight and subparallel on basal two-thirds, rather broadly rounded behind; basal margins arcuate, bearing a row of about nine moderately large, raised, overlapping crenulations with several smaller submarginal ones particularly on interstriae 2 and 3; striae weakly impressed, punctures rather small and shallow; interstriae about twice as wide as striae, armed by abundant, confused, small, transverse crenulations, each averaging about one-third width of an interstriae, never more than half as wide on posterior half of disc. Declivity moderately steep, convex with a feeble impression between striae 1 and 3; strial punctures reduced in size; interstrial punctures ranging from finely granulate to not at all granulate, abundant, confused (about three to four irregular ranks across width of an interstriae). Vestiture rather abundant, short, averaging about half as long as width of an interstriae, never as long as its entire width.

FEMALE.— Similar to male except lateral elevations of frons less prominent and unarmed, with median groove consequently less conspicuous; arms of epistomal process less strongly elevated; pronotal constriction largely filled by a prominent transverse elevated callus both laterally and dorsally; punctures of pronotal disc very slightly larger and deeper; transverse crenulations of elytral disc very slightly larger; and declivital granules much finer, only a few punctures with a minute granule on upper margins.

DISTRIBUTION.— British Columbia to Baja California, Chihuahua, and W Texas.

CANADA: **British Columbia**: Aspen Grove, Little Shuswap Lake, "Midday Ck." in Indian Meadow, Midday Valley, "Spious Ck.," Summerland, "Trepan Ck.," and "Trepanier Ck." USA: **Arizona**: Carr Canyon, Chiricahua Mts., Coconino N. F., Crow King, "Deadmans Flat" (Coconino Co.), Flagstaff, Ft. Apache, "Fort Valley," Grand Canyon N. P., Groom Ck. (Prescott N. F.), Huachuca Mts., "Pleasant Valley," Prescott, San Francisco Mts., Santa Catalina Mts., Santa Rita Mts., Springerville, Walnut Canyon N. M., Williams, "Willow Rock," and Young. **California**: All counties. **Colorado**: Dolores, Ft. Garland, "Vallecito R. S." (La Plato Co.), Monte Vista, and Uncompahgre N. F. **Idaho**: Boise, Cedar Mt., Centerville, Coeur d'Alene, Garden Valley, Kooskia, Moscow, Pioneer, Placerville, Smith's Ferry, Stites, and Troy. **Montana**: Missoula. **Nevada**: Las Vegas. **New Mexico**: Capitan Mts., Cloudcroft, Datil, Gloriela Mesa, Mescalero, Mimbres, Ruidoso, Santa Fe, Santa Catalina Mts., Zuni Mts., and Jeremejo Park. **Oregon**: Ashland, Bend, Blue Mts., Bly, Burnt River, Chiloquin, Cold Springs, Colestin, Corvallis, "Dutch Ck.," Fremont N. F., Ft. Rock, Grants Pass, Jenny Ck., Joseph, Keno, Klamath Falls, Klamath Indian Res., Prineville, "Pringle Falls," Siskiyou Mts., Sisters, Sumpter, Wallowa Mts. **Texas**: Big Bend, Davis Mts. **Utah**: Daves Hollow (Dixie N. F.), Escalante, Panguitch, Pin Hollow (Fish Lake N.F.), Ashley N. F. **Washington**: Blue Mts., Buckeye, Chelan, Dayton, Kooskooskie, Northport, Pullman, Toppenish. MEXICO: **Chihuahua**: Tres Ríos.

HOSTS.— *Pinus ponderosa*, *P. coulteri*, and uncommon in other *Pinus* except during epidemics.

BIOLOGY.— This species probably has killed more merchantable timber in North America than any other organism in historic time. Miller and Keen (1960:1) estimate that approximately one billion board feet of standing timber have been destroyed annually in

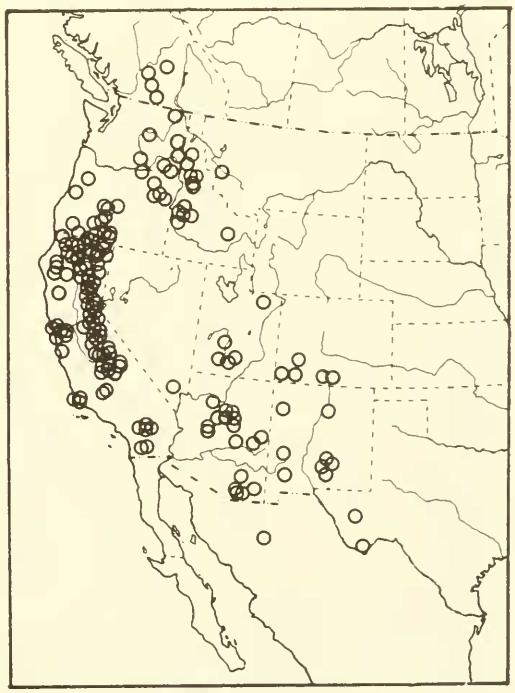


Fig. 58. *Dendroctonus brevicomis*: Distribution map.

Pacific Coast states since studies commenced over half a century ago; this estimate may almost double if losses in British Columbia and the mountain states are included.

Overwintering parent adults and brood may become active at any period when subcortical temperatures become sufficiently high, probably somewhere in the vicinity of 45 to 50 F. The dates at which favorable conditions for flight occur in the spring vary considerably from year to year and from locality to locality depending on exposure, altitude, latitude, weather, and other ecological factors. In general the first of the overwintering adults and brood emerge to attack new trees about the first of May. Attacks from these beetles ordinarily continue until the latter part of June. A particularly early or late season, or a change in latitude north or south of the center of distribution may alter these dates by as much as a month. In the extreme southern limits of distribution it is possible that some flight activity may continue throughout the year. Because beetles do not emerge simultaneously, but do so slowly over a considerable period of time, and because of overlapping broods, some flight activity continues throughout the summer season; periods of greatest flight activity coincide with the emergence of each new brood. Flight activity is discontinued in October or November when daytime temperatures fall below 50 F.

Trees selected for attack usually are living, standing, and larger than 12 inches (30 cm) DBH. Prostrate trees are seldom attacked. In the absence of competing species the attack normally is distributed from the ground level upward to areas as small as four to eight inches in diameter, where cork plates of the bark have formed. Younger bark of limbs or upper bole and of smaller trees where cork plates have not developed are rarely attacked. In the presence of competing species of *Dendroctonus*, particularly *adjunctus* Blandford, and to a lesser extent *ponderosae* Hopkins, the area of attack by *brevicomis* is forced upward from the ground level a variable distance depending on the comparative abundance of competing species.

The attack usually begins in the upper midbole area of the host tree then progresses upward and downward. The attack is slow and continuous, without any sudden or concerted swarming of the beetles. Its duration is variable, evidently depending upon resistance of the host, or upon climatic or other ecological factors peculiar to the season or locality. It may be completed in as little as seven days, or it may continue over the greater part of a year. Characteristically the attack will be concentrated on one particular tree until it is overcome, even when the beetle population is high, before an attack is started on a second nearby tree. There is no attempt to occupy all available bark; the density of individual attacks may be as low as an average of about five per square foot of suitable bark on a susceptible tree, or higher than 20 per square foot on a vigorous or resistant tree. In general, single tree attacks suggest an endemic condition, while group attacks suggest an epidemic condition.

The winding egg galleries are constructed almost entirely in the inner bark or phloem tissues; they are in continual contact with and very lightly score or stain the woody or xylem tissues. Their total lateral displacement usually is equal to or greater than the total longitudinal displacement, although an occasional gallery may be decidedly longitudinal.

The diameter of an individual egg gallery is slightly greater than the width of a beetle; it averages approximately 35 cm in length, although exact measurements of fully formed galleries are virtually impossible to obtain because of the tendency for the winding galleries to branch, to anastomose, and to cross and recross one another. It is not uncommon for more than one pair of beetles to occupy one gallery, usually each pair being found in different branches that use the same entrance hole. Presumably this habit has suggested a tendency toward polygyny to some workers, particularly when the male was late in arriving or failed to arrive at all.

The initial attack is made by the female, usually in a crevice of the bark. About the time she reaches the phloem tissues where the pitch begins to flow she is joined by the male, who then assists her by pushing the excavated frass out of the entrance hole. Continuation of the parental or egg gallery is performed entirely by the female beetle. After several inches of gallery have been

cleared and the frass ejected from the entrance hole, the male then packs the frass in the lower regions of the gallery, thereby closing the entrance hole and tightly filling the gallery except for a few inches in the area where the beetles are working. It has been estimated (Miller and Keen 1960:16) that about two-thirds of an inch (2 cm) of new gallery is formed each day. Mating occurs only after the female has been joined by the male, never on the surface of the tree before the attack begins. Although seldom seen, mating evidently occurs repeatedly, because it has been observed in various stages of gallery construction.

Ordinarily, but not always, the entrance tunnel is without a nuptial chamber or other means of turning around until the first ventilation tunnel or branch in the gallery is reached. Ventilation tunnels are placed at irregular intervals and are not always present. Their presence appears related to the stage of gallery construction, thickness of the bark, and activity of the beetles. Usually they are not constructed before the entrance hole is plugged by frass; they are less abundant or sometimes entirely absent in trees having comparatively thin bark; and they appear to be more numerous in galleries constructed by unusually active beetles. Seldom are they spaced at intervals of less than 5 cm.

Oviposition ordinarily begins about eight days after the attack and continues for approximately 10 to 49 days (Miller and Keen 1960:20), except when egg-laying is interrupted by winter, in which case it is greatly extended. Although estimates of the number of eggs produced by a female based on the average number of eggs per inch of gallery have suggested a figure much higher, the highest number actually reported is 41 (Miller and Keen 1960:19). Usually a majority of the eggs are deposited in the first third of the gallery, the number declining significantly in the final third.

Egg niches are symmetrical and ordinarily are constructed on the sides of the gallery, usually in contact with the cambium. They are broad and deep, the depth being equal to about one-fourth to one-third the diameter of the egg gallery. The deepest point is rounded, matching rather well the anterior profile of the parent beetle as seen from the dorsal aspect. Unfilled egg niches often cannot be distinguished from the beginning of a new branch of the gallery. The number and spacing of niches depends on many factors, but usually the minimum distance between eggs on a particular side of a gallery is 1 cm. When considering both sides of the gallery and the alternating placement of eggs, this distance is reduced by half. Eggs are deposited individually in the niches; each niche is then filled by specially prepared frass packed to the original level or contour of the gallery.

Following the period of oviposition, the gallery may be continued in an irregular feeding tunnel of somewhat greater diameter than usual until death of the parent beetle; or the beetles may construct an exit tunnel, often independent of one another, by extending one of the ventilation tunnels and emerge to attack another host tree. It has been estimated that up to 50 percent of the parent beetles reemerge to produce a second brood, and a few of these reemerge to produce their third brood of the season (Miller and Keen 1960:18). Of those beetles that reemerge from the host, males predominate significantly.

The incubation period has not been determined precisely. Available figures suggest that 7 days are required for hatching under optimum conditions (Miller and Keen 1960:20), presumably with longer periods required when less favorable conditions exist. The newly hatched larvae mine the phloem next to the cambium for approximately 1 cm at right angles to the egg gallery. They then move into the inner bark and end their tunnels near the outer bark, where an area is cleared for pupation. Under optimum conditions larval development may be completed in as little as 30 to 35 days (Miller and Keen 1960:24); however, they do not develop at the same rate and some may require as much as 300 days to complete the larval stage of development. In the pupation cell the larva undergoes physiological changes to become a quiescent prepupa for about two to seven days before pupation occurs (Miller and Keen 1960:30); mature larvae may overwinter as prepupae, apparently never as pupae. Under normal conditions about 6 to 20 days are required to complete the pupal stage (Miller and Keen 1960:31); unfavorable conditions

may extend this period. A maturation period between attainment of the adult stage and emergence from the host varies from 7 to 14 days (Miller and Keen 1960:31), except in the spring months when it may be somewhat longer.

The number of generations each year is complicated by peculiarities of a particular season, by reemergence of parent adults to produce a second or a third brood, and by overlapping generations. In the northern parts of its range one complete and a partial second generation appears normal; in southern California and in Arizona three complete and perhaps a partial fourth generation might be expected.

NOTES.— The above treatment was based on the holotypes of *brevicomis* and *barberi*, and on about 2500 other specimens. The Arizona, Utah, and Colorado specimens tend to be slightly larger and with slightly coarser elytral crenulations than those from the Pacific Coast. However, series with equally coarse elytral crenulations came from northern California.

### 2. *Dendroctonus vitei* Wood
Fig. 59

*Dendroctonus vitei* Wood, 1975(1974), Great Basin Nat. 34:289 (Holotype, male; Patzún, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *mexicanus* Hopkins by the larger size, by the darker color, by the sculpture of the pronotum and elytra, and by other characters indicated below.

MALE.— Length 2.6–4.6 mm, 2.2 times as long as wide; color almost black.

Frons similar to *mexicanus* except epistomal process wider (67 percent of epistomal width, 58 percent in *mexicanus*), its lateral arms much more strongly elevated; area from epistomal process to lateral summits on frons more strongly, more broadly impressed (often subconcave), more finely sculptured; largest

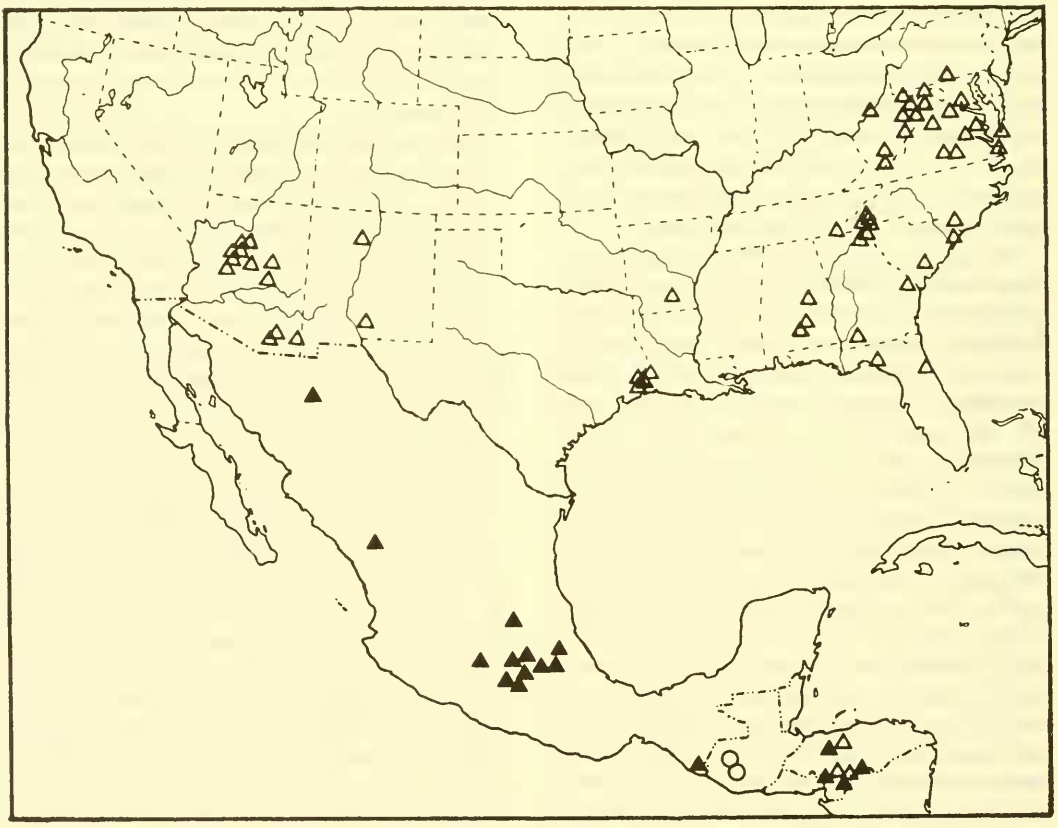


Fig. 59. *Dendroctonus* spp., distribution map; A, *frontalis*, open triangles; B, *mexicanus*, solid triangles; C, *vitei*, open circles.

tubercles at and near lateral summits less numerous, smaller than in *mexicanus*.

Pronotum similar to that of *mexicanus* except punctures averaging much smaller, closer, interspaces averaging less than half diameter of a puncture; interspaces over most of surface minutely granular, subshining, smooth shining areas usually restricted to less than one-fifth of total surface (in *mexicanus* interspaces average more than half diameter of a puncture, their surface smooth, brightly shining over almost entire surface, granulation rare and restricted; small tubercles sometimes occur in lateral areas). Vestiture more uniformly distributed, slightly coarser and longer than in *mexicanus*.

Elytra similar to *mexicanus* except discal striae less strongly impressed, punctures averaging smaller, obscurely impressed to obsolete in most specimens (larger and rather distinctly impressed in most *mexicanus*); interstrial crenulations narrower, lower, more numerous, rarely as much as one-third of crenulations at least half as wide as an interstriae, a few extend entire width of an interstriae). Declivity with striae feebly if at all impressed, punctures usually obsolete (striae and punctures rather strongly impressed in *mexicanus*); interstriae feebly if at all convex, crenulations less numerous and much smaller than in *mexicanus*. Vestiture slightly more abundant and coarser than in *mexicanus*, particularly at sides.

FEMALE.— Similar to male except epistomal process narrower, not as high, frontal summits more poorly developed, usually not tuberculate; pronotal callus more poorly developed than in female *mexicanus*.

DISTRIBUTION.— Guatemala.

GUATEMALA: Patzún, 19-IX-74, 12-III-74, 22-V-74, 9-X-74, 14-X-74, *Pinus tenuifolia*, "*P. maximinoi*," J. P. Vité, R. Lühl; Puente Tzantzir, Sololá, 2-II-72, *P. montezumae*, E. W. Clark.

HOSTS.— *Pinus pseudostrobus*, *P. tenuifolia*.

BIOLOGY.— This species occurs mostly at elevations above 2000 m. Its habits are very similar to *mexicanus*, but it apparently has a shorter life cycle. The pheromones are unique (Vité, Islas, Renwick, Hughes, Kleiforth 1974).

NOTES.— The above treatment was based on the type series of 355 specimens.

### 3. *Dendroctonus frontalis* Zimmermann

Figs. 59, 60, 61

*Dendroctonus frontalis* Zimmermann, 1868, Trans. American Ent. Soc. 2:149, 173 (Holotype, male; Carolina; Mus. Comp. Zool.)

*Dendroctonus arizonicus* Hopkins, 1909, U.S. Dept. Agric. Bur. Ent. Tech. Bull. 17(1):95 (Holotype, female; Williams, Arizona; U.S. Nat. Mus., 7446); Wood, 1974, Great Basin Nat. 34:188. *Synonymy*

DIAGNOSIS.— This species is distinguished from the closely related *brevicomis* LeConte by the longer declivital pubescence, by the more strongly impressed declivital striae, by the more sparsely but more coarsely granulate punctures of the declivital interstriae, by the smaller average size, and, in part, by the distribution.

MALE.— Length 2.0–3.2 mm (average about 2.8 mm), 2.3 times as long as wide; mature color light brown to dark brown.

Frons convex, with a pair of lateral elevations on median half just below upper level of eyes separated by a deep median groove, summits of elevations armed at their dorsomedian margins by one or two prominent, somewhat dorsomedially oriented granules; epistomal margin elevated, its surface smooth and shining; epistomal process slightly wider than half (0.58 times) distance between eyes, its arms oblique (about 40 degrees from horizontal) and elevated, horizontal portion about half its total width, transversely concave, ending just above epistomal margin and bearing under its distal margin a dense brush of conspicuous yellowish setae; surface granulate-punctate above eyes, coarsely, rather deeply punctured and subgranulate below. Vestiture, in addition to epistomal brush, rather long, sparse.

Pronotum 0.73 times as long as wide, widest on basal third; sides rather weakly arcuate on basal three-fourths, rather feebly constricted just behind broadly, shallowly emarginate anterior margin; surface smooth with rather coarse, moderately deep, close punctures; punctures somewhat shallower and less abundant laterally but not reduced in size; a raised median line not apparent. Vestiture rather long, fine, sparse.

Elytra 1.6 times as long as wide, 2.2 times as long as pronotum; sides straight and subparallel on basal two-thirds, rather broadly rounded behind; basal margins arcuate and bearing a row of about nine moderately

large, raised, overlapping crenulations, with several smaller submarginal ones particularly on interstriae 2 and 3; striae rather strongly impressed, punctures rather small, moderately deep; interstriae moderately convex, about one and one-half times as wide as striae and armed by a single very irregular row of rather coarse transverse crenulations, each averaging well over half width of an interstriae. Declivity moderately steep, convex; striae rather strongly impressed, punctures only slightly smaller than on disc; interstriae convex, virtually all punctures rather coarsely, transversely tuberculate, arranged in an irregular single or partly double rank (never more than two ranks across an

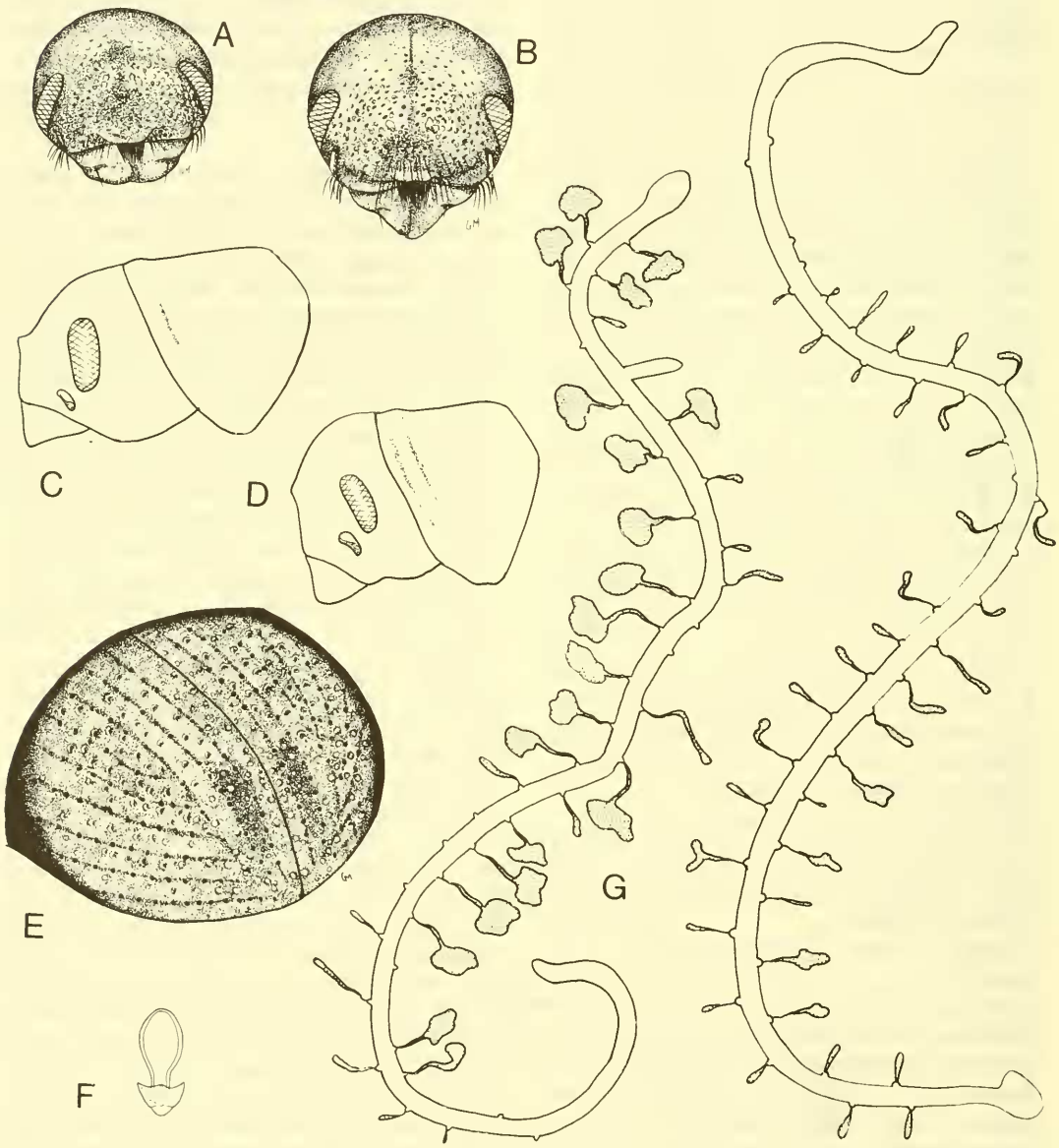



Fig. 60A. *Dendroctonus frontalis*: A, female head; B, male head; C, male head and pronotum (left); D, female head and pronotum (right); E, elytral declivity; F, male seminal rod; G, galleries.

interstriae). Vestiture rather abundant, rather long, length of most hairs equal to width of an interstriae, a few twice as long.

FEMALE.— Similar to male except lateral elevations of frons less prominent and unarmed, with median groove consequently less conspicuous; arms of epistomal process flat; pronotal constrictions largely filled by a prominent transverse elevated callus both laterally and dorsally; punctures of pronotal disc very slightly larger and deeper; transverse crenulations of elytral disc very slightly larger; and declivital granules somewhat finer, a few punctures along edges of interstriae often without granules.

DISTRIBUTION.— Oklahoma and Pennsylvania to E Arizona, Florida, and Honduras.

USA: **Alabama**: Calhoun, Montgomery. **Arizona**: Copper Basin Road near Prescott, Flagstaff, Santa Catalina Mts., Santa Rita Mts., Walker, Williams. **Arkansas**: Hampton. **District of Columbia**: Washington. **Florida**: Haw Ck., Taylor Ck. **Georgia**: Clyo, Demorest, Thomasville. **Louisiana**: Singer, Wilson. **Maryland**: Cumberland. **North Carolina**: Asheville, Biltmore, Black Mts., Boardman, Fletcher, "Mt. Graybeard," Pisgah Ridge, Tryon. **Oklahoma**: "Western Indian Terr." **Pennsylvania**: Mt. Alto. **South Carolina**: "Ben Quan," Clemson, Georgetown, Pregnall. **Tennessee**: Ducktown. **Texas**: Beaumont, Call, Deweyville, Kirbyville. **Virginia**: Arlington, Auburn, Chase City, Cob Island, Glen Allen, Green Bay, King and Queen Co., Port Republic, Virginia Beach. **West Virginia**: Greenbrier, Hampshire, Hardy, Kanawha, Monongalia, Pendleton, Pocahontas, Raleigh, Randolph, Tucker, Wood cos. HONDURAS: Yuscaran.

HOSTS.— *Pinus echinata*, *P. engelmannii*, *P. glabra*, *P. oocarpa*, *P. palustris*, *P. ponderosa*, *P. rigida*, *P. strobus*, *P. taeda*, and *P. virginiana*. Contrary to the statement of Thatcher et al. (1980), five series from *P. ponderosa* were examined from northern Arizona where *P. engelmannii* does not occur.

BIOLOGY.— The winter is passed in all stages, including eggs, with larvae predominating. As with *brevicomis*, activity might resume whenever subcortical temperatures become favorable during or following the winter months. There are three generations each year in the north (Thatcher et al. 1980), but, because all stages overwinter and emerge from the host as they mature, there is an extreme overlapping of generations, resulting in an almost continuous period of flight from April, when the first flights of overwintering adults begin, until December, when activity ceases in the northern parts of the range. In Honduras it is expected that flight activity is continuous throughout the year without interruption. In any particular locality, however, there are periods of greatest flight activity that tend to coincide with the emergence of each new brood. According to Hopkins (1909b:62), a peculiarity of this species is its tendency to migrate considerable distances from the brood tree to begin a new attack; subsequent workers (Dixon and Osgood 1961:6) also indicated that trees selected for attack may be either nearby or considerable distances from the point of emergence, but they tend to be scattered, not clustered.

Trees selected for attack ordinarily are living, standing, and larger than about six inches DBH. The attack usually is concentrated on the upper half of the bole but may reach the

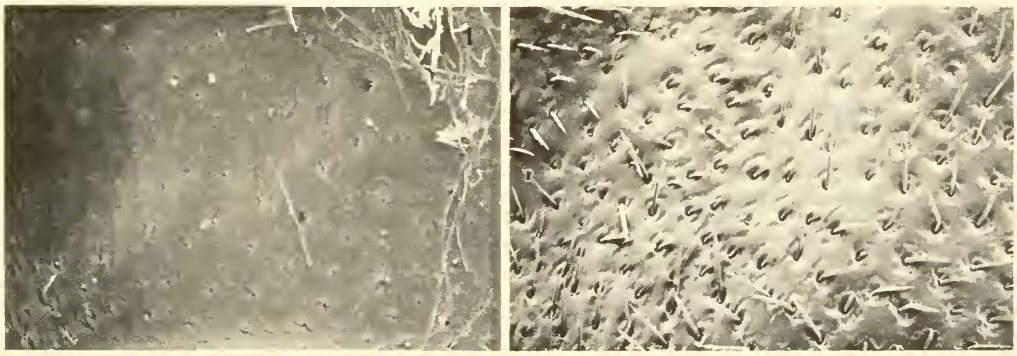



Fig. 60B. *Dendroctonus* sp., posterior half of left side of pronotum: 1, *frontalis*; 2, *vitei*. (Both photographed at 200X.)

ground level. The attack is slow and continuous, its durations depending on numerous factors such as the size and resistance of the host, the population density of beetles in the area, and the climatic and other ecological factors peculiar to the area. The duration and general pattern of attack on a host tree evidently are similar to those of *brevicomis*.

The egg galleries are almost entirely in the phloem tissues, not engraving, but staining the xylem slightly. They are winding, elongate galleries, often branching, anastomosing, or crossing one another. The complicated interwoven series resembles rather closely that of *brevicomis*, except that there is a greater tendency for the galleries to be longitudinal; that is, for the total longitudinal displacement to exceed the total lateral displacement. The diameter of each egg gallery is slightly greater than the width of a parent beetle; in length they average approximately 30 cm, although the winding, complex character of the galleries makes accurate measurement virtually impossible.

As with other species of the genus, the initial attack is made by the female, usually in a crevice in the bark. The male joins the female about the time the pitch begins to flow; he then pushes the frass from the entrance hole while the female extends the gallery. After the gallery has been extended several centimeters he packs the lower areas with frass, thereby blocking the entrance hole, leaving only the area where the beetles are working free for their activities. The gallery may or may not have a nuptial chamber; ventilation tunnels may be spaced irregularly as in *brevicomis*. Extension of the egg gallery may occur at the rate of about 2.5 cm per day. (Dixon and Osgood 1961:6).

The small amount of published data pertaining to the period of oviposition, egg production by individual females, and details of gallery formation are not sufficient for conclusive statements concerning them; however, it does permit the following comments.

Drawings, photographs (Hopkins 1909b:58–68, Fronk 1947:9; Dixon and Osgood 1961:7; etc.), and limited personal observations of egg galleries indicate that egg niches are placed alternately along the sides of the gallery in contact with the cambium. They are symmetrical and about one-third as deep as the width of the gallery and slightly wider than deep. The spacing of niches appears variable, but evidently they may be as close as 6 mm, with an average of 17 mm between niches on one side (accurate measurements should provide figures much lower than these). Eggs are deposited individually and each is packed in its niche with specially prepared frass to the original contour of the gallery.

Fronk (1947:10) found that under optimum conditions the eggs hatch in 3 to 9 days, with an average of 5.5 days; unfavorable conditions such as occur during the winter evidently may lengthen the incubation period to several months. Each newly hatched larva mines the phloem in contact with the cambium, approximately perpendicular to the egg gallery. This mine of the first instar larva is of uniformly thin diameter for about 1 cm, or several times this length in an unfavorable environment (Hopkins 1909:61); it then widens abruptly into a short, irregularly oval

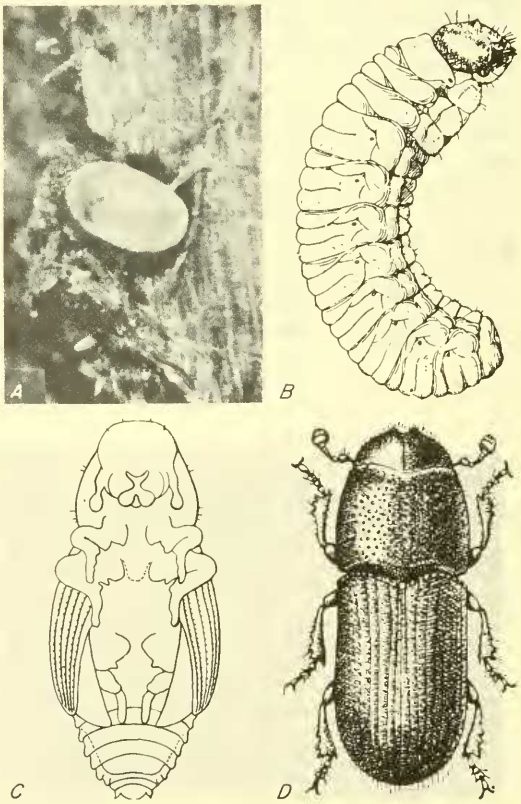



Fig. 61. *Dendroctonus frontalis*: A, egg; B, larva; C, pupa; D, adult. (After Bennett and Ciesla 1971:5.)

area, where the remaining larval instars are passed (Fronk 1947:8). This enlarged area may be in contact with the cambium and visible on peeled bark, or in thick bark it may be entirely in the inner bark, as in *brevicomis*. Toward the end of the fourth instar the larva bores into the outer bark, where it clears a pupal chamber and enters the quiescent prepupal stage. The larval period under optimum conditions varies from 25 to 38 days and the pupal period about 8 to 11 days (Fronk 1947:6); either or both stages might be lengthened several months by unfavorable conditions. In Virginia the life cycle was completed under near optimum conditions in from 40 to 54 days (Fronk 1947:7).

The number of generations completed in one year varies from 3 to 5 in the eastern United States; in Honduras the number may be greater.

NOTES.— Recent studies of pheromone attraction in Mexico and Honduras by J. P. Vité indicate that *frontalis* occurs in Honduras at elevations below 1000 m. It is replaced by a sibling species, *mexicanus*, at higher elevations. Due to the recent discovery of this differential pheromone attraction, the only other biological character noted in the Honduras *frontalis* population is that the life cycle is completed in about 60 days; the life cycle is significantly longer in *mexicanus*. The two populations often can be distinguished anatomically only when long series are studied.

The holotype of *frontalis* and about 700 other specimens were examined. Based on anatomical characters mentioned in the above key, I grouped material from Arizona, New Mexico, the southeastern United States, and part of that from Honduras under *frontalis*. Reliable observers also reported this species from elevations less than 700 m in eastern Mexico, but I have not seen specimens that document the reports. Specimens taken above 700 m elevation from Mexico to Honduras are of *mexicanus* (Wood 1975:288). Because the Arizona specimens are distinguished from *mexicanus* with extreme difficulty, it is possible that some gene flow between these forms occurs in northern or eastern Mexico; however, in Honduras both forms may breed in the same trees in the area of altitudinal overlap, with the *mexicanus* population having a distinctly longer life cycle. In Honduras they behave as distinct species. A third species in this complex, *vitei* Wood, from Guatemala, is distinguishable by several characters.

### 4. *Dendroctonus mexicanus* Hopkins
Fig. 59

*Dendroctonus mexicanus* Hopkins, 1905, preprint of Proc. Ent. Soc. Washington 7:80 (Lectotype, female; Sacramento, Amecameca, Mexico, Mexico; U.S. Nat. Mus., 7518, present designation)

DIAGNOSIS.— This species is distinguished, with difficulty, from *frontalis* Zimmermann by the larger than average size, by the darker mature color, by the concave area on the female frons above the epistomal process, by the smaller or obsolete strial punctures that usually have fine crenulations between them, and by the longer life cycle.

MALE.— Length 2.3–3.7 mm (average about 3.2 mm); 2.3 times as long as wide; color medium brown to black.

Essentially identical to *frontalis* except as noted in diagnosis and key.

DISTRIBUTION.— Chihuahua to Honduras.

MEXICO: **Chiapas**: Huixtla. **Chihuahua**: Tres Ríos. **Distrito Federal**: Mexico, Tacubaya. **Hidalgo**: Jacala. **Mexico**: Amecameca, Chapingo, San Rafael, Texcoco, Tlalmanalco. **Michoacán**: "Michoacán." **Morelos**: Cuernavaca, Tlayacapan. **Puebla**: Texmelucán. **Tlaxcala**: Tlaxcala. **Zacatecas**: Laguan Balderama. GUATEMALA: Godenez, Santa Cruz del Quiché. HONDURAS: Yuscarán.

HOSTS.— *Pinus ayacahuite, P. lawsoni, P. leiophylla, P. montezumae, P. oocarpa, P. ponderosa, P. pseudotrobus, P. rudis, P. teocote.*

BIOLOGY.— Evidently as in *frontalis* except the life cycle is longer than 90 days. The altitudinal distribution evidently is above 700 m; in *frontalis* it is mostly below 700 m, but both species have been taken from the same tree in Honduras. Trees selected for attack usually are clustered; in *frontalis* they tend to be scattered.

NOTES.— The above treatment was based on the lectotype of *mexicanus*, and on about 600 other specimens. This species was regarded (Wood 1963) as a synonym of *frontalis* because of the extreme variability of series from Honduras. When Vité (pers. comm.) was unable to attract all segments of the population in Honduras and none of it in

Mexico with *frontalis* pheromones, the species was reexamined. Differences in life cycle, attack pattern, and morphology then became apparent. The two species are extremely difficult to distinguish using anatomical characters unless series are examined.

See the above notes under *frontalis* for additional information on this species.

### 5. *Dendroctonus approximatus* Dietz

Figs. 62, 63

*Dendroctonus approximatus* Dietz, 1890, Trans. American Ent. Soc. 17:28 (Lectotype, female; Colorado; Philadelphia Acad. Sci., designated by Hopkins, 1909, U.S. Dept. Agric. Bur. Ent. Tech. Bull. 17(1):102)

*Dendroctonus parallelocollis*: Of all authors except Chapuis; Wood, 1969, Great Basin Nat. 29:121 (Erroneous identification corrected)

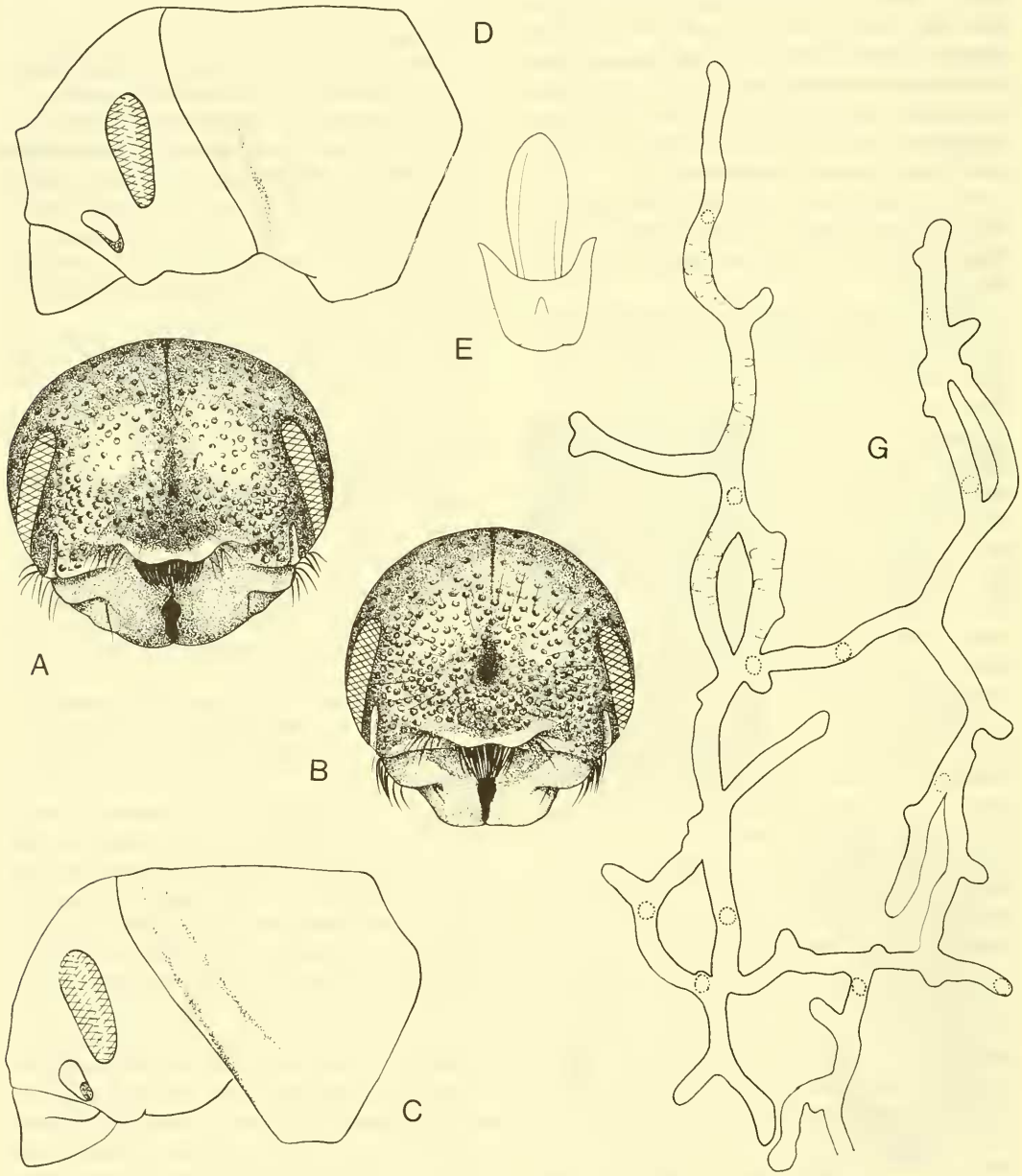



Fig. 62. *Dendroctonus approximatus*: A, female head; B, male head; C, female head and pronotum; D, male head and pronotum; E, male seminal rod; F, galleries.

DIAGNOSIS.— This species is distinguished from *frontalis* Zimmermann and *mexicanus* Hopkins by the larger size, by the more nearly flattened declivital interstriae with 2 weakly impressed, by the uniseriate, rounded granules on declivital interstriae 2, and by the larger, more closely set crenulations of the elytral disc. From *adjunctus* Blandford it is also distinguished by the more strongly impressed declivital striae, by the interstrial granules being uniseriate only on declivital interstriae 2 (rarely also on 1) and much more closely spaced, by the much larger, more numerous crenulations of the elytral disc, and by the more prominent transverse pronotal callus of the female and the large, almost hornlike, frontal tubercles of the male.

MALE.— Length 4.5–7.0 mm (average about 5.5 mm), 2.3 times as long as wide; mature color very dark brown to black.

Frons convex, with a pair of lateral elevations on median half just below upper level of eyes separated by a deep median groove, summits of elevations armed at their dorsomedian margins by one or two prominent, somewhat dorsomedially oriented tubercles; epistomal margin elevated, its surface smooth and shining; epistomal process slightly wider than half (0.57 times) distance between eyes, its arms oblique (about 40 degrees from horizontal) and elevated, horizontal portion about half its total width, transversely concave, ending just above epistomal margin and bearing under its distal margin a dense brush of conspicuous yellowish setae; surface punctate-rugulose above eyes, coarsely, rather deeply punctured and subgranulate below. Vestiture, in addition to epistomal brush, rather long, sparse.

Pronotum 0.80 times as long as wide, widest at base; sides feebly arcuate and converging very slightly to almost imperceptible anterior constriction just behind broadly, very shallowly emarginate anterior margin; surface smooth and shining, punctures rather small, moderately deep, close (size, depth, and arrangement variable in a series); a raised median line feebly indicated anteriorly. Vestiture sparse, inconspicuous; moderately long at sides.

Elytra 1.3 times as long as wide, 2.2 times as long as pronotum; sides straight and subparallel on basal two-thirds, rather broadly rounded behind; basal margins arcuate and bearing a row of about nine moderately large, raised, overlapping crenulations, with several smaller submarginal ones particularly on interstriae 2 and 3; striae weakly impressed, punctures usually rather small and shallow with anterior margins raised, subcrenulate; interstriae about twice as wide as striae and armed by abundant, confused, transverse crenulations, each averaging at least half width of an interstriae, some as wide as an entire interstriae on posterior half of disc. Declivity moderately steep, convex, with interstriae 2 weakly impressed; striae narrowly, moderately impressed, punctures smaller than on disc, distinctly impressed, 1 and 2 almost straight, 3 curving away from suture on upper half, toward suture on lower half; interstriae scarcely if at all convex, about equal in width (except for expanded portion of 3), each bearing a series of moderately large rounded granules, those on 1 and 3 usually confused, uniseriate on 2, usually with a few to many fine punctures in addition to granules; granules on interstriae 2 separated from one another by an average distance equal to one-half width of an interstriae. Vestiture not abundant, longer on sides and declivity, longest setae about one and one-half times as long as width of an interstriae.

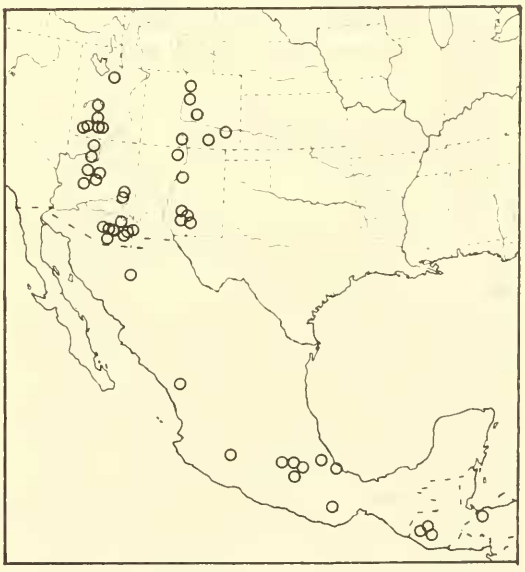


Fig. 63. *Dendroctonus approximatus*, distribution map.

FEMALE.— Similar to male except lateral elevations of frons less prominent and unarmed, with median groove consequently less conspicuous; arms of epistomal process less strongly elevated; pronotal constriction largely filled by a prominent, transvere, elevated callus both laterally and dorsally; punctures of pronotal disc very slightly larger and deeper; transverse crenulations of elytral disc and declivital granules somewhat larger.

DISTRIBUTION.— Central Utah and Colorado to Honduras.

USA: **Arizona**: Black Mesa F. R., Chiricahua Mts., Flagstaff, Fort Apache, Graham Mts., Grand Canyon N. P., Kaibab N. F., Paradise, Pine, Portal, Prescott, Rincon Mts., Santa Catalina Mts., Santa Rita Mts., Show Low, Tucson, Williams. **Colorado**: Brookvale, Glen Haven, Las Animas, La Veta, Monte Vista, Palmer Lake. **New Mexico**: Capitan Mts., Carson N. F., Cloudcroft, Lincoln N. F., Santa Fe, Sierra Blanca. **Utah**: Bryce Canyon N. P., Dixie N. F., Escalante, Kamas, Long Hollow, Panguitch, Panguitch Lake, Pin Hollow in Fishlake N. F. MEXICO: **Chihuahua**: Chuichupa, Tres Ríos. **Durango**: El Salto, Sierra Durango. **Distrito Federal**: Mexico. **Mexico**: Ixtaccihuatl. **Michoacán**: Jacona. **Morelos**: Jonacatepec. **Oaxaca**: Oaxaca. **Puebla**: Texmelucán. **Tlaxacala**: Tlaxacala. **Veracruz**: Jalapa, Veracruz. GUATEMALA: Quezaltenango, Santa Cruz del Quiché, Tecpán. HONDURAS: San Pedro Sula.

HOSTS.— *Pinus ayacahuite*, *P. chihuahuana*, *P. engelmannii*, *P. hartwegii*, *P. leiophylla*, *P. montezumae*, *P. ponderosa*, *P. teocote*.

BIOLOGY.— This is not an aggressive species; consequently, damage caused by it is comparatively minor. It is a secondary enemy of pine, entering the host only after the tree has been overcome by the more aggressive species of *Dendroctonus* or of *Ips*.

Adults and larvae in all stages of development overwinter in their galleries at the base of the host tree, or, in the case of felled trees, on the lower side of the trunk next to the ground. They become active somewhat later than other species and usually extend their old galleries for a period, with the adults resuming egg-laying activities, before emerging from the host. In the northern parts of the range the flight period begins early in June and continues until October, with the principal period of activity occurring in June and early July. In southern Mexico and Guatemala activity probably continues throughout the year without seasonal interruptions. Emergence from the host occurs gradually over a long period of time; consequently, large numbers of beetles are not in flight at the same time, making a concerted attack on one tree by this species exceedingly difficult.

The trees selected for attack are those previously selected by and largely overcome by other species, or those felled more than six weeks prior to the attack. This species usually occupies the basal portion of the bole from the ground level up to a height of six or eight feet. In the northern parts of its range, where it competes with *adjunctus* for space in the basal parts of the host, its galleries seldom extend more than two or three feet above the level of the ground. It also breeds in felled trees (Blackman 1931:30), usually only on the lower side, particularly in those areas in contact with the ground. The smallest trees observed in which this species was breeding were 12 inches DBH, although this probably does not represent the minimum size acceptable to this species.

Ordinarily the attack is directed at the butt of the tree in areas of bark not occupied one to three weeks previously by other species. In an injured tree the attack may extend over a rather long period of time as successive generations slowly girdle it.

Basically the galleries are longitudinal and winding; they are coarser than those of associated species, particularly *adjunctus*, and present a strikingly different overall pattern. Branch galleries, many of which cross or join other galleries, are numerous, causing the entire network of galleries to form an apparently aimless crisscross pattern. As with other species, the galleries are almost entirely in the inner bark, very faintly grooving or at least staining the cambium.

The egg galleries are rather coarse, averaging about 5 mm in diameter. Gallery systems may be extensive, but because of their branching and anastomosing character it is virtually impossible to measure the work of individual beetles.

The initial attack is made by the female, and soon after she reaches the phloem tissues she is joined by the male. He then expels excess frass from the entrance hole or later packs the lower or more remote areas of the gallery with excess frass to keep clear the area where the female is working. Egg niches

are very different from other species; they are not in contact with the cambium, but are located alternately on the sides of the wall farthest from the cambium. The niches are cup-shaped, larger than usual, and extend into the nonliving portion of the bark. Each niche may contain one to four eggs (Blackman 1931:30); no more than one egg per niche was found during my study. The larval mines are entirely in the bark, mostly in the outer bark, and do not contact the cambium at any time. Their length is variable and not easily measured, but evidently they are rather short. Pupal chambers are almost always in the outer bark.

Oviposition apparently begins about a week before the attack and probably continues over a substantially longer period than is the case with related species. The position of the egg niches and the possible deposition of several eggs in each makes it difficult to count with any degree of accuracy the number of eggs produced by any one female, because many of the eggs are destroyed by the observer's attempt to locate the niches. From the number of niches found, however, it is estimated that the number is not large, probably seldom exceeding 40 eggs per female. As with other species, a majority of the eggs apparently were deposited in the first third of the egg gallery. The exact spacing of egg niches, and the periods of incubation and larval and pupal development were not determined.

In the northern parts of its range one generation per year appears to be normal.

NOTES.— The above treatment was based on the lectotype and on about 550 other specimens. Due to misidentification of the type of *parallelocollis* by other authorities and to my inability to locate it for my revision of the genus, most of the literature treating this species prior to 1969 was published under the name *parallelocollis*.

### 6. *Dendroctonus adjunctus* Blandford
Figs. 64, 65

*Dendroctonus adjunctus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):147 (Lectotype, male; Totonicipan, Guatemala; British Mus. Nat. Hist., present designation)

*Dendroctonus convexifrons* Hopkins, 1909, U.S. Dept. agric. Bur. Ent. Tech. Bull. 17(1):87 (Holotype, female; Williams, Arizona; U.S. Nat. Mus., 7445); Wood, 1963, Great Basin Nat. 23:52. *Synonymy*

DIAGNOSIS.— This species occupies a position between the two major groups within the genus, more or less compromising the characters of *approximatus* Dietz and *ponderosae* Hopkins. It is distinguished from *approximatus* by the more slender body form, by the more widely spaced, uniseriate granules on declivital interstriae 1–3, by the more finely sculptured elytral disc, and by the absence of frontal tubercles in the male and the more poorly developed transverse pronotal callus in the female. In many respects it is similar to *ponderosae* but may be distinguished by the more slender form, by the smooth, shining, declivital interstriae, by the stronger median frontal groove, and, in the female, by the transverse pronotal callus.

MALE.— Length 3.0–5.5 mm (average about 4.8 mm), 2.4 times as long as wide; mature body color rather dark brown.

Frons convex, with a pair of unarmed lateral elevations on median half just below upper level of eyes separated by a rather inconspicuous median groove; epistomal margin elevated, its surface smooth and shining; epistomal process half (0.50 times) as wide as distance between eyes, its arms oblique (about 40 degrees from horizontal) and elevated, horizontal portion about half its total width, transversely concave, ending just above epistomal margin and bearing under its distal margin a dense brush of conspicuous yellowish setae; surface punctate-rugulose above eyes, more deeply punctured and subgranulate below. Vestiture, except epistomal brush, sparse, inconspicuous, rather long.

Pronotum 0.74 times as long as wide, widest on basal third; sides rather strongly arcuate on basal three-fourths, rather strongly constricted behind broadly, shallowly emarginate anterior margin; surface smooth with rather fine, shallow, close punctures on median third, becoming more finely punctured laterally; an indistinct median line apparent. Vestiture rather sparse, long, becoming coarse laterally.

Elytra 1.7 times as long as wide, 2.4 times as long as pronotum; sides straight and subparallel on basal two-thirds, rather narrowly rounded behind; basal margins arcuate and bearing a row of about nine moderately large, raised, overlapping crenulations, with

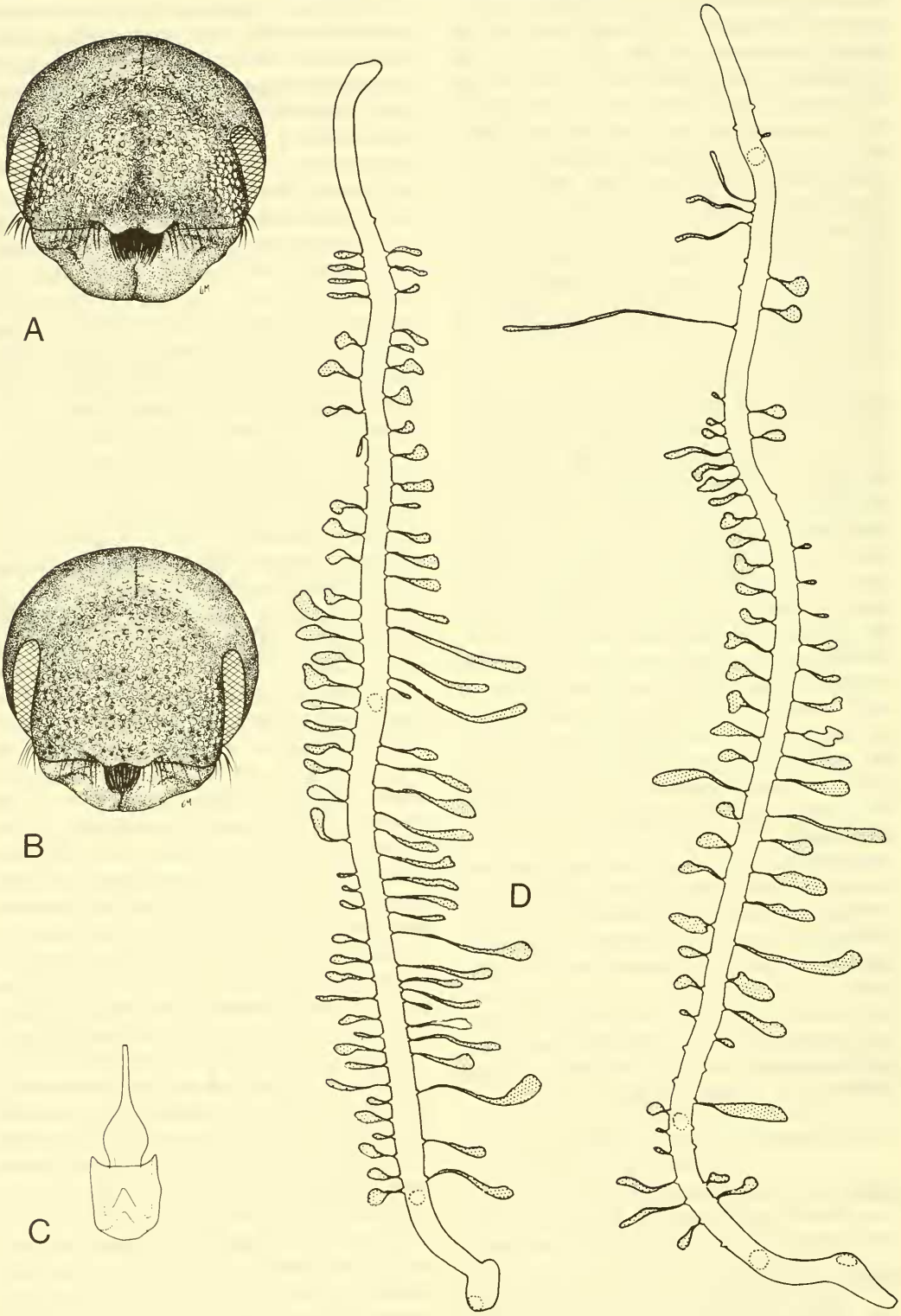



Fig. 64. *Dendroctonus adjunctus*: A, male head; B, female head; C, male seminal rod; D, galleries.

several smaller submarginal onces particularly on interstriae 2 and 3; striae weakly impressed, punctures rather small, shallow; interstriae about twice as wide as striae and armed by rather abundant confused, transverse crenulations, each averaging about one-half width of an interstriae, a few almost as wide as interstriae on posterior half of disc. Declivity moderately steep, convex, with interstriae 2 weakly impressed; striae weakly impressed, punctures greatly reduced, 1 straight, 2 curving slightly toward suture on lower third, 3 diverging from suture on upperhalf, curving toward suture on lower third; interstriae 1 slightly raised, 2 impressed and flat, 3 feebly convex, each bearing a uniseriate row of sparse, rounded, or pointed granules and in addition several confused, minute punctures; granules on 2 separated from one another by an average distance equal to width of an interstriae. Vestiture rather sparse, longer on sides and declivity, longest setae about one and one-half or two times as long as width on an interstriae.

FEMALE.— Similar to male except lateral elevations and median frontal groove poorly developed; arms of epistomal process less strongly elevated; pronotal constriction with a feebly developed transverse elevated callus; punctures of pronotal disc very slightly larger and deeper; and transverse crenulations of elytral disc and granules of declivity very slightly larger.

DISTRIBUTION.— S Utah and Colorado to Guatemala.

USA: **Arizona**: Flagstaff, Fort Apache, Graham Mts., Grand Canyon N. P., Jacobs Lake, Kaibab N. F., Paradise, Rustler Park, Santa Catalina Mts., Show Low, Williams. **Colorado**: Durango, Ft. Garland, Las Animas Co., La Veta, Monte Vista, Rye, San Isabel N. F., "Vallecito R. S." **New Mexico**: Capitan, Carson N. F., Cloudcroft, Ft. Wingate, "Hermit Peak," Las Vegas, Lincoln N. F., Sierra Blanca, Vermejo. **Utah**: Escalante, Long Hollow in Dixie N. F., Manti-La Sal N. F., Panguitch Lake, Sanford Canyon. MEXICO: **Mexico**: Nevada de Toluca, Penuela la Gavia. GUATEMALA: Cerro Quemado, Chuchumatanes, Guatemala, La Esperanza, Las Trojadas, Montaña de las Nubes, Poptum, Quetzaltenango, Sierra María Tecum, Tecpan, Totonicapan.

HOSTS.— *Pinus ayacahuite, P. hartwegii, P. leiophylla, P. montezumae, P. ponderosa, P. pseudostrobus, P. tenuifolia.*

BIOLOGY.— This species generally works in concert with other species of *Dendroctonus* to overcome a tree. Its galleries resemble, superficially at least, those of other species and, consequently, the resulting misidentifications have attributed much of the damage actually done by this species to others having more formidable reputations as tree killers. In the absence of an epidemic of other species it appears much more aggressive than the available literature would indicate, frequently initiating the primary attack on a tree.

Although any stage of development may be represented, the winter usually is passed as half-grown larvae or else as adults starting a new attack in the fall but without commencing oviposition. Larval development is resumed and egg deposition is started or resumed as soon as spring temperatures become sufficiently high. The brood, both young adults and larvae, completes it development and begins to emerge to seek new hosts in May or early June, usually several weeks after the emergence of *brevicomis* and possibly of *ponderosae*. Its habits of commencing attacks in the fall and the late emergence in the spring are important factors in the apparent lack of aggressiveness of this species, because the timing of its flight activity coincides with the period when other species have overcome host trees but have not yet occupied the lower portions of the bole. (This could indicate a lack of seasonal synchrony in the life cycle that does not occur every year.)

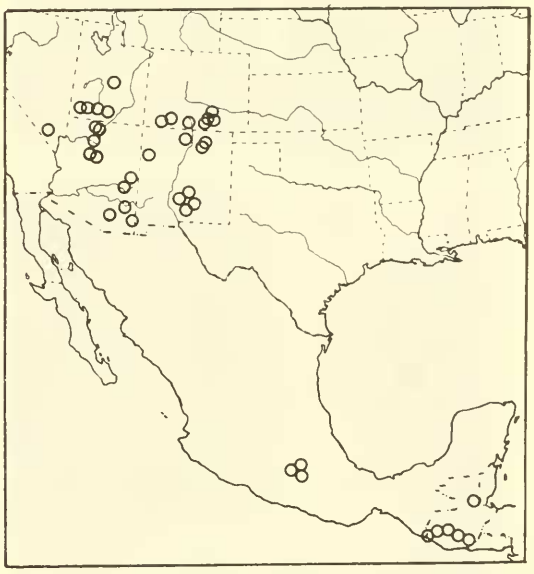


Fig. 65. *Dendroctonus adjunctus*, distribution map.

Although some flight activity occurs throughout the summer months, two periods of increased activity occur. The first is in May and early June; the second and greatest occurs between the later part of August and the middle of October. The attack on a particular tree is spread over a considerable period of time and usually involves a relatively small population of this species.

Trees selected for attack are weakened standing trees larger than about 10 inches DBH. Galleries have been observed in stumps, but not in prostrate trees or logs. In the absence of competing species the area of attack may extend from ground level to a height of about 3 or 5 m (10 or 12 ft). When competing species, particularly *ponderosae*, are present in large numbers this species may be restricted to less than the lower three feet of the bole.

The attack appears to begin in the upper parts of the area occupied by this species; that is, the bole about 1 to 4 m (4 to 12 ft) above the ground level, with successively newer attacks occurring below this area until the level of the ground is reached. The attack may be completed in a few days when populations are high, or it may extend over the greater part of a year, particularly when the first attacks are made in the fall.

Egg galleries are sinuous and almost always extend upward from the entrance hole. As with other species of this genus they are almost entirely in the phloem, very lightly scoring or at least staining the wood. The total longitudinal displacement of an egg gallery usually is about three to four times as great as the total lateral displacement. Ordinarily the gallery extends horizontally either right or left from the entrance hole about 4–7 cm then curves upward; about two to four broad sinuous curves are included in its vertical ascent. From the principal longitudinal axis of the gallery the first of these curves diverges about 4 to 6 cm from this axis. Of 36 egg galleries studied in the Panguitch, Utah, area during the last week of June 1960, the average gallery length was 31 cm and the maximum was 89 cm; the average width was about 4 mm. Although it appeared that an effort was made by the beetles to avoid doing so, galleries did cross or anatomose occasionally. Approximately one gallery in 25 descended vertically, evidently to avoid crowding or crossing neighboring galleries; more rarely one was primarily transverse. Branching or side galleries extending from the main egg tunnel were uncommon. When such branches did occur they usually did not exceed 3 cm in length and did not contain egg niches.

The initial attack is made by the female. As with other species this usually occurs in a crevice of the bark, ordinarily she is joined by the male about the time the entrance tunnel reaches the cambium, then the male ejects frass from the entrance hole while the female extends the gallery. When sufficient working space is available, he then packs the lower portions of the gallery with the excess frass.

Ventilation tunnels occur at irregular intervals; the minimum observed distance between two of them was 1.7 cm; in trees having relatively thin bark they may be entirely absent. The average distance between ventilation tunnels in the 36 galleries measured for this study was 5.2 cm. The first most commonly is placed within 1 cm either above or below the first egg niche; the average distance from the entrance hole to the first egg niche was 3.5 cm.

Egg niches are arranged alternately in the phloem on the sides of the gallery in contact with the cambium. Each is symmetrical, slightly deeper than wide, and, compared to the foregoing species, is rather small. Each niche is very slightly larger than the egg it contains. The number and spacing of egg niches is variable; the minimum observed distance between two niches located on the same side of a gallery was 1.5 mm; the average distance was about 3.5 mm. The average number of egg niches in the 36 galleries mentioned above was 44.1; the maximum was 119. About one-tenth of the niches were located exactly opposite one another on the different sides of the gallery; this was a notable departure from the consistently alternate placement of niches in the preceding species, where such an occurrence was exceedingly uncommon. Eggs are deposited individually in the niches; each niche is then filled by specially prepared frass to the original level of the gallery wall.

The period of incubation has not been determined precisely, but evidently it requires about a week under optimum conditions. The newly hatched larvae construct narrow tunnels in the cambium region perpendicular to the egg gallery. The larval mine extends about 1 to 4 cm along a straight to winding route, without increasing in diameter. It then expands abruptly into an oval to irregular feeding chamber approximately 0.5–1.0 cm wide and about 1 or 2 cm long. The entire larval mine usually is in contact with the cambium and is visible on the inner surface of peeled bark. Some of the larvae pupate in this chamber; most of them, however, mine into the outer bark for pupation.

The number of generations may vary from one complete and a partial second generation per year to one generation in two full years (Hopkins 1909b:55). Although not reported, it appears possible that two generations might be completed in favorable years and localities in the southern parts of its range (Becker 1954).

NOTES.— The above treatment was based on the syntypes of *adjunctus*, the holotypes of *convexifrons*, and on about 700 other specimens. The male syntype labeled "Type" is here designated on the lectotype of *adjunctus* Blandford, as indicated above.

### 7. *Dendroctonus ponderosae* Hopkins

Figs. 66, 67, 68, 69

*Dendroctonus ponderosae* Hopkins, 1902, U.S. Dept. Agric. Div. Ent. Bull. 32:10 (Lectotype, female; Spearfish, South Dakota; U.S. Nat. Mus., 7448, present designation)

*Dendroctonus monticolae* Hopkins, 1905, U.S. Dept. Agric. Bur. Ent. Bull. 56:11 (Lectotype, female; Kootenai, Idaho; U.S. Nat. Mus., 7447, present designation); Wood, 1963, Great Basin Nat. 23:58. *Synonymy*

DIAGNOSIS.— This species is distinguished with difficulty from *jeffreyi* Hopkins by the larger, closer deeper pronotal punctures and, in the area of sympatry, by the smaller average size. It is remotely allied to *adjunctus* Blandford but lacks the median frontal groove and the female pronotal callus, and the elytral declivity is minutely granular and dull.

MALE.— Length 3.5–6.8 mm (average about 5.5 mm; size varies geographically as well as within local population), 2.2 times as long as wide; mature body color black.

Fronx convex from eye to eye, from vertex to epistoma, median line narrowly impressed above upper level of eyes, rather broadly protuberant over an indefinite median area below upper level of eyes, often with remnants of a narrowly impressed median line; epistomal margin elevated, its surface smooth and shining; epistomal process half as wide (0.50 times) as distance between eyes, its arms oblique (about 30 degrees from horizontal) and elevated along their median halves, horizontal portion about half its total width, transversely concave, overlapping and ending just above epistomal margin and bearing under its distal margin a dense brush of conspicuous yellowish setae; surface punctate-rugulose above eyes, coarsely, rather deeply punctured and subgranulate below. Vestiture in addition to epistomal brush, rather long, sparse, inconspicuous.

Pronotum 0.75 times as long as wide, widest at base; sides feebly arcuate, almost straight on basal two-thirds, converging

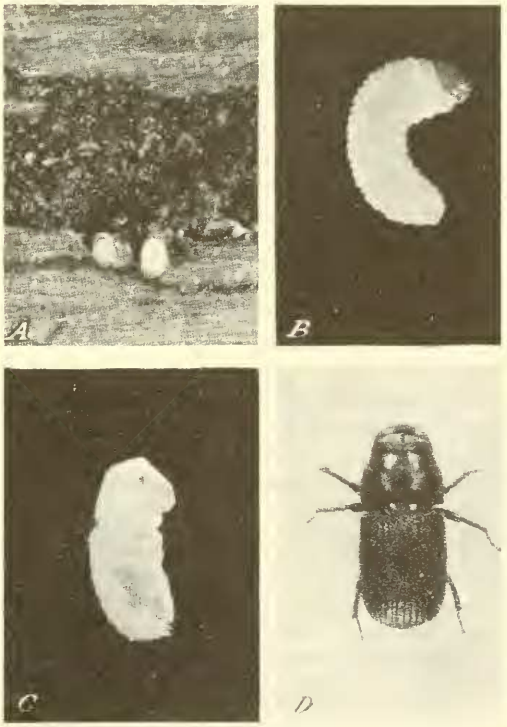



Fig. 66. *Dendroctonus ponderosae*: A, eggs; B, larva; C, pupa; D, adult. (After Evenden, Bedard, and Struble 1943:6.)

slightly toward well-developed constriction just behind broadly, shallowly emarginate anterior margin; surface smooth, shining, with very close, rather small, moderately deep punctures (variable), becoming granulose laterally; a median line feebly indicated, more prominent anteriorly. Vestiture scanty, usually evident only at sides.

Elytra 1.5 times as long as wide, 2.1 times as long as pronotum; sides straight and subparallel on basal two-thirds, rather broadly rounded behind; basal margins arcuate and bearing a row of about nine moderately large, raised, overlapping crenulations, with several small submarginal ones particularly on interstriae 2 and 3; striae weakly impressed, punctures rather small, rather deep; interstriae about twice as wide as striae and armed by rather coarse, confused, transverse crenulations, each averaging about half width of an interstriae. Declivity rather steep, convex, with interstriae 2 rather strongly impressed; striae rather narrowly impressed, punctures smaller than on disc; striae 1 slightly, 2 rather strongly, 3 very strongly curved toward suture; interstriae usually at least slightly convex, minutely rugulose, dull, punctures fine, confused, distinct to obscure or subgranulate; each interstriae with a sparse, more or less definite median row of rather large granules. Vestiture scanty, longer and more conspicuous on declivity, longest setae slightly longer than a distance equal to width of an interstriae.

FEMALE.— Very similar to male, but evidently epistomal process less well developed, and elytral crenulations and declivital granules a little larger.

DISTRIBUTION.— S British Columbia and E South Dakota to Baja California and New Mexico.

CANADA: **British Columbia**: Adams Lake, Alleyne Lake, Arrowhead, Aspen Grove, Babine Lake, Blue River P. O., Big Loon Lake, Cowichan Lake, Downie Ck., Forester Ck., Frances Ck., Grand Forks, "Hope Mts.," Kamloops, Kootenay N. P., Little Fish Ck., Little Shusway Lake, Midday Valley, Morrison Lake, Mud Lake, Na Kusp, "Nehalliston For.," Peachland, Princeton, Puntchesakut Lake, Revelstoke, Seymour Narrows, Shuswap Lake, Steamboat Mt., Sugar Lake, Sugarloaf Mt., Takla Lake, Tarnezell Lake, "Trepan Ck.," Trout Lake, Upper Arrow Lake, Whitetail Lake, Windermere, Yoho N. P. USA: **Arizona**: Chiricahua Mts., "Crook N. F.," Flagstaff, Fredonia, Kaibab N. F., San Francisco Mts. **California**: Altura, Amador Co., Bass Lake, Bear Ck. R. S., Bailey Ridge, Blogett For. in El Dorado Co., Echo Lake, Eiler Lake, Hackamore, Hope Valley, Hume, Idyllwild, Kingston in Placer Co., Lake Ostrander, Leland Meadow, Tuolumne Co., Kern Co., Mariposa Grove, Miami R. S., Modoc, Myers, North Fork,

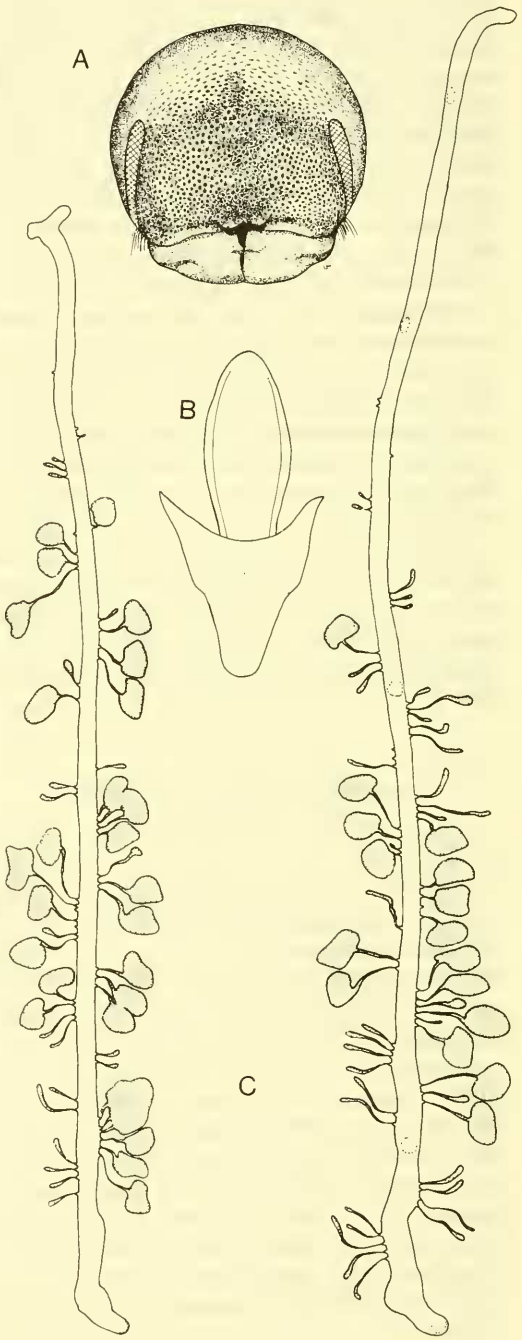



Fig. 67. *Dendroctonus ponderosae*: A, female head; B, male seminal rod; C, galleries.

Onion Valley, Pinecrest, Sequoia N. P., Snowline Camp in El Dorado Co., Soda Springs, Sonora Pass in Mono Co., Summit Lake, Tenaya Lake, Three Rivers, Wawona, Wright's Lake in El Dorado Co., Yosemite. **Colorado**: Bailey, Brookvale, Cascade, "Cat Mt.," Cuchetopa, Durango, Eagle, Elictra Lake, Estes P., Florissant, Ft. Garland, Glenwood Springs, Gunnison N. F., Gould, Green Mt. Falls, Hahns Pk., Husted, Idaho Springs, "Indian Ck.," Jones Ranch, "Kennedy Sta.," Larkspur, Las Animas, La Veta, Longs Pk., Manitou, Medicine N. F., Meeker, Monte Vista, Montrose, Montezuma N. F., "Ouray N. F.," Pogosa Springs, Palmer Lake, Pikes Pk., Pine, Pingre Pk., Poncho Springs, Porter, Saguache, San Isabel, San Juan N. F., Uncompahgre N. F., "Ute Pass," Westcliff, White River N. F. **Idaho**: Cedar Mt., Centerville, Coeur d'Alene, Coeur d'Alene N. F., Collins, Kootenai, "Moscow Mts.," Sandpoint, Smith's Ferry, Weiser. **Montana**: Apgar, Bigfork, Blackfeet Indian Res., Columbia Falls, Helana, "Iron Mt.," Lame Deer, Lewis and Clark N. F., Logan Pass, Lolo, Madison N. F., Missoula, Saltese, Sula. **Nevada**: Baker, Crystal Bay, Glenbrook, Las Vegas. **New Mexico**: Gila N. F., Tres Ritos, Vermejo P. **Oregon**: Ashland, "Auburn," Austin, Baker, Bly, Buck Lake, Cold Springs, Crater Lake N. P., Diamond Lake, Elk Ck., "Ferris Ranch," Grants Pass, Haines, "Highland Mine," Joseph, Keno, Klamath Falls, Klamath Indian Res., "Loves Sta.," Meryl Ck., North Powder, Ochoco N. F., Pinehurst, "Pokegama," Round Lake, Sparta, Sumpter, Wallowa. **South Dakota**: Black Hills, Custer, Deadwood, Elmore, Hill City, Lead, Nemo, Piedmont, Sylvan Lake. **Utah**: Ashley N. F., Bryce Canyon N. P., Duck Lake, Escalante, Kamas, Logan Canyon, Manti-La Sal N. F., Panguitch Lake, Uinta and Ouray Indian Res., Wasatch Mts., Wasatch N. F. **Washington**: Crescent Lake, Dayton, Fairfax, "Kamiak Butte," Longmire Spring, Metaline Falls, Moran, Mt. Rainier, Mt. Rainier N. F., Northport, "Pialschie," Pullman, Randle, Seattle, Washington N. F., White River. **Wyoming**: Bear Lodge in Black Hills N. F., "Downington," Elk Mt., Encampment, Fremont Lake, "Keystone," North Fork, Wapiti. MEXICO: **Baja California**: Sierra San Pedro Martir.

HOSTS.— *Pinus albicaulis, P. balfouriana, P. contorta, P. coulteri, P. edulis, P. flexilis, P. jeffreyi* (rare), *P. lambertiana, P. monophylla, P. monticola, P. murrayana, P. ponderosa, P. strobiformis.* During an epidemic it was recorded from *Picea engelmannii.*

BIOLOGY.— This has been referred to (Craighead et al. 1931:1009) as the most destructive species of *Dendroctonus.* Estimates of losses in our timber resources due to this insect are scattered, conflicting, and confused by the fact that this species has been known concurrently by two separate scientific names. Considering all factors, the average annual loss attributed to it since 1895 possibly may approach 1.5 billion board feet.

For the most part the winter is passed as second and third instar larvae, although a few parent adults may survive hibernation and a few larvae may reach the prepupal stage. Activity is resumed in the spring whenever temperatures become sufficiently high, probably about 50 F. A small fraction of the overwintered parent adults may resume egg laying activity in the spring, but usually most of them extend their galleries without ovipositing; very few of them reemerge. Ordinarily by mid-June half the immature stages have pupated (Blackman 1931:14) and by mid-July most have matured. The young adult beetles do not emerge immediately from the brood tree, but enlarge the pupal chamber, often removing sufficient of the inner bark that their excavations join one another. One of these enlarged chambers may contain as many as 50 beetles. The period of flight is concentrated, seldom beginning before 15 July and rarely continuing later than 25 August. In those areas of California where more than one generation occurs each year there may be notable departures from the usual activity cycle. Whether these deviations are the result of genetic or ecological factors is uncertain.

Trees selected for attack by endemic populations of this insect usually are overmature or weakened standing trees larger than 6 inches DBH. Windfalls or cull logs occasionally may provide favorable breeding places (Evenden et al. 1943:7), particularly when the bole is inclined. During epidemics the more vigorous, rapidly growing trees may be preferred (Beal 1939:2), and coniferous host species not belonging to the genus *Pinus* may be attacked. Under endemic conditions the area of a particular tree attacked by this species may be restricted or forced upward from the base of the bole by such competing species as *adjunctus,* or downward from upper parts of the bole by *brevicomis.* Under endemic conditions in a given area the local population may exhibit a strong preference for one-host species even though other acceptable host species may be intermixed. The preferred host in a given area may be ponderosa, lodgepole, limber, western white, or other pine species. In a given area during an epidemic any acceptable host, or sometimes any conifer, may be attacked, and following the epidemic the attacks usually are again confined to the same host species originally

favored. Climatic factors or competition usually reestablish the original conditions. These local races perhaps may indicate the existence of genetic factors that could lead to the formation of distinct species of beetles, but all available data suggests that the present stage of their evolution has not reached the point where geographical races (subspecies) can be recognized.

The attack evidently may follow either of two patterns, depending on the age and vigor of the host tree and on the presence or absence of certain competing species of bark beetles. In mature sugar pine, where aggressive competing species are virtually absent, the attack usually begins in the upper crown; the lower sections of the tree may then be attacked by one or more successive generations over a period of two or more years (Evenden et al. 1943:9). In younger trees of this and other species the attack usually begins at or near the base and extends upward. Compared to other species the attack is concentrated into a relatively short period of time. It coincides with the period of emergence from about 15 July to 25 August, seldom requiring more than five weeks and possibly requiring as little as three or four days during an epidemic. The beetles strike the tree individually, not in dense swarms as some popular accounts of the attack might suggest. According to Blackman (1931:21), the number of entrance tunnels per square foot of bark surface of a successful attack on an average tree ranges from about four to nine. He also observed that the number of attacks was higher in trees where four to nine trees were killed in a group (5.90 per sq ft) than where only one to four trees were killed in a group (5.23 per sq ft).

The vertical linear egg galleries usually are almost straight, although occasionally an environmental peculiarity may cause some to wind slightly. They are constructed primarily in the soft inner bark of phloem, continually in contact with the cambium and very lightly scoring the wood.

The diameter of an individual egg gallery is slightly greater than the width of the beetle that constructed it. Its length varies considerably, but evidently it depends more on environmental than on hereditary factors. In lodgepole pine in the Wasatch National Forest in Utah, 35 egg galleries selected at random averaged 32.6 cm and the maximum length was 67.5 cm; in ponderosae pine on the Dixie National Forest in Utah 34 egg galleries averaged 47.5 cm and the maximum length was 79.0 cm. Both series of measurements were made in drought areas in July 1960. Measurable galleries in ponderosa pine in California and Oregon and in western white pine in Oregon gave comparable results, but were too few in number to provide reliable data. Presumably, the character of galleries observed during a severe epidemic

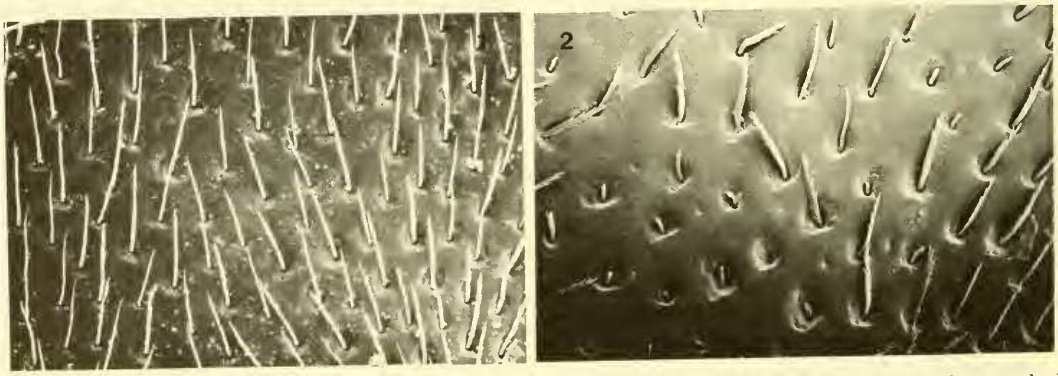



Fig. 68. *Dendroctonus* spp., posterior half of left side of pronotum: 1, *ponderosae*; 2, *jeffreyi*. (Both photographed at 200X.)

of this species in the Black Hills area led Hopkins (1909a:112) to assume that a completely different species existed in that area as compared to an endemic Pacific Coast form, which apparently constructed much longer galleries. Actually, under endemic conditions in comparable environments, the eastern, western, northern, and southern populations appear indistinguishable when measurements, bark samples, or photographs of gallery systems are compared.

The initial attack is made by the female, usually in a crevice in the bark. About the time she reaches the cambium tissues where the pitch begins to flow she is joined by the male, who then assists her by pushing the excavated frass out of the entrance hole. Continuation of the egg gallery is performed entirely by the female beetle. After several centimeters of gallery have been cleared and the frass ejected from the entrance hole, the male then packs the frass in the lower regions of the gallery, thereby closing the entrance hole and tightly filling the gallery except for a few centimeters in the area where the beetles are working. It is not uncommon, following mating, for the male to leave the gallery, either before the entrance is blocked or through a ventilation tunnel, in order to join a second female.

From the entrance hole the gallery usually ascends diagonally about 3–5 cm before turning directly upward. In about half the gallery systems studied this diagonal portion extended to the right of the entrance hole, about a third went to the left, and in the remainder the diagonal portion was absent. This oblique part of the tunnel ordinarily is more irregular in width than the remainder of the egg tunnel and ordinarily is sufficiently wide to permit turning or to act as a nuptial chamber. Ventilation tunnels usually are placed at irregular intervals along the egg gallery but are not always present. Their presence appears to be related to the stage of gallery construction, to the thickness of the bark, and to the activity of the beetles. Evidently they are not constructed until after the entrance has been plugged. In thin-barked lodgepole pine 18 of the 35 galleries measured (see above) included ventilation chambers, and of these 18 only 3 contained more than 2 ventilation tunnels, with the maximum number being 4 in one gallery. In the relatively thick-barked ponderosa pine 33 of the 35 galleries measured (see above) included ventilation tunnels and only 3 of the 33 included fewer than 5; the maximum number in one gallery was 13.

The initial part of gallery construction progresses rapidly. Oviposition usually begins when the gallery is about 1–2 cm above the oblique portion, probably about four to five days after the attack. Egg-laying evidently continues until interrupted by cold weather. The eggs are deposited individually in comparatively small niches, although it is not uncommon for two eggs to be in one niche.

Egg niches are comparatively small, each is just large enough to accommodate an egg and a very small amount of specially prepared frass. The niches are both more narrow and shallow than those of the foregoing species. They are distributed in a pattern peculiar to this species and *jeffreyi*, with alternating groups of one to eight niches placed along the sides next to the cambium. The size and spacing of these groups varies tremendously from gallery to gallery and even within the same gallery, depending upon the prevailing environmental conditions. Ordinarily about half these "groups" consist of one niche each; seldom do they exceed five in number. It is not uncommon for one or two niches to occur opposite one of these groups, a departure from their strictly alternate arrangement. In a third of the galleries studied there were no niches in the upper or last half of the gallery; in an additional one-tenth there were none in the last third. When niches occurred in the terminal regions of the gallery it appeared, in many cases, that the adult female either abandoned the gallery prior to the onset of cold weather or died before or during the winter months, and the usual feeding area at the end of the tunnel was not represented.

Following oviposition the parent beetles may continue the gallery, often ending it in a somewhat irregular feeding tunnel, or they may abandon the gallery to commence a new attack. Evenden (1943:12) estimated that 10 to 30 percent of the parent adults from sugar pine and almost 100 percent of those from western white pine reemerged to begin a second attack. These values appear to be higher

than the estimated reemergence rate observed during this study, but support the observation that there is a greater tendency for reemergence to occur when the bark of the host tree is either comparatively thin or subject to rapid drying for various other reasons.

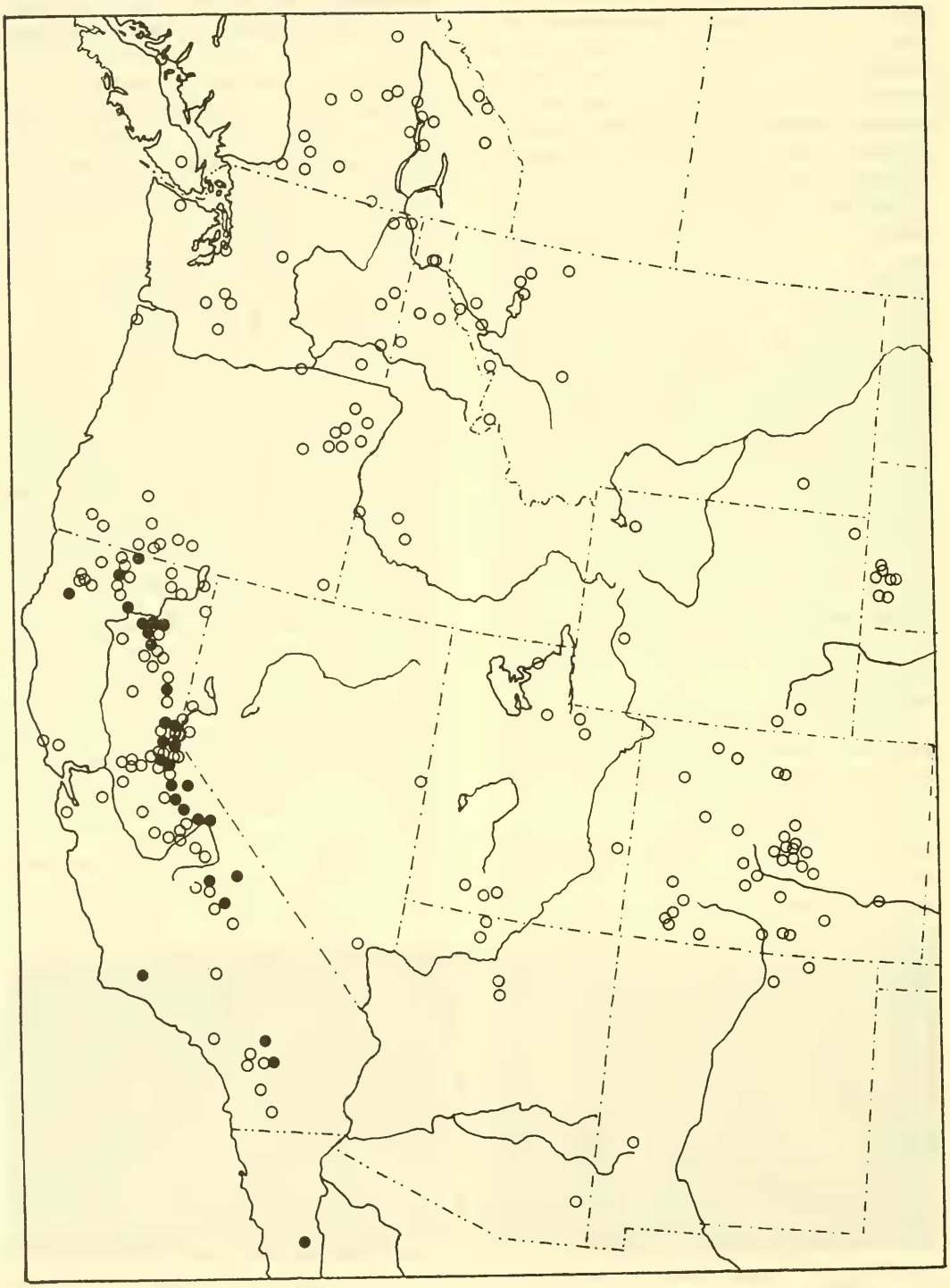


Fig. 69. *Dendroctonus* spp., distribution map: *ponderosae*, open circles; *jeffreyi*, closed circles.

The length of the incubation period has not been determined precisely, but has been estimated by various workers to require about 7 to 10 days. The larval mines are continuously in contact with the cambium and are somewhat irregular, but usually their main axis tends to be perpendicular to the egg gallery. Their length varies considerably with the amount of moisture or crowding present. They may be only 1 to 2 cm in length, increasing very slightly in width before reaching the suddenly expanded irregular feeding area where the last two or three instars and pupation are passed, or they may extend 10 to 20 cm and increase substantially in width before the pupal cell is formed. It is not uncommon to find both extremes in the same system of galleries. The larvae may pass the winter in any instar, but apparently second and third instar larvae predominate. Because of overwintering in this stage and because only one generation usually occurs each year, the average length of the larval period is near 300 days. During the latter part of the larval period a pupal cell is cleared of the frass in the enlarged feeding area, still in contact with the cambium. Here the prepupal and pupal stages are passed, the later evidently requiring about two to four weeks for completion. A maturation period of about one month usually follows the pupal stage before emergence occurs.

NOTES.— The names *ponderosae* and *monticolae* were based on syntypic series. The females referred to by Hopkins (1909a,b) as types of their respective species are here designated as lectotypes of those species as indicated above.

The size of specimens of this species appears to be influenced by the thickness of the phloem of their host and by moisture and temperature factors. Populations from Pacific Coast areas are almost always smaller than 5.0 mm, and those from eastern areas are almost always larger than 5.5 mm in trees with sufficiently thick phloem.

Due to three mixed series and to two series in which the host labels were reversed, all collected in northern California by the same individual, I (Wood 1963) concluded that *ponderosae* and *jeffreyi* were synonymous. Whether that mixing and apparent falsification of data was deliberate or accidental has not been determined. It was detected during my subsequent studies involving several long series of both forms from the area where the supposed intergradation occurred. It is now obvious that both *ponderosae* and *jeffreyi* are good species (Lanier and D. L. Wood 1968).

Lanier and D. L. Wood (1968) and others have cited Hay (1956) as establishing the original synonymy of *ponderosae* and *monticolae*; however, they overlook the fact that *monticolae* was named from *Pinus monticola*, not from *P. ponderosae* or *P. contorta*. The possibility that beetles attacking adjacent stands of *P. monticola* and *P. ponderosa* were either the same or different species was never investigated by Hay. He hybridized Idaho beetles reared from *P. ponderosa* with others from Utah and Colorado also from *P. ponderosa*. He did not investigate the fundamental nomenclatural question, although he did contribute important biological data.

The above treatment was based on the lectotypes of *ponderosae* and *monticolae* and more than 6000 other specimens.

### 8. *Dendroctonus jeffreyi* Hopkins

Figs. 68, 69

*Dendroctonus jeffreyi* Hopkins, 1909, U.S. Dept. Agric. Bur. Ent. Tech. Bull. 17(1):114 (Holotype, female; Little Yosemite, California; U.S. Nat. Mus., 7449)

DIAGNOSIS.— This species is distinguished with difficulty from *ponderosae* Hopkins by the smaller pronotal punctures that are separated by spaces averaging at least twice as large as the diameter of a puncture, and, in the area of sympatry, by the larger size (*ponderosae* specimens from South Dakota to Arizona may average as large as *jeffreyi*).

MALE.— Length 4.6–6.8 mm (average about 6.0 mm), 2.2 times as long as wide; color black.

Essentially identical to *ponderosae* except as noted in diagnosis and key.

FEMALE.— Similar to male except epistomal process less well developed and elytral crenulations and granules averaging slightly larger.

DISTRIBUTION.— S Oregon to N Baja California.

USA: **California**: Big Bear Lake, Big Bend R. S., Big Pine, Big Springs in Shasta Co., Black's Mt. in Lassen Co., Butte Lake, Cisco, Cottabe Springs in Calaveras Co., Darrington, Donner Lake, Eiler Lake in Lassen Co.,

Fallen Leaf Lake, Hat Creek, Kingvale, Lassen N. P., Old Station in Shasta Co., San Bernardino N. F., Sands Flat, Sequoia N. F., Scaffold Meadows, Shasta N. F., Strawberry in Tuolumne Co., Wolfhorn, Vade, and Yosemite N. P. Oregon: Bly. MEXICO: Baja California: Sierra San Pedra Martir.

HOSTS.— *Pinus jeffreyi*, and very rarely *P. ponderosa* (probably accidental).

BIOLOGY.— The galleries and basic habits are as in *ponderosae*. Eaton (1956) indicates the principal attack occurs in June and July with a lesser peak in late September and October. He reports the volume of standing timber killed by this species as 55 million board feet annually from 1932 to 1951. One generation per year is normal in the northern part of its range; a partial or complete second generation may occur in southern areas. The attack is directed at the lower half of the bole.

In June 1961, 34 gallery systems averaging 41.7 cm per gallery were measured in Jeffrey pine on the Tahoe National Forest in California. The maximum length was 66.0 cm. These figures agree with those for *ponderosae*; the number and position of egg niches also appeared to be indistinguishable from *ponderosae*. Perhaps a more extensive statistical analysis conducted under both endemic and epidemic conditions would reveal significant differences.

The above treatment was based on the holotype and on more than 500 other specimens.

### 9. *Dendroctonus parallelocollis* Chapuis

Figs. 70A,B

*Dendroctonus parallelocollis* Chapuis, 1869, Synopsis des Scolytides, p. 36 (Holotype, female; Mexico; Brussels Mus.)

*Dendroctonus aztecus* Wood, 1963, Great Basin Nat. 23:69 (Holotype, male; San Raphael, Mexico, Mexico; Wood Coll.); Wood, 1969, Great Basin Nat. 29:121. *Synonymy*

DIAGNOSIS.— This species is distinguished from *terebrans* (Olivier) by the subcylindrical pronotum that lacks a conspicuous anterior constriction, by the more coarsely sculptured elytral disc, and by the distribution.

MALE.— Length 4.9–6.3 mm (average about 5.5 mm), 2.65 times as long as wide; mature body color black.

Frons almost uniformly convex between eyes from vertex to epistomal process with a small, rather indefinite median impression on lower third well above base of epistomal process; epistomal margin elevated, its surface smooth and shining; epistomal process slightly narrower than half (0.44 times) distance between eyes, its lateral margins oblique (about 45 degrees from horizontal) and not at all elevated, horizontal portion slightly more than half its total width, flat, overlapping, and very slightly exceeding epistomal margin and bearing under its distal margin a dense brush of conspicuous yellowish setae; surface rather coarsely, closely, deeply punctured with rather abundant, isolated granules interspersed. Vestiture, in addition to epistomal brush, moderately long, sparse, inconspicuous.

Pronotum 0.80 times as long as wide, widest on basal half; sides weakly arcuate, almost subparallel on basal half, then converging gradually to rather poorly developed transverse constriction just behind broadly, shallowly emarginate anterior margin; surface smooth and shining with moderately small, close, rather deep punctures, becoming rather shallow laterally and very minutely granulate on lateral rim; a median line obscurely indicated anteriorly. Vestiture scanty, becoming more abundant, longer, and rather coarse anteriorly and laterally.

Elytra 2.4 times as long as wide, 2.3 times as long as pronotum; sides straight and subparallel on basal two-thirds, rather broadly rounded behind; basal margins arcuate and bearing a row of nine moderately large, raised, overlapping crenulations, with several smaller submarginal ones particularly on interstriae 2 and 3; striae weakly impressed, punctures rather small and moderately deep; interstriae almost twice as wide as striae and armed by abundant, confused, transverse crenulations, each averaging about two-thirds width of an interstriae, a few wider than an interstriae and sometimes crossing striae. Declivity steep, uniformly convex; striae 1 to 3 straight, punctures almost as large as on disc; interstriae 1 to 3 about equal in width and bearing rather abundant, somewhat confused (usually arranged in widely staggered single row), moderately large tubercles. Vestiture much longer and more abundant on declivity, a few setae twice as long as width of an interstriae.

FEMALE.— Similar in all respects to male except pronotum evidently a little more coarsely punctured and the elytra somewhat more coarsely sculptured.

DISTRIBUTION.— Chihuahua and Sinaloa to Honduras.

MEXICO: **Chihuahua**: Garcia-Dublan Road, VII-31, D. E. Beck. **Mexico**: San Raphael, 11-IX-49, No. 16028, *Pinus leiophylla*, J. P. Perry, Jr., Tlalmanalco, 1, 8-I, and 16-IV-50, *P. leiophylla*, J. P. Perry, Jr. **Michoacán**: 6 km W Quiroga, 17-IV-65, 2200 m, *Pinus*, S. L. Wood; 10 km E Volcan Parícutin, 19-VI-65, *Pinus*, S. L. Wood; Uruapan, 12-VII. **Sinaloa**: 32 km or 20 miles NE Copala, 22-VII-53, *Pinus*, S. L. Wood. GUATEMALA: "Guatemala." HONDURAS: San Lucas, Paraíso, 22-IV-64, 800 m, *P. oocarpa*, S. L. Wood; Tegucigalpa, 9-III-64, *P. oocarpa*, S. L. Wood; Zamorano, Morazan, 18-IV-64, 700 m, *P. oocarpa*; S. L. Wood.

HOSTS.— *Pinus leiophylla* and *P. oocarpa*.

BIOLOGY.— The stumps of dying trees larger than 12 inches DBH were attacked near the ground level, with the parental tunnels extending upward or downward from that point. The parental gallery systems form a complex crisscross system very similar to *approximatus* Dietz; however, alternating egg niches are in contact with the cambium and larval mines are exposed on peeled bark.

NOTES.— The above treatment was based on the holotypes of *parallelocollis* and *aztecus*, and on 61 other specimens. It is a rare species that is easily confused in the field with other species.

### 10. *Dendroctonus terebrans* (Olivier)

Figs. 71, 72

*Scolytus terebrans* Olivier, 1795, Entomologie ou Histoire Naturelle des Insects, Coleopteres 4(78):6 (Syntypes ?; Amerique septentrionale; presumably Paris Museum, but not located)

*Dendroctonus terebrans*: Erichson, 1836, Archiv Naturgesch. 2(1):53

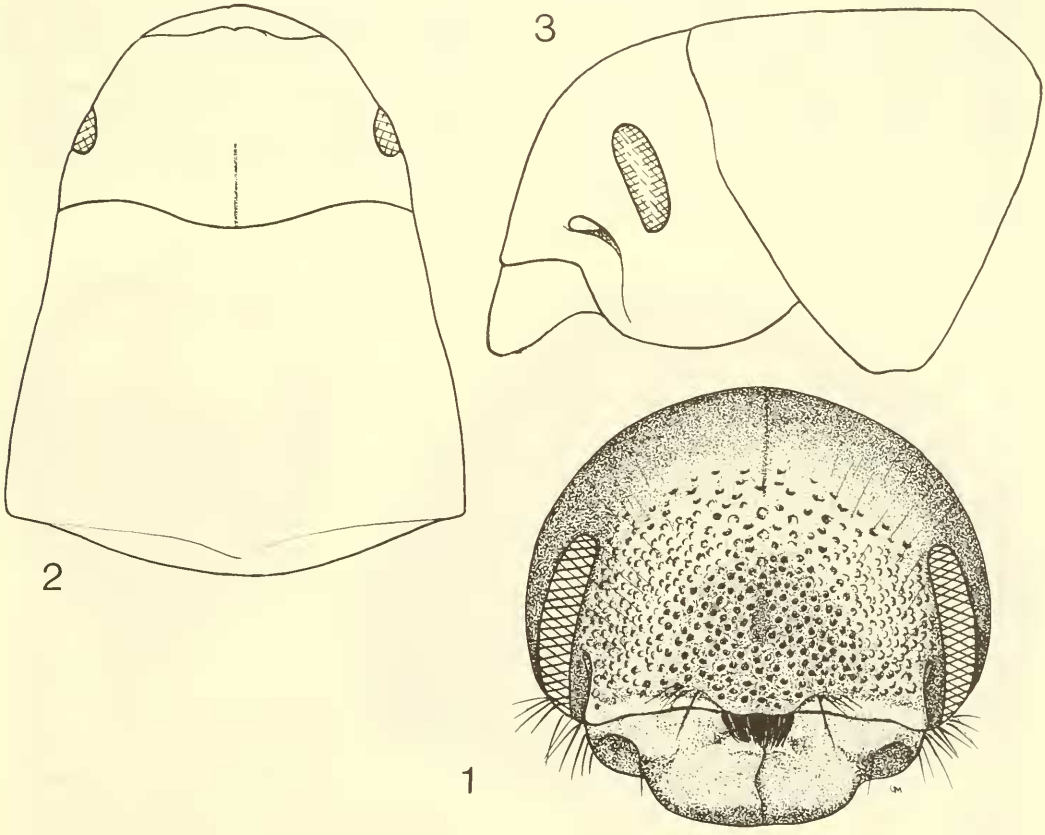



Fig. 70A. *Dendroctonus parallelocollis*, head and pronotum of female: 1, anterior; 2, dorsal; 3, lateral.

DIAGNOSIS.— This species is distinguished from the closely related *valens* LeConte by the black body color, by the much larger punctures on the lateral areas of the pronotum, by the larger, more abundant declivital tubercles, and, in part, by the distribution.

MALE.— Length 5.0–7.5 mm (average about 6.0 mm), 2.2 times as long as wide; mature body color dark brown to black.

Frons rather evenly convex, with a shallow median impression about a third of distance from upper level of eyes to epistomal margin, very feebly elevated lateral to impression; epistomal margin elevated, its surface smooth and shining; epistomal process broad, about half as wide (0.50 times) as distance between eyes, its arms oblique (about 30 degrees from horizontal), elevated only at median angles of arms, horizontal portion about two-thirds its total width and broadly, transversely concave, overlapping and ending just above epistomal margin and bearing under its distal margin a dense brush of yellowish setae. Vestiture, in addition to epistomal brush, moderately long, sparse, inconspicuous.

Pronotum 0.70 times as long as wide, widest at base; sides weakly arcuate and converging very slightly toward moderately strong constriction just behind broadly, shallowly emarginate anterior margin; surface smooth and shining, punctures moderately large, rather shallow, close, becoming two to three times larger in diameter near lateral margins; bottom or floor of each puncture irregularly reticulate; a partly impunctate, feebly raised median line indicated on posterior two-thirds; vestiture scanty, longer and more evident laterally.

Elytra 1.4 times as long as wide, 2.1 times as long as pronotum; sides straight and subparallel on basal two-thirds, rather broadly rounded behind; basal margins arcuate and bearing a row of about 12 moderately large, raised, overlapping crenulations, with several smaller submarginal ones particularly on interstriae 2 and 3; striae weakly impressed, punctures small and rather shallow; interstriae more than twice as wide as striae and armed by abundant, confused, transverse crenulations each averaging about half width of an interstriae, a few about two-thirds as wide on posterior half of disc. Declivity rather steep, convex; strial punctures slightly smaller than on disc; interstrial punctures confused and all rather coarsely granulate, largest granules forming a somewhat definite

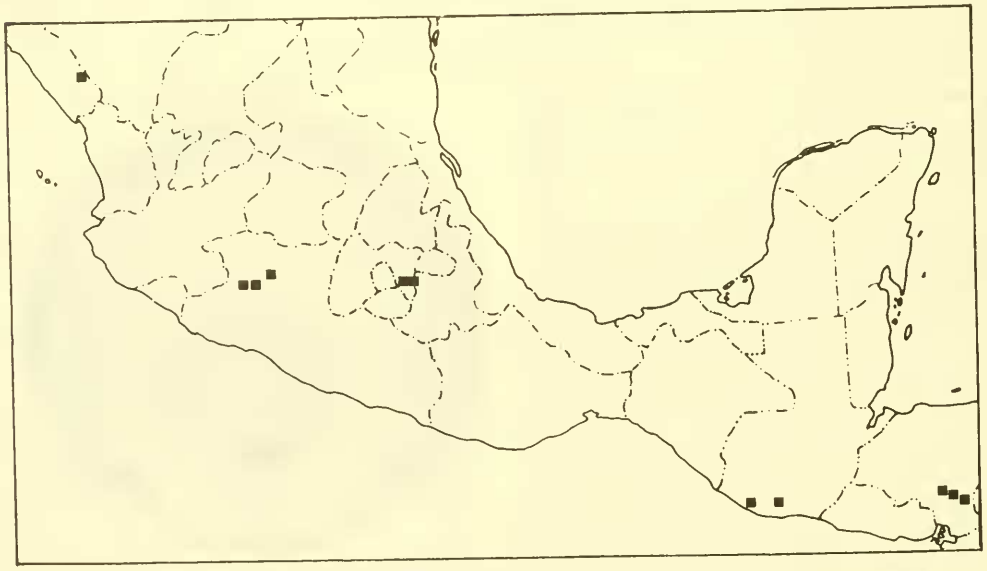


Fig. 70B. *Dendroctonus parallelocollis*, distribution map.

largest granules forming a somewhat definite median row on each interstriae. Vestiture moderately abundant, longer on declivity, length of longest setae slightly greater than a distance equal to width of an interstriae.

FEMALE.— Similar to male except a median frontal elevation evident at upper level of eyes; epistomal process less well developed; pronotal punctures very slightly larger; discal crenulations and declivital granules a little larger.

DISTRIBUTION.— E Massachusetts to E Texas and Florida.

USA: **Alabama**: Auburn, Barton, Calhoun, "DeSoto S. P.," Grand Bay, Mobile, "Redland." **Arkansas**: Hot Springs. **Delaware**: "Delaware." **District of Columbia**: "Taxoma" **Florida**: Baker Co., Dunedin, Ft. Lauderdale, Gainesville, "Juniper Springs," Largo, Levy Co., Miami, Nassau Co., O'Leno S. P., Opa Locka, Tampa, Winter Park. **Georgia**: Clayton, Cornelia, Ft. Valley, Kingsland, Myrtle, Thomasville, Waverly. **Louisiana**: "Hart." **Massachusetts**: Woods Hole. **Maryland**: "Baden." **New Jersey**: Clementon, Iona, "Lahaway," Lakewood, Mt. Misery, New Brunswick. **New York**: Islip, Rockaway Beach and Bay Shore on Long Island. **North Carolina**: Asheville, Southern Pines. **Pennsylvania**: Chinchilla. **South Carolina**: Chicora Place, Lumber, "New Landing," Pregnall, Spartanburg. **Texas**: Austin, Call, Deweyville, Kirbyville, Turlington. **Virginia**: Ashland, "Camp Pickett," Falls Church, "Glenn," King. **West Virginia**: Kanawha Station, Marion Co., Morgantown, Romney, "Roosevelt," Crow.

HOSTS.— *Pinus echinata, P. elliottii, P. palustris, P. rigida, P. serotina, P. strobus, P. taeda.*

BIOLOGY.— This is a secondary enemy of pines, and, less commonly, other coniferous trees; consequently, economic damage attributed to it is slight when compared to some of the other species of *Dendroctonus.*

Since this species has not been observed by me during the course of this study the following comments are based on personal observations made on two occasions two decades ago, and on the reports of Hopkins (1909b:147) and of Blackman (1922:57).

The principal overwintering stage is the adult, either in the bark of the brood tree or in newly started galleries of a newly attacked host; they may also pass the winter as partly grown larvae. In the spring the adults become active in March or April and either begin or extend their new galleries as the period of oviposition commences. Overwintering larvae complete their development in the spring and evidently emerge from the brood tree prior to mid-July. The period of flight activity evidently continues more or less gradually from March to December. In the southern parts of its range, activity may continue without interruption throughout the year.

Stumps more than four inches in diameter of recently cut trees or of injured or weakened trees are selected for attack. Their galleries ordinarily extend downward into the

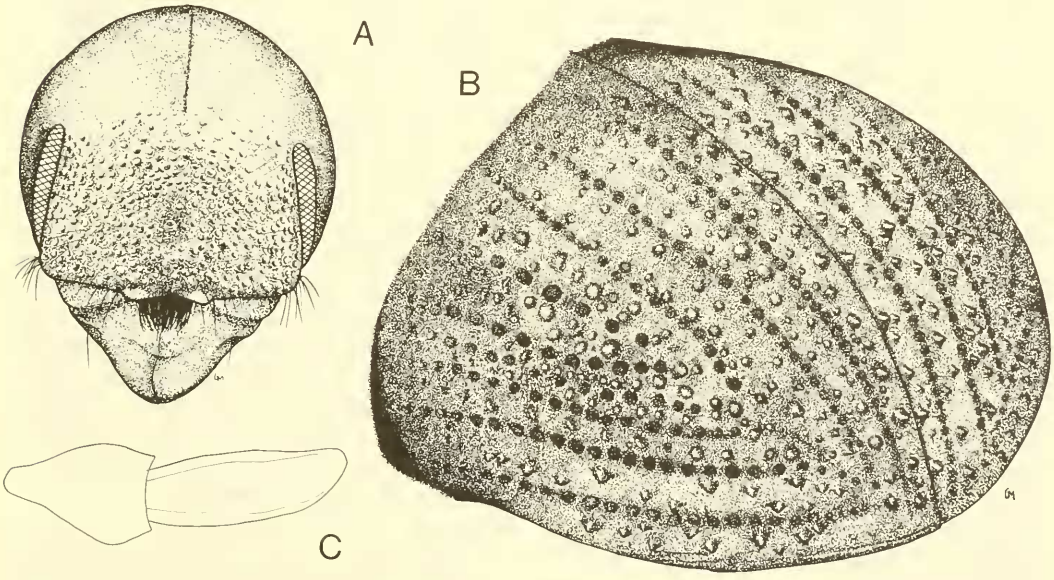



Fig. 71. *Dendroctonus terebrans*: A, female head; B, female declivity; C, male seminal rod.

roots; occasionally they extend upward as much as two or three feet above the ground level, except in the southwestern parts of its distribution, where they may extend more than 12 ft above the ground (Smith and Lee 1972:5). Frequently the attacks are made in the vicinity of a wound at the base of the tree. Even though such attacks do not kill the host immediately, they may interfere with normal growth and reduce vitality, thereby inviting other insect or disease-causing agents to attack the tree.

The attack ordinarily begins at or just above the ground level, usually with only a few pairs of beetles participating. The female constructs the entrance tunnel and normally is joined by the male shortly after she reaches the cambium. If the amount of pitch encountered is excessive, the gallery usually is extended upward; otherwise it is extended downward after ascending 1 or 2 cm. The egg gallery varies considerably in length, but seldom exceeds 30 cm. It may be linear, slightly wider than the beetle making it, or it may be branched; ordinarily it is irregularly widened at various places. As with other species, the male removes the frass from the working area, ejecting it from the entrance hole at first, then later packing it into the unused areas.

There are no individual egg niches. Groups of eggs are deposited rather loosely at one side of the gallery in one of the widened areas. These groups are then separated from the main areas of the gallery by a rather tightly packed partition of frass.

The periods of incubation and of larval development have not been precisely determined. The larvae do not construct individual tunnels, but work together in the phloem tissues in contact with the cambium, extending the cavity started by the parents. In some instances these cavities are said to cover several square feet of the inner bark (Blackman 1922:58). These extensions by the larvae appear to wander aimlessly, favoring no particular direction. Larvae from eggs laid in the spring evidently pupate by mid-July and emerge in the fall. There is one complete and partial second generation each year in most areas; two complete generations may occur in the extreme southern parts of its range.

NOTES.— The above treatment was based on about 300 specimens. The type evidently is in the Paris Museum, but it has not been located.

This species is very similar to *valens* in anatomical characters and in habits; consequently, much confusion exists in the literature pertaining to the identity of these species (Hopkins 1909b:148). In coastal areas from New Jersey to Massachusetts and, apparently, in the mountains of North Carolina, these species occur in adjacent areas in distinctive habitats without hybridization.

### 11. *Dendroctonus valens* LeConte

Figs. 72, 73, 74

*Dendroctonus valens* LeConte, 1860, Pacific R. R. Explor. 5(2):59 (Holotype, male; San Francisco, California; Mus. Comp. Zool.)

*Dendroctonus beckeri* Thatcher, 1954, Coleopt. Bull. 8:4 (Holotype, female; Totonicapan, Guatemala; U.S. Nat. Mus.); Wood, 1963, Great Basin Nat. 23:78. *Synonymy*

DIAGNOSIS.— This species is distinguished from the very closely related *terebrans* (Olivier) by the reddish brown body color, by the smaller punctures on the lateral areas of the pronotum, by the smaller, less abundant granules on the elytral declivity, and, in part, by the distributions.

MALE.— Length 5.3–8.3 mm (average about 7.3 mm), 2.1 times as long as wide; mature body color uniformly reddish brown.

Frons irregularly convex, with a pair of lateral protuberances about a third of distance below upper margin of eye to epistomal margin, these protuberances separated by a broad, shallow, subconcave impression; epistomal margin elevated, its surface smooth and shining; epistomal process very broad, equaling about two-thirds (0.60 times) distance between eyes, its arms oblique (about 20 degrees from horizontal), elevated only at inner angles of arms, horizontal portion about two-thirds its total width, broadly concave, overlapping and ending just above epistomal margin and bearing under its distal margin a dense brush of yellowish setae. Vestiture, in addition to epistomal brush, moderately long, sparse, inconspicuous.

Pronotum 0.73 times as long as wide; sides weakly arcuate, almost subparallel on basal two-thirds, then moderately constricted just

behind broadly, shallowly emarginate anterior margin; surface smooth and shining, punctures very close, rather shallow but sharply impressed, rather small but irregular in size, not larger laterally; an impunctate, sometimes feebly raised median line indicated on posterior three-fourths; vestiture scanty, longer and more evident laterally.

Elytra 1.5 times as long as wide, 2.2 times as long as pronotum; sides straight and subparallel on basal two-thirds, rather broadly rounded behind; basal margins arcuate and bearing a row of about 12 moderately large, raised, overlapping crenulations, with several smaller submarginal ones particularly on interstriae 2 and 3; striae weakly impressed, punctures rather small and deep; interstriae about one and one-half times as wide as striae and armed by abundant, confused, small, transverse crenulations, each averaging about one-third width of an interstriae, almost never more than half as wide on posterior half of disc. Declivity moderately steep, convex, with a feeble impression between striae 1 and 3; strial punctures slightly smaller than on disc; interstrial punctures confused and finely to coarsely granulate, largest granules forming an indefinite median row (in a few males

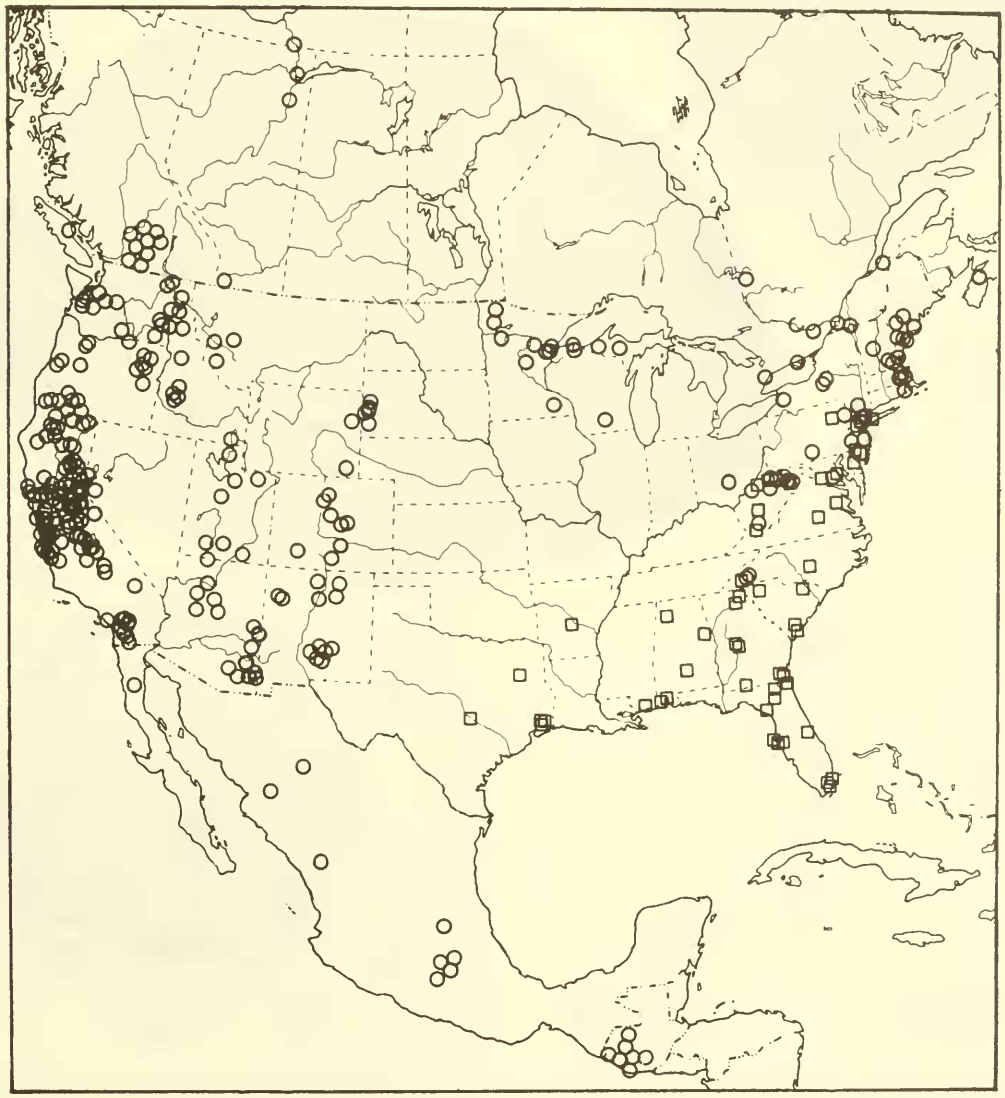


Fig. 72. *Dendroctonus* spp., distribution map: *terebrans*, open squares; *valens*, open circles.

only this median row of granules represented). Vestiture moderately abundant, longer on declivity; longest setae slightly exceed a distance equal to width of an interstriae.

FEMALE.— Similar to male except a rounded median frontal elevation evident at upper level of eyes; pronotal punctures very slightly larger; and discal crenulations and declivital granules a little larger.

DISTRIBUTION.— Northwest Territories and Nova Scotia to Honduras, except not in SE USA.

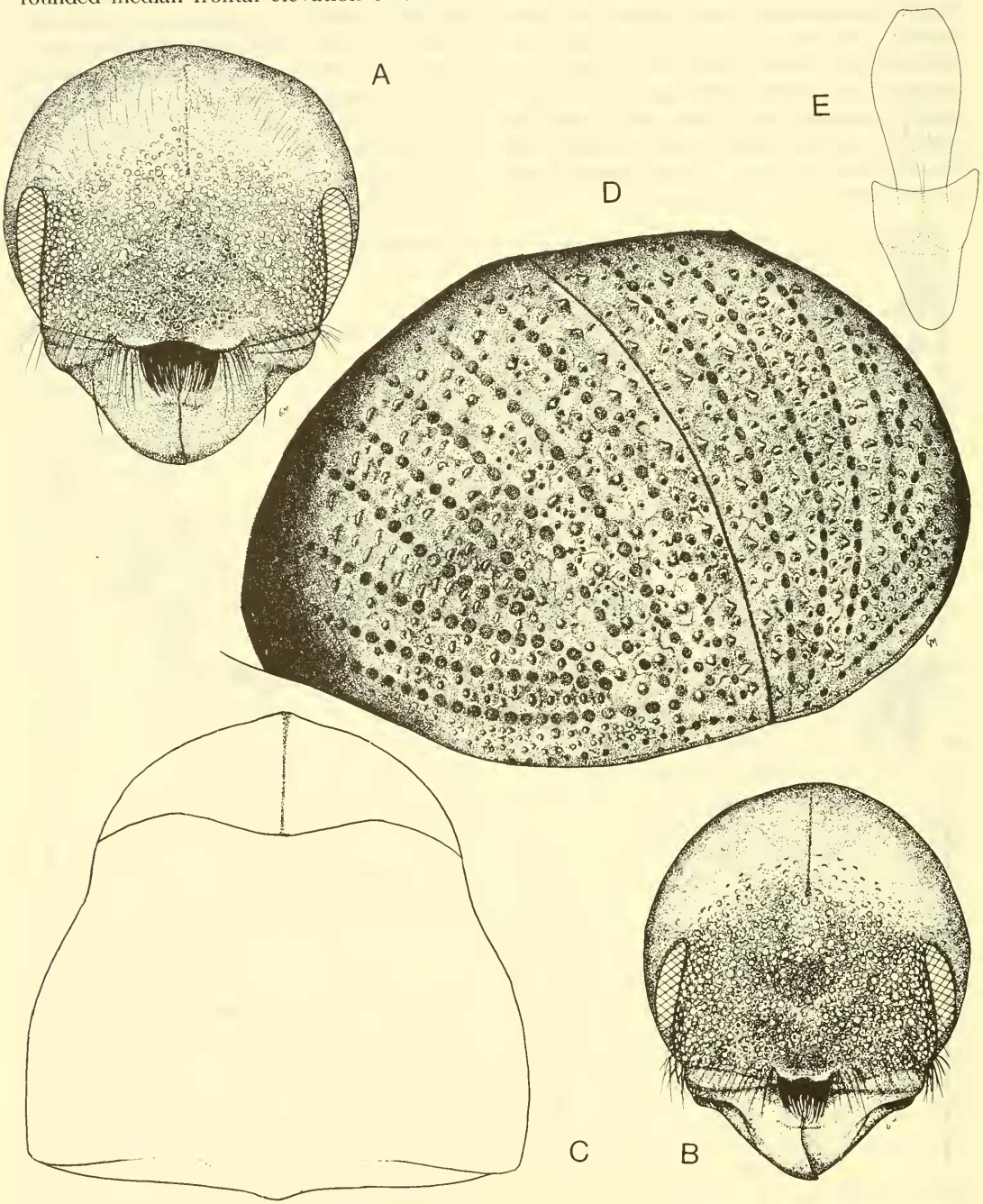



Fig. 73. *Dendroctonus valens*: A, male head; B, female head; C, head and pronotum; D, female declivity; E, male seminal rod.

CANADA: **Alberta**: Athabasca Falls, Ft. Chipewyan, Waterton Lakes N. P. **British Columbia**: Aspen Grove, Campbell River, Canford, Kamloops, Little Shuswap Lake, Midday Ck., Nicola, O'Kanagan Landing, Oliver, Peachland, Princeton, "Spious Ck.," Summerland, Trinity Valley, Vernon, Westwold. **Northwest Territories**: Ft. Smith. **Nova Scotia**: Kentville. **Ontario**: Ottawa, Prince Edward Co., Toronto, Quetiquo Pk. **Quebec**: Duparquet, Ft. Coulonge, Montreal, Saint Anne, Saint Johns. USA: **Arizona**: Apache N. F., Chiricahua Mts., Flagstaff, Ft. Apache Indian Res., Fredonia, Graham Mts., Grand Canyon N. P., McNary, Oak Ck. Canyon, Paradise, Portal, Prescott, Ramsey Canyon, Rincon Mts., Santa Catalina Mts., Williams. **California**: All counties. **Colorado**: Bailey, Cheyenne Mts., Estes Park, Ft. Garland, Douglas Co., Longs Peak, Manitou Park, "Mt. McClellan," Palmer Lake, Placer, "Powder River," Red Mts., San Isabel N. F., Vallecito R. S. in La Plata Co. **Idaho**: Beaver Creek in Logan Canyon, Cedar Mt., Centerville, Coeur d'Alene, Farragut, Grangeville, Grimes Pass, Harris Ridge, Moscow, Pioneerville, Priest River, Smiths Ferry. **Illinois**: "Illinois." **Kansas**: "Kansas." **Maine**: Brunswick, Casco Bay, Limerick, Orono, Paris, Peak Island, Portland. **Massachusetts**: Cambridge, Framingham, Lynn, Stoneham. **Michigan**: Grand Island, Marquette. **Minnesota**: Aitkin, Cloquet, Duluth, Grand Rapids, Itasca Park, Olmsted, Plummer, Roseau Co., Two Harbors. **Montana**: Helena, Missoula, Sula. **Nevada**: Reno. **New Hampshire**: Durham, Manchester, Webster. **New Jersey**: Lakehurst, Milltown, Newfoundland. **New Mexico**: "Bright Angel," Capitan, Capitan Mts., Carson N. F., Cloudcroft, Coolidge, "Culdridge," Ft. Wingate, Las Vegas, Lincoln N. F., Ruidoso, Sierra Blanca, Vermejo. **New York**: Hamburg, Ithaca, Syracuse, West Point. **North Carolina**: Asheville, Balsam, Biltmore, "Pink Beds." **Ohio**: Hocking Co. **Oregon**: Albany, "Anthony Ck.," Ashland, Aspen Lake, Baker, Bourne, Clover Ck., Cold Springs, Colestine, Corvallis, Crater Lake, Hood River, Joseph, Kirby, Klamath Lake, LaGrande, Mt. Hood, Prineville, Pringle Falls, Siskiyou Mts., "Slate Ck.," Sumpter, "Sutton Ck.," Talent. **Pennsylvania**: Chambersburg, Milford, Philadelphia. **South Dakota**: Black Hills, Custer, Deadwood, Elmore, Lead, Spearfish. **Utah**: Ashley N. F., Escalante, Eureka, Kamas, Logan Canyon, Mammoth Mt., Navajo Mt., Panguitch Lake. **Virginia**: Fredericksburg. **Vermont**: Fairlee. **Washington**: Blewett Pass, Buckeye, Dayton, Easton, East Satsop River, Fairfax, "Grass Prairie," "Half Moon," Malden, Metaline Falls, Newman, Northport, Olympia, Pullman, Satus Ck., Seattle, Snohomish River, Snohomish, Toppenish. **West Virginia**: Bretz, Cranesville, Crow, "Deckers Ck.," Dellslow, Hardy Co., Kanawha Station, "Mayfield Hill," Moorefield, Morgantown, Randolph, Pendleton, Romney, "Roosevelt," Tucker Mine. **Wisconsin**: Ashland, Bayfield, Madison. **Wyoming**: "Lynn," Moskee, Wyoming in Albany Co. MEXICO: **Baja California**: Sierra San Pedro Martir. **Chihuahua**: Cerrocahui, Chihuahua. **Distrito Federal**: Mexico. **Durango**: El Salto. **Hidalgo**: Jacala. **Mexico**: Chalco, Ozumba Mt., Tlalmanalco. **Morelos**: Cuernavaca. **Puebla**: Texmelucán. GUATEMALA: Cerro Quemado, Cuchumatenes Mts., El Baul, Guatemala City, Heuheutenanto, La Esperanza, Momostenango, Patzún, Panajachel, Quezaltenango, Totonicapan, Uruapan. HONDURAS: Cerro Peña Blanca.

HOSTS.— *Pinus contorta, P. coulteri, P. echinata, P. edulis, P. hartwegii, P. jeffreyi, P. lambertiana, P. lawsonii, P. leiophylla, P. monticola, P. murrayana, P. oocarpa, P. ponderosa, P. pseudostrobus, P. radiata, P. resinosa, P. rigida, P. sabiniana, P. sylvestris, P. strobiformis, P. strobus, P. tenuifolia,* and *P. virginiana, Abies concolor, Larix laricina, Picea glauca, P. excelsa,* and *P. rubens.*

BIOLOGY.— In general, this is a secondary enemy of pine and spruce, but on occasion it attacks and kills apparently healthy trees. It usually works in conjunction with other more aggressive species and, consequently, comparatively little economic loss is attributed to it.

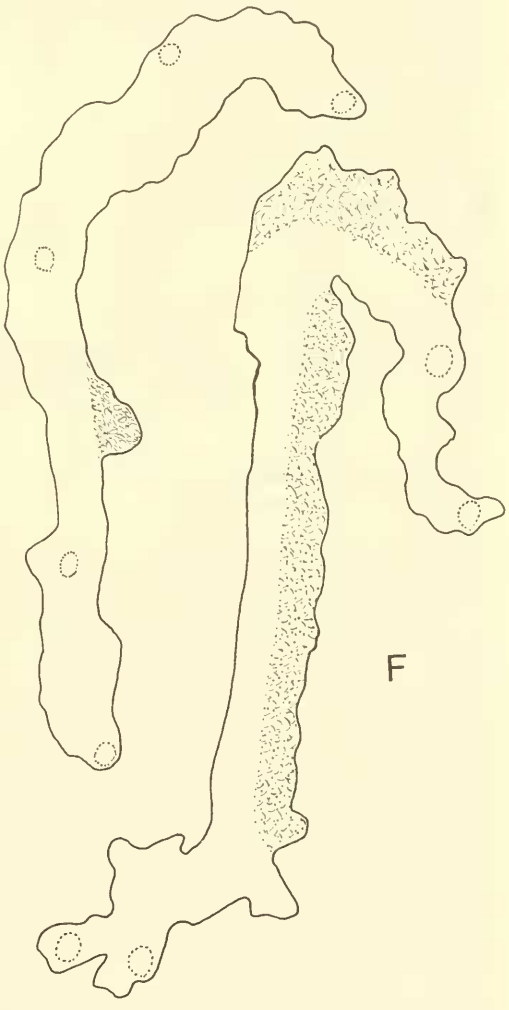



Fig. 73 continued, F, egg galleries.

This species may overwinter either as young or mature adults or as partly grown larvae. There is an extreme overlapping of generations, which is reflected by these insects being seen in flight any month of the year during their period of activity. In the northern parts of its range this period of activity evidently is from May to October; in the southern areas the species is active throughout the year.

Ordinarily stumps and injured, weakened, or dying trees larger than 20 cm DBH are selected for attack, although in some areas apparently healthy trees may be selected. The attack usually is concentrated at or near the ground level at the base of the tree, but in some areas it may extend 6 or more ft above the level of the ground. Generally this species arrives quite some time after other species have attacked a particular tree.

The attack on any one tree ordinarily involves only a few pairs of this species. It usually begins a few centimeters above the ground level then progresses above and below the point. It is not concentrated and, in fact, may involve two or more successive generations before the host succumbs.

The egg galleries of this species are exceedingly variable. The female, as with other species in the genus, constructs the entrance tunnel. After reaching the cambium region the tunnel extends upward for a short distance. If the amount of pitch encountered is excessive, it may continue upward; if not, it may curve downward into the roots. The egg gallery may be linear, slightly wider than the length of the beetle constructing it, or it may be branched or of a broad, irregular cave type. The linear pattern is more common in warmer parts of the range. In southern Mexico, Guatemala, and Honduras egg galleries exceeding 40 cm in length were common; however, it should be mentioned that broad cave-type excavations were found in the same tree with linear galleries, as were all degrees of intergradation between these extremes. Usually one side of the gallery is expanded somewhat, either continuously or irregularly, for deposition of the eggs.

Oviposition in most areas of the United States evidently begins in late May or early June and continues throughout the warm months. Egg-laying in northern or southern areas might begin earlier or later than this. The eggs are deposited along the far side of the expanded parts of the gallery, away from the main area of activity, either loosely packed in frass or in layers, in groups of 10 to 40 or more. They are then covered with a more or less compact layer or partition of frass. There are no individual egg niches.

According to Swaine (1914:20) the larvae hatch in about 10 days. They do not construct individual tunnels but mine in congress in the phloem next to the cambium in a general direction away from the egg gallery. Behind them the large flat cavity is filled by a reddish frass. The length of the larval period has not been determined precisely, but probably exceeds two months; it is suspected that in northern areas it may exceed a year. Pupal cells generally are formed in the frass, although occasionally a larva will construct a short individual tunnel in the phloem adjoining the common cavity where the pupal cell is formed. In the southern parts of its distribution there is one complete and at least a

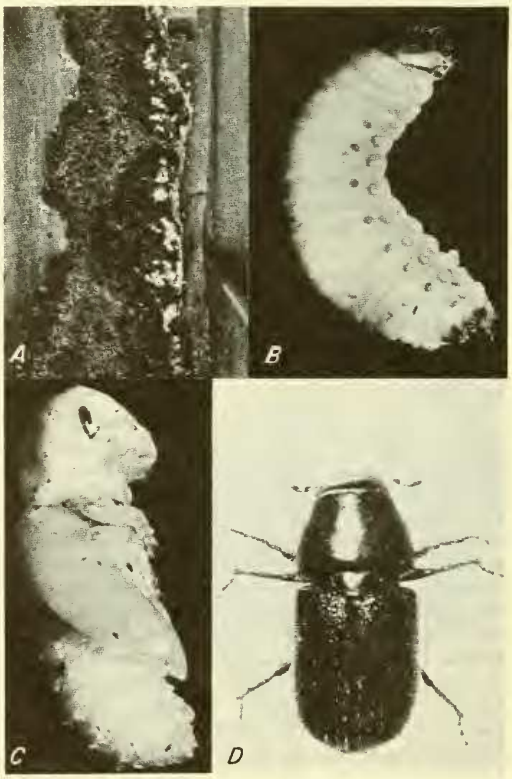



Fig. 74. *Dendroctonus valens*: A, eggs; B, larva; C, pupa; D, adult. (After Smith 1971:5.)

partial second generation each year; in northern areas a generation evidently may require more than one year.

NOTES.— The above treatment was based on the holotypes of *valens* and *beckeri* and on more than 3000 other specimens. Specimens emerging from crowded or unusually dry, hot environments frequently are abnormally small, pale, and occasionally abnormal in surface features. Those from the northeastern parts of the range may be strikingly different from specimens originating from California or from Central America. The synonym *beckeri* was named from unusually dark specimens. Vité (pers. comm.) suggested that data from pheromone tests indicate *valens* could be a composite of several species. Additional studies are needed to clarify this problem.

### 12. *Dendroctonus rhizophagus* Thomas & Bright

*Dendroctonus rhizophagus* Thomas & Bright, 1970, Canadian Ent. 102:479 (Holotype, male; 16 km or 10 miles SW El Salto, Durango, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— Biologically, this species is distinct from *valens* LeConte; anatomically, they intergrade to such an extent that separation is difficult. Although the characters are not absolute, they may be distinguished as described below. These comparisons were based on specimens from El Salto, Durango, for both species.

MALE.— Length 5.0–6.3 mm, 2.1 times as long as wide; color dark reddish brown, elytra of fully mature individuals almost always lighter in color.

Frons about as in *valens* except subcrenulate granules almost never present, sparse and much finer when present.

Pronotum about as in *valens* except punctures tending to be less uniform in size, those on basal half separated by distances averaging greater than diameter of a puncture (about half this distance in *valens*), middle third with a few very large punctures interspersed with others; median line more broadly impunctate and moderately to acutely carinate at least on basal half (feebly, if at all elevated in *valens*).

Elytra as in *valens* except strial punctures tending to be larger, especially on declivity, and interstrial crenulations tending to be smaller.

FEMALE.— Similar to male, with frons resembling female *valens* except median summit at upper level of eyes forming a more definite, subacutely elevated, longitudinal carina, its crest impunctate (more broadly rounded and with median line randomly punctured in *valens*).

DISTRIBUTION.— Chihuahua to Durango.

MEXICO: **Chihuahua**: San Juanito (David Cibrián and M. M. Furniss, pers. comm.); Mesa del Huracan, 24-VII-64, *Pinus engelmannii*, J. B. Thomas. **Durango**: 16 km W El Salto, 15-VII-64, *P. durangensis*, J. B. Thomas.

HOSTS.— *Pinus durangensis*, *P. engelmannii*, *P.* spp.

BIOLOGY.— Seedlings as small as 2 cm in basal diameter to poles 8 cm DBH are attacked near or below the surface of the ground. Two generations per year occur in the same area where *valens* has only one generation per year. Parental galleries tend to be more linear than *valens* and there are differences in egg deposition and larval mines (Cibrián and Furniss, pers. comm.). A detailed treatment of these differences will be described later by these authors.

NOTES.— The above treatment was based on the type series and on several other specimens. This species was treated by me as *valens* until the biological differences became known.

### 13. *Dendroctonus punctatus* LeConte

Figs. 75, 76

*Dendroctonus punctatus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:173 (Holotype, female; northern New York; Mus. Comp. Zool.)

*Dendroctonus johanseni* Swaine, 1919, Canadian Arctic Exped. Rept. 1913–1918, 3(E):5 (Holotype, female?; Sandstone Rapids, Coppermine River, Northwest Territories; Canadian Nat. Coll, 9248); Wood, 1963, Great Basin Nat. 23:86. *Synonymy*

DIAGNOSIS.— This species is distinguished from *murrayanae* Hopkins and *rufipennis* (Kirby) by the uniformly brown color, by the smooth, polished frons, which is deeply punctured but entirely devoid of granules, and by the much larger punctures of the elytral declivity. It is almost identical with the Eurasian *micans* (Kugelann).

MALE.— Length 5.4–6.8 mm (average about 6 mm), 2.41 times as long as wide; body color uniformly brown to dark brown.

Frons convex, protruding very slightly at center just below middle; epistomal margin elevated, smooth, shining; epistomal process a third (0.32 times) as wide as distance between eyes, its arms strongly oblique (about 55 degrees from horizontal) and slightly elevated, horizontal portion about two-thirds its total width, shallowly concave, overlapping and ending just above epistomal margin and bearing under its distal margin a dense brush of yellowish setae; surface smooth and shining from vertex to epistoma, punctures, rather close, deep, coarse, sharp, interspersed with very few minute punctures, with no indication of granules or tubercles. Vestiture fine, long, inconspicuous, rather sparse.

Pronotum 0.71 times as wide as long, widest at base, sides weakly arcuate and converging toward rather strong constriction just behind broadly, shallowly emarginate anterior margin; surface smooth and shining, punctures rather fine but irregular, close, deep, with a few very minute points interspersed; median line impunctate posteriorly;

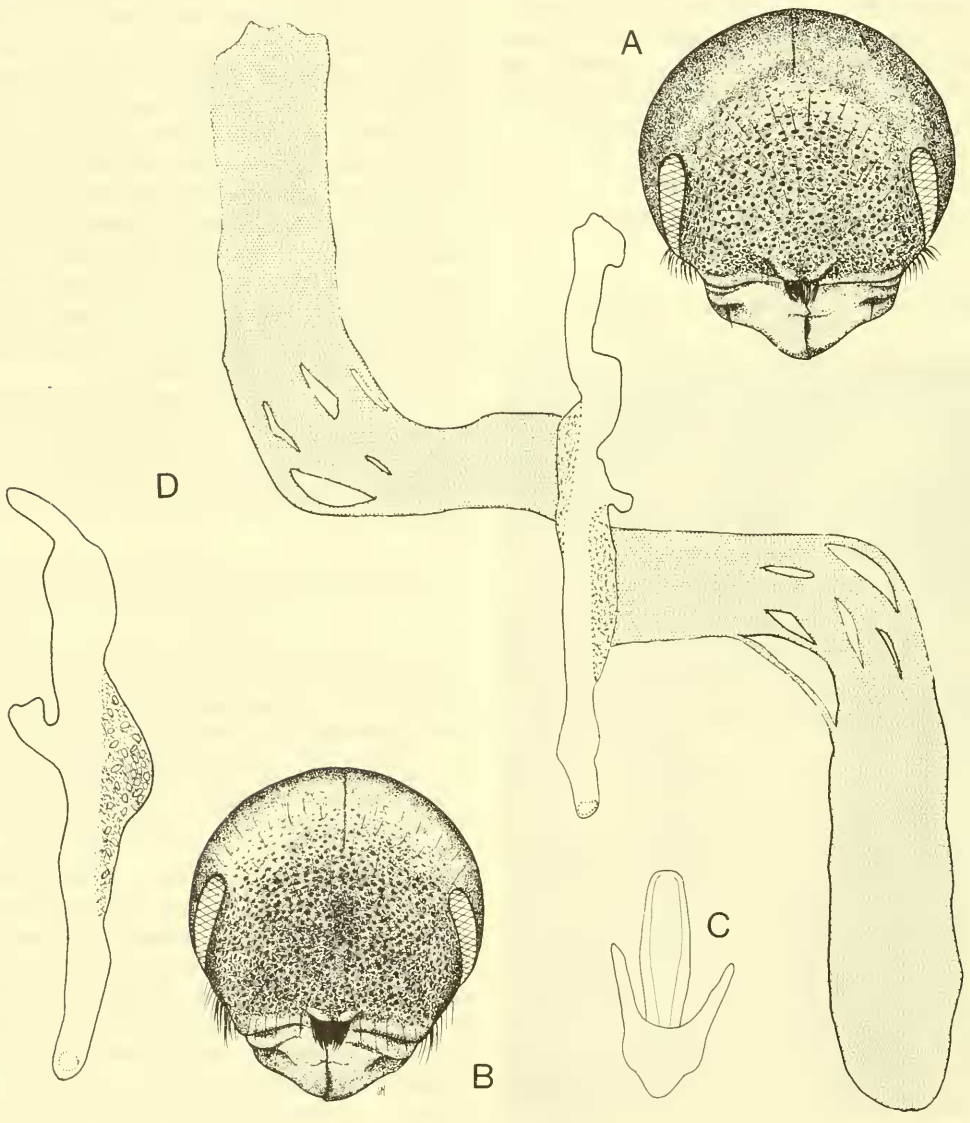



Fig. 75. *Dendroctonus* spp.: A, *punctatus*, head; B, *murrayanae*, head; C, *murrayanae*, seminal rod; D, *murrayanae*, galleries.

vestiture moderately abundant, fine and rather short on disc, longer and coarse laterally.

Elytra 2.5 times as long as pronotum; sides straight and subparallel on basal two-thirds, rather broadly rounded behind; basal margins arcuate and bearing a row of about 12 moderately large, raised, overlapping crenulations, with several smaller submarginal ones particularly on interstriae 2 and 3; striae weakly impressed, punctures large and rather deep; interstriae about one and one-half times as wide as striae and armed by rather abundant confused, small, transverse crenulations, each averaging about one-fourth width of an interstriae, never more than a third as wide on posterior half of disc. Declivity rather steep, convex, with sutural interstriae slightly elevated; strial punctures almost as large as on disc; interstriae smooth, with numerous confused punctures less than one-third as large as those of striae, about a third of them minutely granulate on their upper rims. Vestiture rather long and abundant; slightly longer on declivity, longest setae about one and one-half times as long as width of an interstriae.

FEMALE.— So very similar to male that sexes recognized only with difficulty; female very slightly more coarsely sculptured, particularly declivital granules very slightly larger.

DISTRIBUTION.— Alaska to New York and West Virginia.

ALASKA: Bonanza Ck. near Fairbanks, Circle, Haines Rd. (mile 27), Rampart House, Savonoski. CANADA: **Alberta**: Cypress Hills, McKenzie Highway (25th baseline). **Northwest Territories**: Aklavik, Ft. Smith, Sandstone Rapids of the Coppermine River. **Ontario**: Frater. **Yukon**: Alaska Highway (mile 1152), Carcross, Carmaks (mile 8, Mayo Rd.), Rampart House, Watson Lake, Whitehorse, Wolf Ck. USA: **New York**: "N. Y." **Pennsylvania**: Mt. Alto. **West Virginia**: Randolph Co.

HOSTS.— *Picea glauca*, *P. rubens*, *P. sitchensis*.

BIOLOGY.— This species evidently is rare in forests accessible to commercial logging; consequently, it is not presently recognized by forest interests as an important species. Structurally and (apparently) biologically it is so similar to *rufipennis* that field observers usually do not distinguish it from that species.

It is known to infest the lower bole and stumps of spruce from West Virginia to Alaska. Structurally it is almost indistinguishable from *micans* and is very similar to *murrayanae*; therefore, it is presumed that its biology is equally similar to these species. Collectors who took *punctatus* in two different areas of northern Canada and in Alaska suspected that at least two years were required to complete the life cycle in those areas; one year evidently is sufficient in the Great Lakes area and in the eastern United States.

NOTES.— The above treatment was based on the holotypes of *punctatus* and *johanseni*, and on about 250 other specimens. It is a geographical replacement of the Eurasian *micans* that is distinguishable only by means of minute characters. Because the reduction of these forms to the level of subspecies would serve no useful purpose and tend to confuse the literature relating to them, both are treated here as valid species.

### 14. *Dendroctonus murrayanae* Hopkins

Figs. 75, 76

*Dendroctonus murrayanae* Hopkins, 1909, U.S. Dept. Agric. Bur. Ent. Tech. Bull. 17(1):140 (Holotype, female; Keystone, Wyoming; U.S. Nat. Mus., 7454)

*Dendroctonus rufipennis*: Hopkins, 1909 (nec. Kirby, 1837), U.S. Dept. Agric. Bur. Ent. Tech. Bull. 17(1):138; Wood, 1963, Great Basin Nat. 23:88. *Misidentification corrected*

DIAGNOSIS.— This species is very closely allied to *punctatus* LeConte and *rufipennis* (Kirby) and is distinguished from them with considerable difficulty. From *punctatus* it differs by the more closely punctured, sparsely granulate frons, by the more coarsely punctured pronotum, by the subequal size of strial and interstrial punctures of the declivity, by the reddish brown elytra with dark brown pronotum, and by the hosts. From *rufipennis* it differs by the distinctly punctured, finely, more sparsely granulate frons, by the male genitalia, by the galleries, and by the hosts.

MALE.— Length 5.0–7.3 mm (average about 6 mm), 2.3 times as long as wide; body color dark brown, with reddish brown elytra.

Frons convex, protruding slightly on lower half; epistomal margin elevated, smooth, shining, epistomal process a third (0.32 times) as wide as distance between eyes, its arms strongly oblique (about 55 degrees from the

horizontal) and moderately elevated, horizontal portion about two-thirds its total width, shallowly concave, overlapping and ending just above epistomal margin and bearing under its distal margin a dense brush of yellowish setae; surface shining from vertex to epistoma, punctures very close, deep, coarse, about half of them with a small rounded granule on median or lower rim (usually). Vestiture fine, long, inconspicuous, rather sparse.

Pronotum 0.74 times as long as wide, widest at base; sides weakly arcuate and converging toward rather strong constriction just behind broadly, shallowly emarginate anterior margin; surface smooth and shining, punctures rather fine, but irregular, close, deep; median line impunctate posteriorly. Vestiture moderately abundant, fine, and rather short on disc, longer and coarse laterally.

Elytra 2.4 times as long as pronotum; sides straight and subparallel on basal two-thirds, rather broadly rounded behind; basal margins arcuate and bearing a row of about 12 moderately large, raised, overlapping crenulations, with several submarginal ones particularly on interstriae 2 and 3; striae very weakly impressed, punctures rather large and deep, usually decreasing in size toward base; interstriae slightly more than one and one-half times as wide as striae and armed by rather abundant, confused, small crenulations, each averaging about one-fourth width of an interstriae, never more than half as wide on posterior half of disc. Declivity rather steep, convex, with sutural interstriae slightly elevated; striae impressed, punctures half as large as on disc, usually three times as large as those on interstriae (except in a few examples having unusually large interstrial punctures); interstriae almost smooth, subshining, punctures rather abundant, confused (very irregularly three-ranked), median series very finely granulate on upper rims. Vestiture rather long and abundant; slightly longer

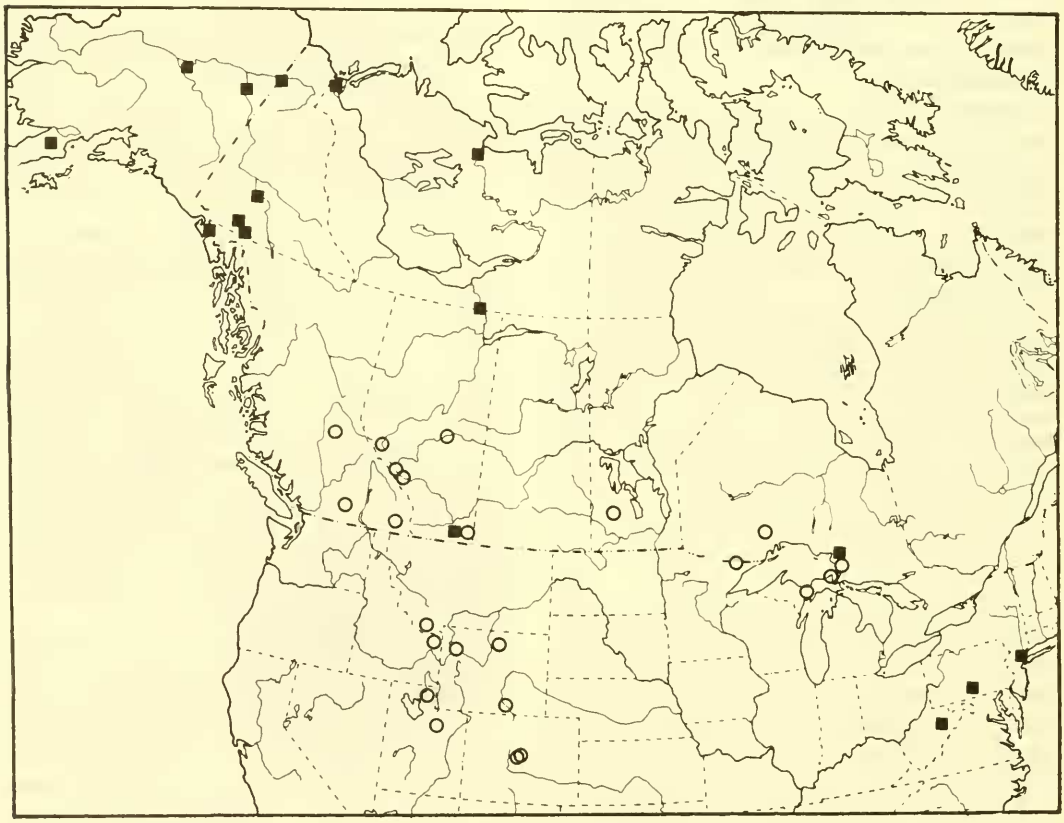


Fig. 76. *Dendroctonus* spp., distribution map: *punctatus*, solid squares; *murrayanae*, open circles.

on declivity, longest setae about one and one-half times as long as width of an interstriae.

FEMALE.— Very similar to male except arms of epistomal process less strongly elevated and declivital granules distinctly larger.

DISTRIBUTION.— British Columbia and Ontario to Utah, Colorado, Minnesota, and Michigan.

CANADA: **Alberta**: Banff, Cypress Hills, Edmonton, Hillsdale, Jasper N. P., Lake Louise. **British Columbia**: Stanley, Wycliff. **Manitoba**: Clear Lake Trail in Riding Mts. **Ontario**: Black Sturgeon Lake, Frater. USA: **Colorado**: Jefferson, Kenosha Pass, Wheeler Basin. **Idaho**: Targhee N. F. **Michigan**: Grand Island, Whitefish Point. **Minnesota**: International Falls. **Montana**: Wisdom. **Utah**: Logan Canyon, Wolf Ck. Pass. **Wyoming**: Bighorn Basin, Dubois, "Homestake," Keystone, Saratoga, Shoshone N. F.

HOSTS.— *Pinus banksiana*, *P. contorta*, and *P. strobus*.

BIOLOGY.— Ordinarily this is not an aggressive species, although available data indicate that it has contributed to bark beetle epidemics more commonly than published data would suggest, and that it has killed healthy, vigorous lodgepole pine. Because of the close superficial resemblance to *rufipennis* some losses actually caused by this species have been attributed to the destructive spruce beetle that supposedly infested lodgepole pine. In all cases where specimens were preserved for study the "spruce" beetles infesting lodgepole pine actually were this species.

The overwintering young and old adults and larvae in all stages of development became active when subcortical spring temperatures became sufficiently high, probably about 45 to 50 F. Flight activity probably does not begin before June at the high altitudes in Utah where lodgepole pine grows. The earliest attacks observed during this study were found in the second week of July. Because of overlapping generations it is suspected that attacks probably continue from late June to early September.

Stumps, windfalls, and overmature or weakened trees larger than about 8 inches DBH are selected for attack by this species. Trees dying from the attacks of *ponderosae* apparently provide a favorite breeding place. In standing trees the area under attack seldom extends higher than about 60 cm above the level of the ground; in addition, it usually extends downward into the roots. In prostrate trees the lower side of the bole is preferred.

The attack evidently begins at or near the ground level at one side of the tree and progresses upward, downward, or around the tree from that point. At times two or more successive generations may be involved in progressively girdling a living tree. Ordinarily only a few pairs of beetles are involved in the attack on a particular tree.

The egg galleries are irregularly vertical, slightly wider than the beetle making them, with two or three irregular but shallow expanded areas along one or both sides; often short branch galleries may also be present. The galleries observed during this study averaged about 12 cm in length; the longest ones were 20 cm in length; they were constructed entirely by the female. As with other species, they were excavated in the phloem in contact with the cambium. In a number of instances it was observed that the female excavated the complete egg gallery before the male appeared; evidently this is not a normal habit. In such instances there were no eggs or larvae in the gallery. When the male was present the lower part of the gallery was packed with frass, thereby closing the entrance hole. Copulation was observed twice; in both instances it occurred near the middle of the gallery in one of the expanded areas.

In the Wasatch National Forest in Utah eggs were found during 1960 from 12 July to 9 September; it was not determined whether or not these were the first or last eggs of the season. The eggs are deposited in the expanded areas in groups of about 20 to 50 or more. A more or less loose covering or partition of frass separates them from the main parts of the egg gallery. In the galleries observed, from one to three such groups occurred in each gallery. Hatching time varied considerably with the season, but probably averaged about 10 days in the galleries studied. There were no individual egg niches in any of the galleries. Evidently a female may reemerge to construct a second set of galleries; this is supported by the fact that in September about a fourth of the galleries studied contained only the female; there were no adults present in an additional fourth.

The larvae feed in congress in a general transverse direction away from the egg gallery. About 6 to 10 cm from the egg gallery the excavated area turns either upward or downward and continues in that direction for an additional 20 to 30 cm or more. It appears characteristic of this species, just before or just after the vertical turn is made, for a few small groups of larvae to become separated from the main body of larvae and mine independently for short distances before rejoining them. This leaves irregular islands of unexcavated phloem in the general cavity. When near maturity, several of the larvae may construct short independent mines where pupations occurs; however, most of the pupal cells occur in the frass of the principal larval excavation. It appeared that the eggs laid in early July were represented by third and fourth instar larvae in September and probably did not mature until the following June; eggs laid in September evidently matured the following July. Evidently there may be one complete and a partial second generation each year in Utah. In the northern parts of the distribution it is possible that less than one complete generation occurs each year.

NOTES.— The above treatment was based on the holotype and on 425 other specimens. Various reports (Massey and Wygant 1954) have indicated that during epidemics of *rufipennis* lodgepole pine has been killed by that species. An effort was made to locate and examine all voucher specimens on which those reports were based. In every case I investigated those specimens proved to be of *murrayanae*. Apparently all lodgepole pine allegedly killed by *rufipennis* actually was killed by this species.

Minute differences in size and punctation on the elytral declivity are evident between eastern and western parts of the distribution (Wood 1963:90). Based upon specimens and other data at hand, I do not consider these features sufficiently important to justify the recognition of separate races.

### 15. *Dendroctonus rufipennis* (Kirby)

Figs. 77, 78, 79

*Hylurgus rufipennis* Kirby, 1837, *in* Richardson, Fauna Boreali Americana 4:195 (two syntypes, female; Boreal North America; British Mus. Nat. Hist.)

*Dendroctonus rufipennis*: LeConte, 1868, Trans. American Ent. Soc. 2:173

*Hylurgus obesus* Mannerheim, 1843, Moskov. Obshch. Isp. Prirody. Otd. Biol. Biul. (Bull. Soc. Imp. Nat. Moscou) 16:296 (Holotype, female; Sitka Island, Alaska; Univ. Zool. Mus., Helsinki); Wood, 1963, Great Basin Nat. 23:93. *Synonymy*

*Dendroctonus similis* LeConte, 1860, Pacific R. R. Explor. 5(2):59 (Lectotype, female?; Oregon; Mus. Comp. Zool., present designation); LeConte, 1868, Trans. American Ent. Soc. 2:173. *Synonymy*

*Dendroctonus piceaperda* Hopkins, 1901, U.S. Dept. Agric. Div. Ent. Bull. 28:16 (Neotype, female; Camp Caribou, Maine; U.S. Nat. Mus., 7451, present designation); Wood, 1963, Great Basin Nat. 23:94. *Synonymy*

*Dendroctonus engelmanni* Hopkins, 1909, U.S. Dept. Agric. Bur. Ent. Tech. Bull. 17(1):130 (Holotype, female; Capitan, New Mexico; U.S. Nat. Mus., 7452); Wood, 1963, Great Basin Nat. 23:95. *Synonymy*

*Dendroctonus borealis* Hopkins, 1909, U.S. Dept. Agric. Bur. Ent. Tech. Bull. 17(1):133 (Holotype, female; Eagle, Alaska; U.S. Nat. Mus., 7453); Wood, 1963, Great Basin Nat. 23:96. *Synonymy*

DIAGNOSIS.— This species is distinguished from the very closely related *murrayanae* Hopkins, with great difficulty, by the more coarsely, more closely granulate frons, by the distinctive male genitalia, by the galleries, and by the host.

MALE.— Length 4.4–7.0 mm (average about 5.5 mm), 2.3 times as long as wide; mature body color very dark brown with reddish brown elytra, old adults usually uniformly black.

Frons convex, protruding slightly on lower half; epistomal margin elevated, smooth, shining; epistomal process a third (0.35 times) as wide as distance between eyes, its arms rather strongly oblique (about 45 degrees from horizontal) and moderately elevated, horizontal portion almost two-thirds its total width, shallowly concave, overlapping and ending just above epistomal margin and bearing under its distal margin a dense brush of yellowish setae; surface shining, punctures very close, deep, rather fine, largely obliterated in central area by fine, abundant granules, at least one or two granules for each puncture in central area, less numerous in surrounding areas. Vestiture fine, long, inconspicuous, rather sparse.

Pronotum 0.71 times as long as wide, widest at base; sides weakly arcuate and converging toward rather strong constriction just behind broadly, shallowly emarginate anterior margin; surface smooth and shining,

punctures rather fine but irregular in size, close, deep; median line impunctate posteriorly. Vestiture moderately abundant, fine and rather short on disc, longer and coarse laterally.

Elytra 2.4 times as long as pronotum; sides straight and subparallel on basal two-thirds, rather broadly rounded behind; basal margins arcuate and bearing a row of about 12 moderately large, raised, overlapping crenulations, with several smaller submarginal ones particularly on interstriae 2 and 3; striae very weakly impressed, punctures rather large and shallow, usually decreasing slightly in size toward base; interstriae slightly more than one and one-half times as wide as striae and

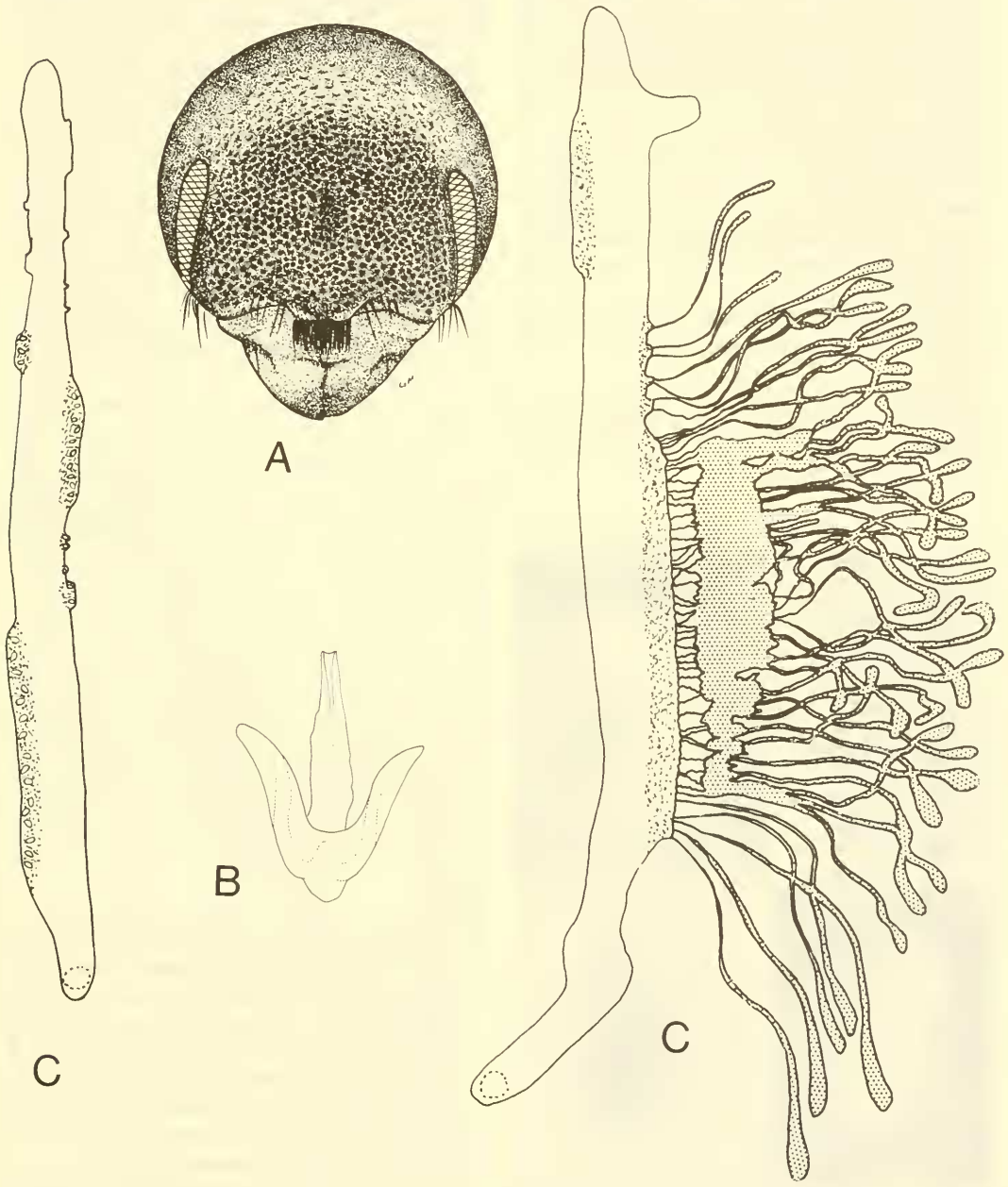



Fig. 77. *Dendroctonus rufipennis*: A, female head; B, male seminal rod; C, galleries.

armed by rather abundant confused, small, transverse crenulations, each averaging about one-fourth width of an interstriae, never more than a third as wide on posterior half of disc. Declivity rather steep, convex, with sutural interstriae slightly elevated; striae usually not impressed, punctures minute, subequal in size to and often confused with those of interstriae; interstriae almost smooth, subshining, punctures rather numerous, confused, median series on each interstriae very minutely granulate on upper rims. Vestiture rather long and abundant; slightly longer on declivity, longest setae about one and one-half times as long as width of an interstriae.

FEMALE.— Very similar to male except arms of epistomal process less strongly elevated and declivital striae usually weakly impressed, with interstrial granules rather large and usually pointed.

DISTRIBUTION.— Alaska and Newfoundland to Arizona, New Mexico, Michigan, and Pennsylvania.

ALASKA: Chichagof Isl., Circle, Eagle, Eklutna, Ft. Yukon, Homer, Juneau, Kenai Peninsula, Klutina Lake, Matanuska, Nutzotin Mts., Ruby, St. James Bay, Savonoski, Seward, Skagway, Tanana, Yakutat. CANADA: **Alberta**: Babine Lake, Banff, Calgary, Cypress Hills, Edmonton, Exshaw, Harlech, Jasper N. P., Kanaskis For. Sta., Lake Athabasca, Lake Louise, Lesser Slave Lake, Nordagg, Smoky Lake. **British Columbia**: Aspen Grove, Babine Lake, Bloom Ck. Valley, Boundary Lake, Creighton Valley, Emerald Lake, Glacier, Lorna, Lower Post, Lumberton, Lumby, Ootsa Lake, "Paxton Valley," Priest River, Princeton, Queen Charlotte Isl., Salmo, "Seymour Ck.," Stanley, Trinity Valley, Vancouver, Vernon, Vermilion Summit on Banff Rd., Victoria, Ymir, Yoho N. P. **Manitoba**: Churchill, "Northern Manitoba," Riding Mt. N. P. **New Brunswick**: Nictor Lake, Fredericton. **Saskatchewan**: "Northern Saskatchewan." **Northwest Territory**: Aklavik, Coppermine River, Ft. Norman, Ft. Smith, Yellowknife. **Nova Scotia**: Cape Breton Isl., St. Peters. **Ontario**: Black Sturgeon Lake, Egg Lake in Algonquin Pk., Frater, Hearst, "Nighthawk Lake," North Bay, "Remi Lake," Timmins. **Quebec**: Anticosti Isl., Cascapedia, Puparquet, Gaspé Peninsula. **Yukon**: Teslin, Whitehorse. USA: **Arizona**: Chiricahua Mts., San Francisco Peak. **California**: Crescent City. **Colorado**: Argentine Pass, Boulder, Clyde, Ft. Collins, Glenwood Springs, Gore Pass, Gunnison, Hahns Peak, Holy Cross Mts., Leadville, "Leavinworth Valley," Meeker, New Castle, Ouray Peak, Pingree N. P., Rabbit Ears Pass, San Isabel N. F., Silver Plume, Steamboat Springs, Twin Sisters, White River N. F. **Idaho**: Beaver Ck. of Logan Canyon (Utah), Collins, Lieber Ck. in Coeur d'Alene N. F. **Maine**: Beaver Pond, Camp Caribou, Cupsuptic, "Meadows." **Michigan**: Grand Island, Isle Royal, Marquette, Munising. **New Hampshire**: Colebrook, West Stewartstown, Wonalancet. **Minnesota**: Itasca St. Pk., International Falls. **New Mexico**: Capitan Mts., Cloudcroft, Las Vegas, Pecos Wilderness Area, Sandia Mts., Santa Fe Basin, Sierra Blanca. **New York**: Pleasant Lake. **Oregon**: Batterson, Cannon Beach, Cascade Head Expt. For., Coos Bay, Gold Lake, "Highland Mine," Hood River Meadows, Joseph, Marshfield, "Mt. Misery," Mt. Ashland, Santiam Pass, Tolgate. **Pennsylvania**: Rickets. **South Dakota**: Black Hills N. F., Spearfish Canyon. **Utah**: Alta, Ashley N. F., Cedar Breaks N. M., Ephraim, Escalante, LaSal Mts., Logan Canyon, Lost Lake, Panguitch, Paradise Pk., Parowan Canyon, Wolf Ck. Pass. **Washington**: Aberdeen, Easton, Fairfax, Hoquiam, Lake Wenatchee, Metaline Falls, Morse Ck., Mt. Rainier, Neah Bay, Parkway, Sappho, "Tieton R. S.," Wanatchee Lake, White Pass, White River, Winthrop, Yakima.

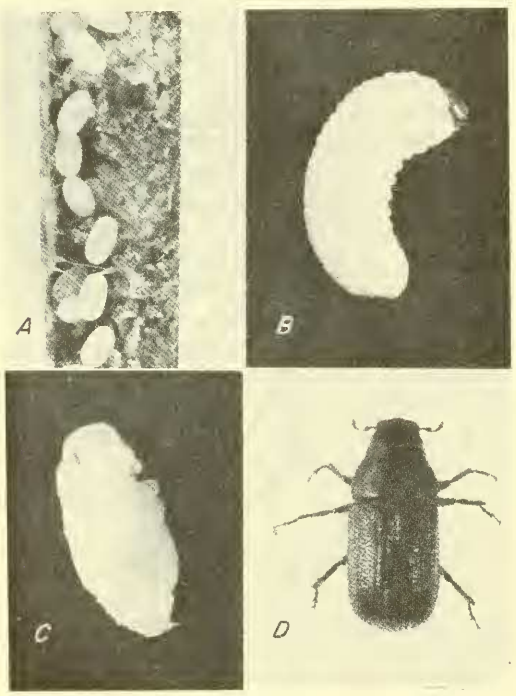



Fig. 78. *Dendroctonus rufipennis*: A, eggs; B, larva; C, pupa; D, adult. (After Massey and Wygant 1954:4.)

HOSTS.— All species of *Picea* within its range.

BIOLOGY.— This is the most destructive of the spruce-inhabiting bark beetles. It is responsible for killing an estimated average of approximately .33 to .50 billion board feet of standing spruce timber each year. It is also reported to have inflicted substantial losses of lodgepole pine (Massy and Wygant 1954:1), but this was not substantiated by my examination of the beetles collected from the infested trees (see *murrayanae*, above).

The life cycle of the spruce beetle is complicated by an apparently unique habit of

adult hibernation that contributes toward adapting this species to cold habitats. It may overwinter in any stage of development, but adults and half-grown larvae predominate. A one-year life cycle is more common in southern and warmer sites; a two-year cycle is the most common habit, but a three-year cycle is more common throughout the range of the species than is the one-year cycle; and a four-year cycle may be possible at very cold sites (Schmid and Frye 1977:4). Local climatic factors or peculiarities of a given season may accelerate or delay development.

In a typical two-year cycle, activity may begin as early as May when subcortical temperatures reach about 45 to 50 F. Flight activity of second-year (breeding) adults may begin in late May, but usually it occurs in June and July.

Under endemic conditions the trees selected for attack consist of windfalls or other prostrate dying green trees or of overmature or weakened standing trees larger than about eight inches DBH. During an epidemic almost any spruce tree in the stand may be selected regardless of size or vigor. The attack usually begins on the lower third of the bole, except for the first two or three feet above the ground. It ordinarily progresses to include the upper bole and stump later in the season. In prostrate trees only the lower half next to the ground is attacked. The upper bole smaller than eight inches in diameter and limbs generally not subject to attack by this species. The attack is slow and continuous, without any sudden or concerted swarming of the beetles; its duration may vary from a few days to many months, depending on the population density of beetles in the area, upon the resistance of the host, or upon climatic or other ecological factors peculiar to the season or locality. The number of attacks per square foot of bark surface may be as high as 24, but averages between 6

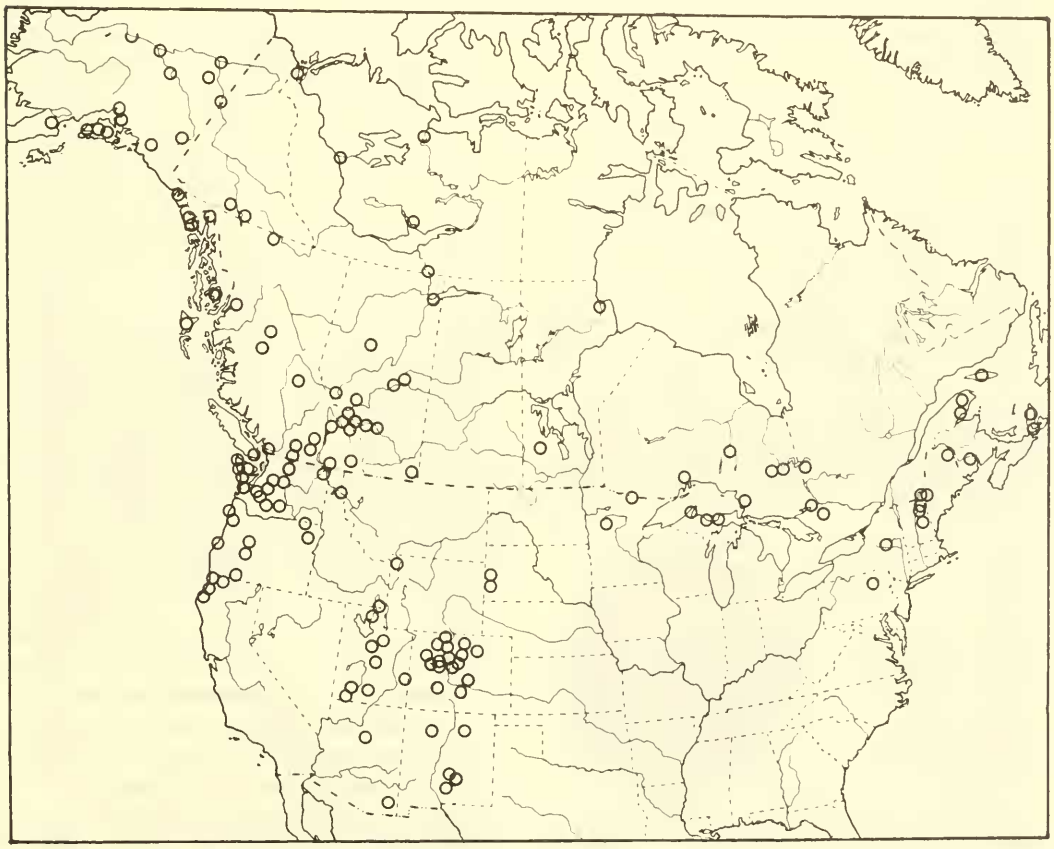


Fig. 79. *Dendroctonus rufipennis*, distribution map.

and 9; the density of the attacks evidently is greater at the base of the tree and gradually decreases upward (Massey and Wygant 1954:13).

The egg galleries are constructed by the female beetle mostly in the phloem tissues, but they engrave the wood more deeply than other species of *Dendroctonus*; the thinness of spruce bark may have some bearing on this habit. The egg galleries are parallel to the grain of the wood, almost straight, ordinarily with the lower 1 or 2 cm next to the entrance hole hooked diagonally to either the right or left. The average length of 13 cm and the maximum length of 23 cm for egg galleries observed during this study, made in 1960 in the Wasatch National Forest of Utah, agree with that reported by Massey and Wygant (1954:13). The egg galleries are slightly wider than the width of the beetle making them and, in addition, there usually is an egg groove along the side next to the cambium about 1–2 cm deep. Ventilation tunnels are placed at irregular intervals, but are not always present.

Oviposition evidently begins less than a week after the attack; there is some question as to its duration because most of the beetles reemerge to construct a second or third set of galleries. Massey and Wygant (1954:15) reported a maximum of 144 eggs in one gallery; they also reported that there was an average of 20.5 eggs per inch of gallery (excluding the diagonal first inch). In the present study it was found that the number of eggs per inch of gallery where eggs occurred was equal to that found by Massey and Wygant, but this rate of deposition was seldom maintained for more than a third the length of the gallery. The largest number of eggs counted in one gallery during this study was 53 in an area where a small epidemic was beginning on the Wasatch National Forest.

There is considerable variation in the way eggs are deposited. In some galleries all or part of the eggs are placed individually in separate niches. These niches may be lengthened sufficiently to accommodate two or more eggs, or extended into elongate grooves as much as 8 cm in length. The niches, or the more typical grooves, ordinarily are placed alternately on the sides of the egg tunnel in contact with the cambium. Ordinarily, individual niches are formed when the gallery enters a moderately unfavorable environment. Each egg or group of eggs is covered by a layer or partition of frass that separates them from the main gallery.

Following oviposition the gallery may be extended a short distance in an irregular feeding tunnel. When both parents are represented, separate feeding tunnels may give the gallery a characteristic Y-shaped ending. Evidently most of the beetles reemerge to form a second or third set of galleries. Reemerging beetles may extend the flight and oviposition periods beyond the July date indicated above.

At the high altitudes where this species occurs in Colorado, incubation is thought to require three to four weeks (Massey and Wygant 1954:16); it probably takes much less time in Pacific Coast areas, where suitable hosts enable this species to live at or near sea level. The newly hatched larvae feed in the phloem in contact with the cambium, either individually or in groups, in a general direction at right angles away from the egg gallery. Ordinarily, communal feeding is the rule during the second instar. When about one-third grown, all larvae form separate feeding tunnels that wind throughout the phloem, frequently crossing one another. Some larvae that hatch from the first eggs deposited in June may become callow adults by late August to October; however most of them overwinter as larvae and complete their development the following spring or summer. Pupal cells are formed at the ends of the larval mines or in frass of a previously excavated area, either next to the cambium or entirely in the bark. The pupal period in the late spring or early summer may be completed in about 10 to 15 days (Massey and Wygant 1954:17); however, completion of this stage may be extended if pupation begins in the late fall. A normal life cycle requires one year at low elevations on favorable sites or two years at higher, colder sites. Under unfavorable conditions three or even four years may be required to complete a life cycle (Schmid 1977).

The low temperatures that prevail throughout much of the year in many areas

where this species occurs may have a profound effect on the length of the life cycle of this insect. Collectors who took it in the McKenzie River area in northern Canada and in north central Alaska estimated that at least two years were required for larval development.

In the two-year cycle, newly transformed first-year adults (those hatched the previous year) emerge from standing trees primarily in August and September and move to the previously uninfested base of the brood tree, where they reenter the bark and overwinter in feeding tunnels. They reemerge the following summer as breeding adults. First-year adults in prostrate trees remain in their brood tunnels, without emerging, through their second winter. This habit normally places the overwintering beetles below the snow line, where they are protected from the extremely low winter temperatures that characterize their habitat. Schmid (1977:4) indicates that a varying percentage (from 3 to 88 percent) of the beetles in a given generation at a particular site may exhibit this hibernation habit.

The existence of a three-year life cycle has been suggested (Wygant 1954, Schmid 1977), but has not been fully documented. If it does occur, it is apparently achieved by prolongation of the larval period.

NOTES.— The above treatment was based on the holotypes of *rufipennis*, *obesus*, *engelmanni*, and *borealis*, on the known syntypes of *similis*, and on the neotype of *piceaperda*. The syntype of *similis* in the LeConte collection labeled "type" is here designated as the lectotype of that species; the female specimen labeled type no. 7451 in the U.S. National Museum and referred to as the type by Hopkins (1909a:126) is here designated as the neotype of *piceaperda*. Because this specimen was collected in 1902, it could not possibly have been a syntype. In addition to these types more than 6,000 other specimens were examined.

### 16. *Dendroctonus simplex* LeConte

Figs. 80, 81

*Dendroctonus simplex* LeConte, 1868, Trans. American Ent. Soc. 2:173 (Lectotype, male; Canada; Mus. Comp. Zool., present designation)

DIAGNOSIS.— This species is distinguished from the closely related *pseudotsugae* Hopkins by the much smaller size, by the less strongly protuberant, smoother, but more coarsely punctured frons, by the more coarsely punctured pronotum, by the larger punctures on the declivital interstriae, and by the distribution.

MALE.— Length 3.4–5.0 mm (average about 4.2 mm), 2.4 times as long as wide; mature body color dark brown, elytra often with a reddish cast.

Frons broadly convex, protruding somewhat on lower half, inflated area arising abruptly just above smooth, elevated rim of epistomal margin; epistomal process less than a third (0.30 times) as wide as distance between eyes, its arms very strongly oblique (about 80 degrees from horizontal) and usually not elevated, horizontal portion about three-fourths its total width, flat, overlapping and apparently flush with epistomal margin (actually ending just above slightly extended margin), and bearing under its distal margin a dense brush of yellowish setae; surface shining, smooth, with rather coarse, deep, very close punctures and a very few minute granules. Vestiture sparse, rather short, fine, inconspicuous.

Pronotum 0.71 times as long as wide; widest at base, sides weakly arcuate and converging toward the rather strong constriction just behind broadly, shallowly emarginate anterior margin; surface smooth and shining, punctures rather coarse, irregular in size, close, deep; median line narrowly impunctate posteriorly. Vestiture moderately abundant, fine and rather short on disc, longer and coarse laterally.

Elytra 2.5 times as long as pronotum; sides straight and subparallel on basal two-thirds, rather broadly rounded behind; basal margins arcuate and bearing a row of about 10 rather

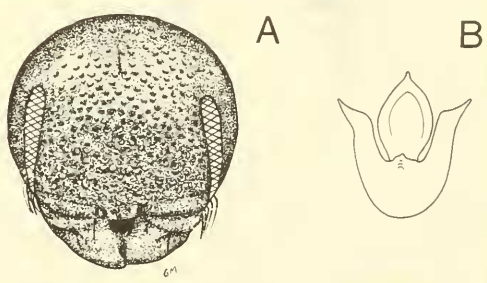



Fig. 80. *Dendroctonus simplex*: A, male frons; B, male seminal rod.

large, raised, overlapping crenulations, with several smaller submarginal ones particularly on interstriae 2 and 3; striae weakly impressed, punctures rather large and deep, usually decreasing slightly in size toward base; interstriae less than one and one-half times as wide as striae and armed by an irregular row of transverse crenulations, each averaging about one-third width of an interstriae, a few half as wide on posterior half of disc, a few fine punctures interspersed with crenulations. Declivity rather steep, convex, with sutural interstriae very strongly elevated and interstriae 2 weakly impressed; striae rather deeply, narrowly impressed, punctures greatly reduced; interstrial punctures rather coarse, numerous and confused on 1, uniseriate on 2 and 3; none of punctures granulate. Vestiture rather coarse, slightly longer on declivity, longest setae equal in length to about one and one-half times width of an interstriae.

FEMALE.— Very similar to male except declivital interstriae with minute confused punctures and each with a median row of coarse, somewhat pointed tubercles, tubercles spaced by a distance slightly less than width of an interstriae.

DISTRIBUTION.— Alaska and Newfoundland to NE British Columbia, Minnesota, and West Virginia.

ALASKA: College, Fairbanks, McGrath. CANADA: **Alberta**: Bilby, Edmonton, Mitsue, Smith. **British Columbia**: Wildmare Ck. **New Brunswick**: Fredericton, Nictor Lake. **Newfoundland**: "New Foundland." **Nova Scotia**: Sydney. **Ontario**: Deili, Pine Springs, Wooler. **Quebec**: Gaspé, Natashquan, Ungara Bay. USA: **Maine**:

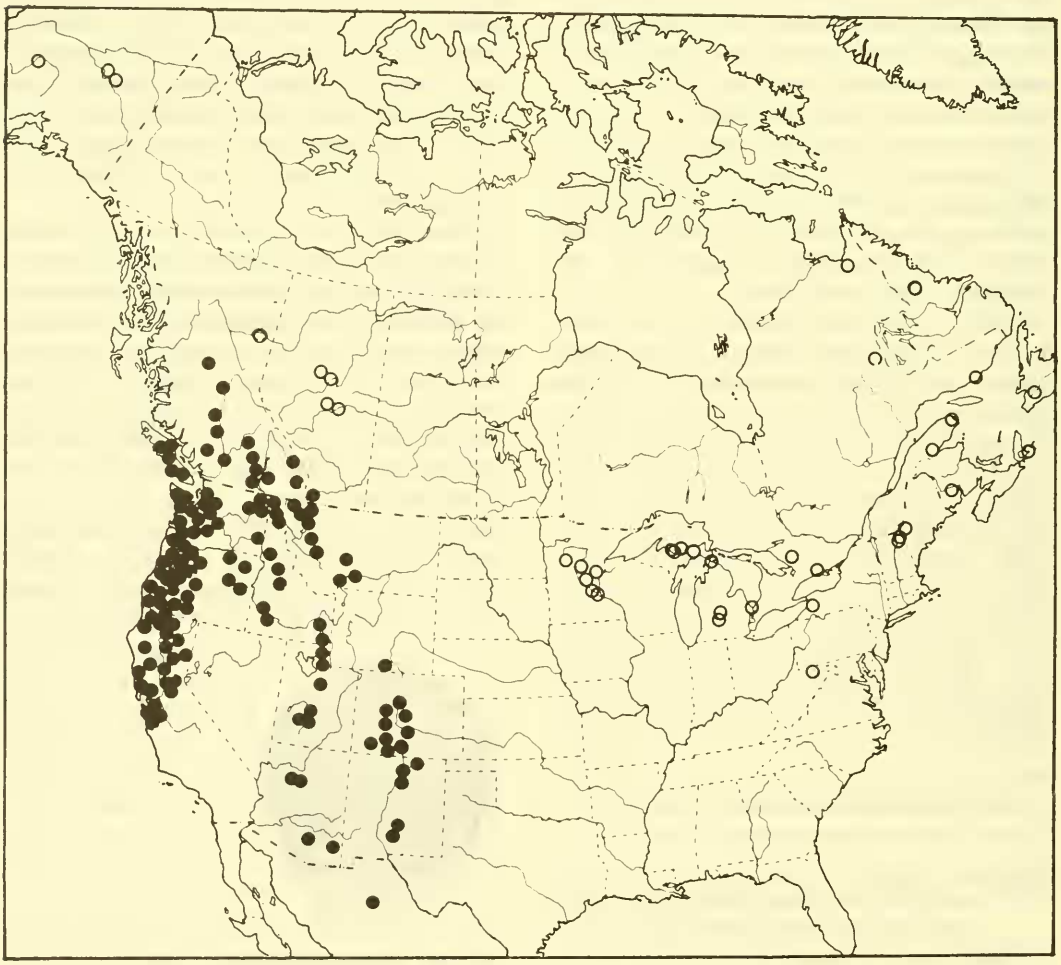


Fig. 81. *Dendroctonus* spp., distribution map: *simplex*, open circles; *pseudotsugae*, solid circles.

Cupsuptic. **Michigan**: East Lansing, Grand Island, Grand Ledge, Mackinac Isl., Marquette, Munising, Port Huron, Seney. **Minnesota**: Carlton Co., Hennepin Co., Itasca St. Pk., Lake Itasca, Mille Lacs Co., Pine River, St. Paul. **New Hampshire**: Pittsburg, West Stewartstown. **New York**: Erie Co. **West Virginia**: Cranesville.

HOSTS.— *Larix laricina*.

BIOLOGY.— This species prefers dying or injured trees and, consequently, is not generally regarded as having major economic importance. However, it is known to have successfully attacked and killed healthy mature larch trees.

This species was not observed during this study; all comments that follow are based on Hopkins (1909b:103–106), Simpson (1929:274–279), and Prebble (1933:146). The galleries illustrated by Hopkins for this species are used as the basis for the qualified description of the galleries below. Because the placement of eggs in his figure lacks detail and the system appears to resemble that of the very closely related *pseudotsugae*, and because of the general phyletic position of *simplex* in the genus, it is presumed that egg grooves, not niches as illustrated, would normally be constructed by this species.

The principal overwintering stage is the young adult in the brood gallery, although it is not uncommon for some larvae to overwinter. Flight activity begins early in May and continues at a relatively low level until late August; the period of greatest activity apparently is from the last week of May to the second week of June. Adult beetles may reemerge to construct a second or third set of galleries during the season, but none of their progeny leave the brood tree until the following spring.

Trees selected for attack include windfalls, snow breaks, stumps, or other weakened or severely damaged material. The exact pattern of the attack and details of the galleries and habits have not been reported.

Hopkins (1909b:103) indicated that the galleries are vertical and slightly sinuate. Evidently they average about 20 to 25 cm in length. The eggs are deposited in groups of three to six or more, presumably in grooves rather than in individual niches. The larvae mine individually in continual contact with the cambium, away from the egg gallery and without crossing one another. Evidently the larval mine increases only slightly through the first and second instars then expands suddenly into an irregularly oval feeding area, where the last two larval instars, pupation, and hibernation occur.

Oviposition ordinarily begins about the last week of May. The eggs hatch in about 11 days (Prebble 1933:146) and complete larval development in approximately 27 days; about 7 days are required for the pupal stage during the early summer months. Simpson found young adults in the first set of galleries completed during the season by 1 August; in the second set of galleries young adults were present by 17 September; larvae produced in the third set of galleries formed by these same parent adults passed the winter as larvae. The young adults produced in the first and second sets of galleries overwintered in those galleries and emerged the following May and early June. The overwintered larvae from the third set of galleries matured in June and emerged during July.

NOTES.— Two male syntypes are in the LeConte collection; the first of these syntypes is labeled type and is here designated as the lectotype of *simplex*. The above treatment was based on the lectotype and on about 360 other specimens.

### 17. *Dendroctonus pseudotsugae* Hopkins

Figs. 81, 82, 83

*Dendroctonus pseudotsugae* Hopkins, 1905, U.S. Dept. Agric. Bur. Ent. Bull. 56:11 (Neotype, female; Grants Pass, Oregon; U.S. Nat. Mus., 7450, present designation)

DIAGNOSIS.— This species is distinguished from the closely related *simplex* LeConte by the larger size, by the more strongly protuberant, more finely punctured, subgranulate, irregular surface of the frons, by the more finely punctured pronotum, by the finer punctures of the declivital interstriae, and by the distribution.

MALE.— Length 4.4–7.0 mm (average about 5.5 mm), 2.3 times as long as wide; body color very dark brown, with reddish brown elytra.

Frons broadly convex, protruding rather strongly on lower half, inflated area arising abruptly just above smooth, elevated rim of epistomal margin; epistomal process about a fourth (0.24 times) as wide as distance between eyes, its arms very strongly oblique

(about 80 degrees from horizontal) and usually not elevated, horizontal portion about three-fourths its total width, flat, overlapping and apparently flush with or exceeding epistomal margin and bearing under its distal margin a dense brush of yellowish setae; surface irregular, rather finely, closely punctured and becoming granulate on lower half. Vestiture sparse, rather short, fine, inconspicuous.

Pronotum 0.71 times as long as wide, widest at base; sides weakly arcuate and converging toward strong constriction just behind broadly, shallowly emarginate anterior margin; surface smooth and shining, punctures rather small, irregular in size, close, deep; median line narrowly impunctate posteriorly (usually); vestiture moderately abundant, fine and rather short on disc, longer, coarse laterally.

Elytra 2.5 times as long as pronotum; sides straight and subparallel on basal two-thirds, rather broadly rounded behind; basal margins arcuate and bearing a row of about 10 rather

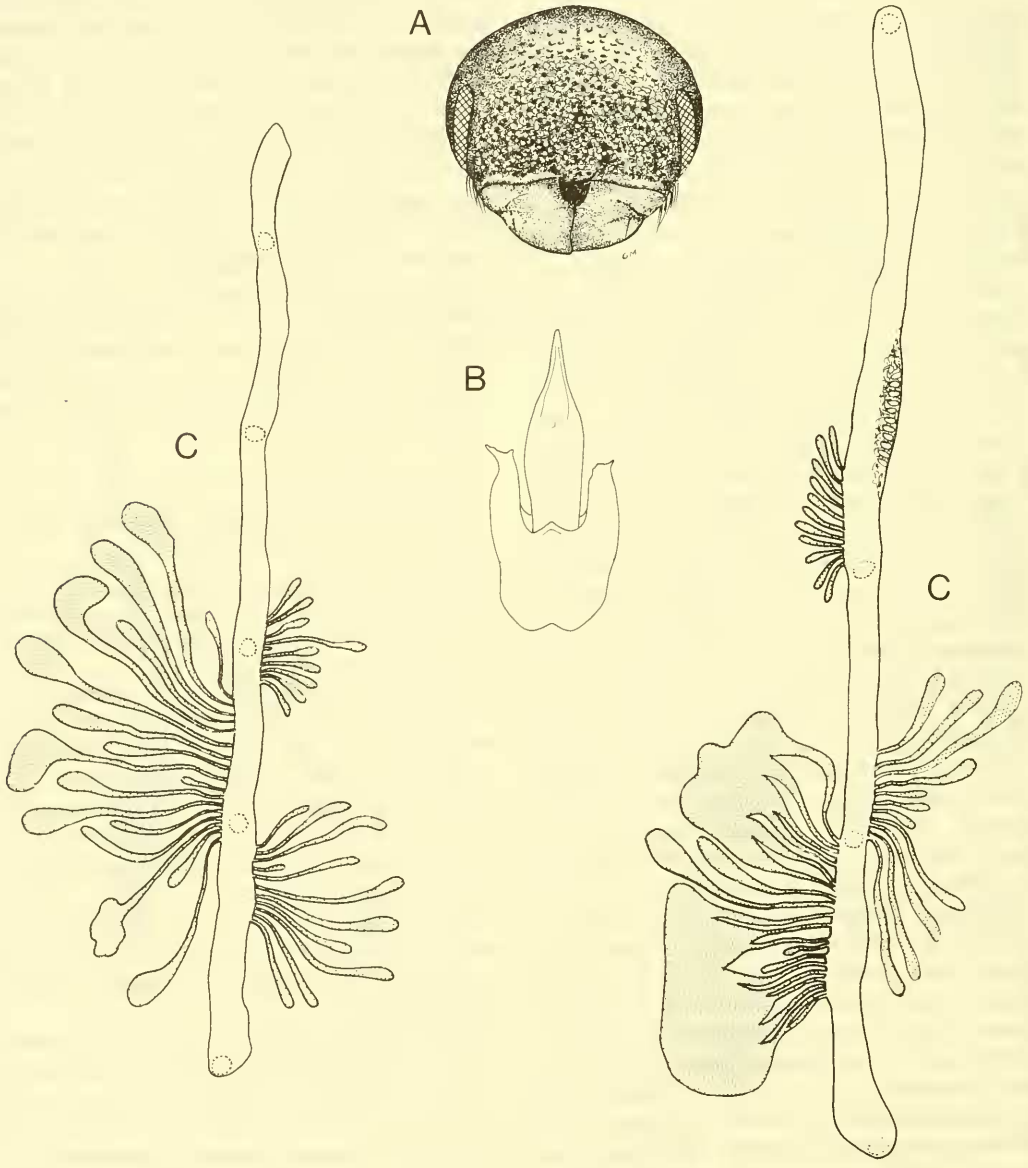



Fig. 82. *Dendroctonus pseudotsugae*: A, male frons; B, seminal rod; C, galleries.

large, raised, overlapping crenulations, with several smaller submarginal ones particularly on interstriae 2 and 3; striae weakly impressed, punctures rather large and moderately deep, usually decreasing slightly in size toward base; interstriae about one and one-half times as wide as striae and armed by abundant, confused, transverse crenulations, each averaging almost half the width of an interstriae, a few two-thirds as wide on posterior half of disc. Declivity rather steep, convex, with sutural interstriae very strongly elevated and interstriae 2 weakly impressed; striae rather deeply impressed, punctures half as large as on disc; interstrial punctures rather fine, abundant and confused on 1 and 3, almost uniseriate on 2; none of punctures granulate. Vestiture rather coarse, slightly longer on declivity, longest setae equal in length to about one and one-half times the width of an interstriae.

FEMALE.— Very similar to male except declivital interstriae with smaller punctures and each with a median row of very coarse, somewhat pointed tubercles, tubercles spaced by a distance slightly less than width of an interstriae.

DISTRIBUTION.— British Columbia and Alberta to California and Chihuahua.

CANADA: **Alberta**: Waterton. **British Columbia**: Australian, Babine Lake, Barriere, Bestwick, Boston Bar, Britain River, Buttle Lake, Campbell River, Canim Lake, Cowichan Lake, Cumberland, Fernie, Fraser River Valley, Grant Lake, Hamilton Lake, Kamloops, Kettle River Valley, Lac LaHache, Lillooet River Valley, Lumby, MaCallister, Merritt, Nimpkish Valley, Okanagan Lake, Prince George, Quesnel, Seymour Narrows, Soda Ck., Trinity Valley, Upper Campbell Lake, Vancouver, Vernon, West Kettle River Valley, Williams Lake, Windermere Lake, Wogs Lake. USA: **Arizona**: Chiricahua Mts., Flagstaff, San Francisco Mts., Santa Catalina Mts. **California**: Alameda Co., Alma, Bean Ck., Big Basin, Boulder Ck., Callahan, Camp Meeker, Chester, Coulterville, Dead Horse Summit in Siskiyou Co., Fieldbrook, Foresthill, Gaberville, Green Point, Guerneville, Hackamore, Half Moon Bay, Happy Camp in Siskiyou Co., Lagunitas, La Honda, Lights Ck., McCloud, Meadow Valley, Moffat Ck. in Siskiyou Co., Mohawk, Palo Alto, Placerville, Point Reyes, Quincy, Santa Cruz, Trinity Co., Upper Lake in Lake Co., Wrights, Yellow Ck. **Colorado**: Colorado Springs, Ft. Garland, Gunnison N. F., Moffat, Pagosa Springs, Palmer Lake, San Isabel N. F., San Juan N. F., Saguache. **Idaho**: Beaver Canyon in Nez Perce Co., Beaver Ck. in Logan Canyon (Utah), Henry's Lake, Kooskia, Kootenai, Pioneerville, Priest River, Sandpoint, Smiths Ferry, Stites. **Montana**: Apgar, Belton, Bozeman, Columbia Falls, Fish Ck. Station, Kalispell, Lake McDonald, Middle Ck. in Gallatin Co., Ovando. **New Mexico**: Capitan, Cloudcroft, Santa Fe, Tres Ritos, Vermejo Pk. **Oregon**: Ashland, Clover Ck., Cloud Springs, Corvallis, Detroit, Dixie Pass, Elk Ck., Forest Grove, Grants Pass, Hood River, Jewell, Klamath N. F., MacDonald Forest, Mary's Peak, Mistletoe, Mt. Angel, Myrtle Point, Newport, Oregon Caves, Otis, Philomath, Pinehurst, Portland, St. Helens, Salmon River, Santiam N. F., Siskiyou Mts., Sumpter, Tillamook, Tiller, Waldo. **Utah**: Cache N. F., Logan Canyon, Panguitch, Parowan Canyon, Provo Canyon, Sanford Canyon. **Washington**: Ashford, Buckeye, Curlew, Des Moines, Easton, Fairfax, Grays Harbor City, Hoodsport, Hoquiam, Kent, Keyport, La Grande, Longmire, Meredith, Metaline Falls, Monroe, Mt. Rainier N. P., North Bend, Northport, Orting, Port Angeles, Port Williams, Pullman, Puyallup, Quiault, Sappho, Satsop, Seattle, Shelton, Stimpson Ck. in Mason Co., Vancouver. **Wyoming**: Saratoga. MEXICO: **Chihuahua**: 68 km W San Juanito, La Magdalena.

HOSTS.— *Pseudotsuga menziesii*, *P. macrocarpa*, and less commonly from *Larix occidentalis* and *Tsuga heterophylla*.

BIOLOGY.— This is a primary insect enemy of Douglas fir. Although estimate of damage inflicted by it are not available for all regions where it occurs, it may be responsible for an average annual loss approaching .5 billion board feet of timber.

The winter is passed chiefly as young adults, although some larvae and parent adults also overwinter successfully. Flight activity may begin as early as the first of April and evidently continues at least until early September. Two principal periods of flight activity occur: the first during May or June is composed of overwintered young adults; the second during July or August is composed of beetles that overwintered as larvae and of parent adults reemerging from their first set

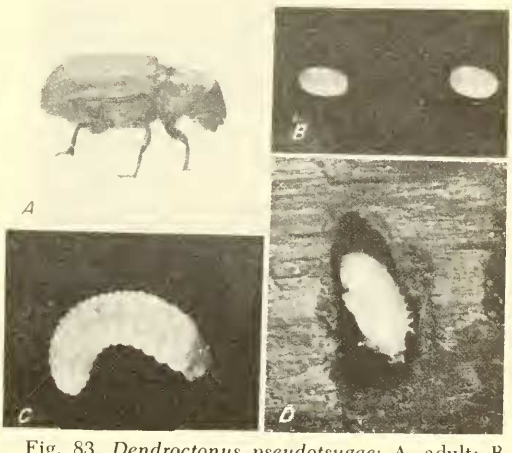



Fig. 83. *Dendroctonus pseudotsugae*: A, adult; B, eggs; C, larva; D, pupa. (After Bedard 1950:3.)

of galleries. The exact timing of each principal flight period may vary from locality to locality with altitude, latitude, exposure, peculiarities of a particular season, or other local ecological factors.

Ordinarily the material selected for attack includes stumps, windfalls, broken logs, or other injured or prostrate trees larger than eight inches in diameter. However, when populations are high or when assisted by drought, healthy, vigorous standing timber may be selected. The attack on a standing tree usually begins in the upper midbole area and progresses upward and downward from that point. In prostrate material, at least when the bark is relatively thick, the beetles attack the sides and upper surfaces as well as the lower. The attack is slow and continuous, without any sudden or concerted swarming of the beetles. Its duration is variable, evidently depending on the population density of beetles in the area, upon resistance of the host, or upon local climatic or other local ecological factors. It may be completed in a few days or it may continue for more than a year and involve two or possibly more successive generations.

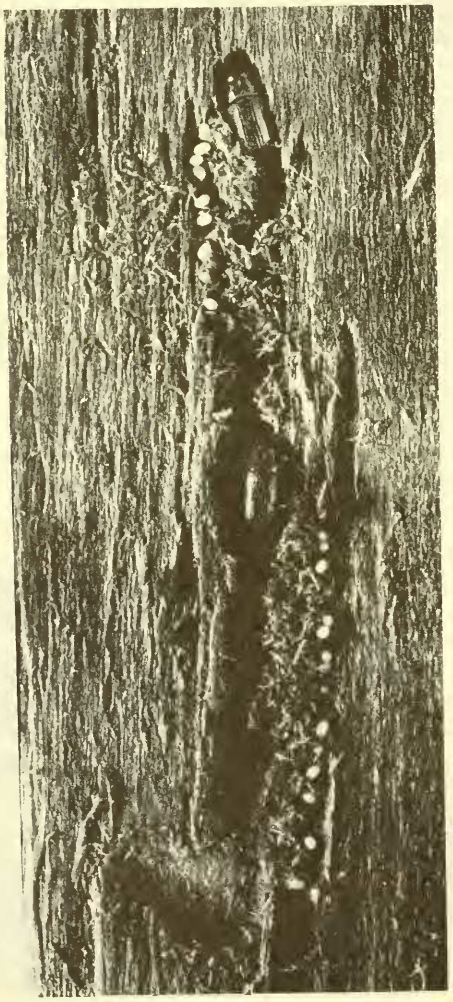


Fig. 83 continued, E, adults and eggs in gallery. (After Bedard 1950:5).

The egg galleries are constructed almost entirely in the inner bark; they are in continual contact with the cambium and may very lightly score or at least stain the wood. They are straight or nearly so, and parallel the grain of the wood.

The initial attack is made by the female beetle in a crevice of the bark. Soon after beginning the attack she is joined by a male who takes over the function of removing frass from the entrance hole. Mating evidently occurs within a few hours after the cambium is reached. After the gallery has been extended several centimeters the male may pack the lower areas with the frass, thereby closing the entrance hole, or he may leave the gallery in search of another female. Most of the galleries are from about 12 to 30 cm in length, but are known to exceed 90 cm. As with other species, ventilation tunnels are placed at irregular intervals, or they may be entirely absent. The maximum number of ventilation tunnels counted in more than a hundred galleries measured during this study was four; about 80 percent of the galleries had two ventilation tunnels.

Oviposition may begin within two or three days after the attack; according to Vité and Rudinsky (1957:157) the first eggs, under controlled laboratory conditions, may appear within 36 hours after the attack begins. Eggs evidently may be found throughout the period of summer activity until about early September. According to Chamberlin (1918:20) one female may produce as many as 160 eggs in one gallery; the maximum number counted during this study was 102 in a gallery only partly complete.

Eggs are deposited in grooves about 2–4 mm deep along the sides of the gallery, near but not necessarily touching the cambium. The grooves are placed alternately on the sides, without overlapping or without more

than a few millimeters between the end of the groove on one side and the beginning of the next on the other side. The grooves vary considerably in length, ranging from less than 1 to more than 8 cm. The eggs are deposited in a single row in contact with one another and oriented with the long axis perpendicular to the egg gallery and more or less parallel to the cambium. It is presumed that the larvae emerge from the egg at the end farthest from the egg gallery. This habit of orienting the eggs is peculiar in the genus among the species observed during this study, and presumably is associated with the fact that the larvae construct independent mines, rather than working in congress as with other species that deposit masses of eggs in common grooves. The eggs are held in position by a rather thick layer or partition of coarse, fibrous frass that separates them from the egg gallery. Following the period of oviposition most of the females reemerge to construct a second set of galleries.

The period of incubation varies considerably with various factors, particularly temperature. Vité and Rudinsky (1957:161) found, under controlled conditions, that it ranged from about 6 to 28 days. Under field conditions estimates of the incubation period range from 8 to 24 days. Under controlled conditions, Vité and Rudinsky (1957:161) found that larval development required about 19 to 72 days and the pupal period about 5 to 18 days. The larvae construct individual mines more or less perpendicular to the egg gallery and are in continual contact with the cambium area. They increase gradually in diameter and tend to fan out somewhat as they progress. Unless crowding occurs, they normally do not cross one another. Near the end of larval development a pupal chamber may be cleared in the cambium area at the end of the larval mine, or the larva may bore out into the bark for a variable distance before pupating. The young adults overwinter in the brood galleries and emerge the following spring. Larvae that develop from eggs deposited in the fall may not mature before the onset of cold weather and, therefore, pass the winter as larvae. These larvae mature early in the following summer and may emerge in July or August, or, evidently, they may overwinter in the brood galleries (Bedard 1950:9). There is one complete generation and possibly a partial second generation each year.

NOTES.— Since this species was originally validated in 1905 and the type cited by Hopkins (1909aa:121) was collected in 1908, a type evidently does not exist. For this reason, the specimen considered to be the type by Hopkins (1909a:121), specified above, is here designated as the neotype of *pseudotsugae* Hopkins. The above treatment was based on this neotype and on about 2800 other specimens.

## Tribe PHRIXOSOMINI

Phrixosomini Wood, 1978, Ann. Soc. Ent. France 14:111 (Type-genus: *Phrixosoma* Blandford, 1897)

Anatomical features.— The frons is not sexually dimorphic, the eye is completely divided, the antennal funicle is 6-segmented, the club is unmarked by sutures except that 1 is partly septate, the procoxae are contiguous, the scutellar area of the metathorax is separated from the postnotum by a definite suture, and the tibiae are armed by socketed denticles.

Biological features.— All species are monogamous and phloeophagous. The parental tunnels are biramous. Eggs are placed in niches. The larval mines follow a definite course and rarely cross one another. Symbiotic relationships with fungi have not been reported. All known species breed in tropical trees of the family Guttiferae.

Taxonomy.— The unique genus in this monobasic tribe occurs in Central and South America and in Africa. The genus appears to be ancient and apparently predates the separation of South America and Africa. Species differences are minute; some South American forms are scarcely distinguishable from some African species. They are remotely allied to the Asiatic Hyorrhynchini; both tribes apparently represent relics of ancient groups now virtually extinct.

### Genus *PHRIXOSOMA* Blandford

*Phrixosoma* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):148 (Type-species: *Phrixosoma rude* Blandford, monobasic)

*Bothryperus* Hagedorn, 1909, Deutsche Ent. Zeitschr. 6:742 (Type-species: *Bothryperus psaltes* Hagedorn, monobasic); Schedl, 1963, Ent. Abh. Der. Tierk, Dresden 28:258. *Synonymy*

*Neohylesinus* Eggers, 1920, Ent. Blätt. 16:118 (Type-species: *Neohylesinus quadrioculatus* Eggers, monobasic); Eggers, 1927, Rev. Zool. Afr. 15:196. *Synonymy*

*Sphaerosinus* Eggers, 1929, Tijdschr. Ent. 72:40 (Type-species: *Sphaerosinus striatus* Eggers, monobasic)

Diagnosis.— The completely divided eye, the 6-segmented antennal funicle with procurved sutures on the club, the cylindrical third tarsal segments, and the unique sexual dimorphism distinguish this genus.

Description.— Length 1.6–2.5 mm; 2.0–2.3 times as long as wide; frons convex, not dimorphic, usually with a fine, long, median carina. Eye completely divided. Antennal scape long, funicle 6-segmented; club slightly asymmetrical, with three procurved sutures, lateral two-thirds of 1 septate. Pronotum unarmed, punctured to obscurely granulate. Scutellum present. Elytra ascending behind on costal margin; declivity convex, gradual, short; striae impressed, punctures small to obsolete; interstriae finely granulate; vestiture short, mostly hairlike, often coarse. Anterior coxae contiguous; anterior margin of pronotum extending as ridge to coxal margin then continuing as an intercoxal ridge. Vertex sexually dimorphic in two species.

Distribution.— About 11 species from Central and South America and eight from Africa are known.

Biology.— Representatives of this monogamous genus attack the limbs and bole of trees of the family Guttiferae, where they construct tunnels in the phloem tissues. Their bi- or triramous parental galleries usually engrave the wood lightly; the short larval mines appear to wander aimlessly in the phloem.

Key to the species of *Phrixosoma*

1. Slender species, 2.3 times as long as wide; pronotum closely, rather deeply punctured; striae at base of declivity almost as wide as interstriae; Costa Rica to Panama; 2.2–2.3 mm ..... 1. ***rude* Blandford**

— Stout species, 2.0 times as long as wide; pronotum granulate, punctures obscure; striae at base of declivity about half as wide as interstriae ..... 2

2(1). Interstrial granules confused throughout disc, rarely a single row toward declivital base; elytral setae much finer, often longer; frons with a fine median carina; vertex not dimorphic; Costa Rica to Panama and Colombia; *Symphonia globulifera* 1.8–2.5 mm ..... 2. ***obesum*** **Blackman**

— Interstrial granules and setae on posterior half of disc distinctly three-ranked; all elytral setae stouter, often almost scalelike; female vertex transversely impressed and ridged ..... 3

3(2). Smaller; interstrial granules confused almost to middle of disc; discal interstriae usually wider, about twice as wide as striae; anterior slope of pronotum finely granulate; frons commonly devoid of median carina; female impression on vertex weak, its upper margin weakly ridged; Honduras to Panama and Venezuela; *Rheedia edulis*; 1.6–2.0 mm ..... 3. ***minor*** **Wood**

— Larger; interstrial granules three-ranked almost to base; discal interstriae usually three times as wide as striae; anterior slope of pronotum obscurely if at all granulate; transverse impression on female vertex, its upper margin abruptly ridged; Honduras; in *Clusia flava*; 1.9–2.5 mm ..... 4. ***clusiae*** **Wood**

### 1. *Phrixosoma rude* Blandford

*Phrixosoma rude* Blandford, 1897, Biol. Centr. Amer., Coleopt 4(6):148 (Lectotype, sex?; Volcan de Chiriquí, Panama; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This rather unique species is distinguished from others in the genus by the more slender body form, by the very fine, hairlike pubescence, and by the more clearly, more deeply punctured pronotum.

FEMALE.— Length 2.2–2.3 mm, 2.3 times as long as wide; color black.

Frons broadly convex, a shallow, transverse impression just above epistomal margin; surface rather coarsely reticulate, with rather small, rounded granules, a fine, low, median carina extending from just below upper level of eyes to epistomal margin; vestiture largely confined to epistomal area.

Pronotum 0.85 times as long as wide; widest near base, sides rather strongly arcuate on basal half, weakly constricted just before rather broadly rounded anterior margin; surface shining, almost smooth, punctures moderately small, close, rather deep, oval to irregular in shape, becoming finely granulate toward base; vestiture very fine, hairlike, inconspicuous.

Elytra 1.5 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae narrowly impressed, punctures small, moderately deep; interstriae about twice as wide as striae, armed by moderately high, isolated, rather close granules, those on 1 almost uniseriate, others confused. Declivity convex, moderately steep; interstriae narrower than on disc, more nearly convex, reticulate, granules reduced in size and number. Vestiture hairlike, three rows of setae on each interstriae, middle row slightly less than twice as long as others and slightly shorter than distance between median rows.

DISTRIBUTION.— Costa Rica and Panama.

COSTA RICA: Santa Ana, San José, 8-XI-63, 1300 m, no. 254, Rheedia edulis, S. L. Wood. PANAMA: Volcán de Chiriquí, G. C. Champion.

HOST.— *Rheedia edulis*.

BIOLOGY.— One female was taken from a newly constructed entrance tunnel in the phloem of a cut limb about 7 cm in diameter.

NOTES.— The above treatment was based on my Santa Ana specimen and on the two specimens of Blandford's series of three syntypes now in the British Museum. Because a type has not been selected, I here designate the first of the two specimens remaining in Blandford's series as the lectotype of the species as indicated above.

### 2. *Phrixosoma obesum* Blackman

*Phrixosoma obesa* Blackman, 1943, Proc. U.S. Nat. Mus. 94:393 (Holotype, female; Gatún, Canal Zone, Panama; U.S. Nat. Mus., 56572)

DIAGNOSIS.— Although not closely related, this species differs from *rude* Blandford by the characters summarized in the above key, by the much finer frontal granules, by the more numerous, smaller elytral granules, by the more abundant elytral vestiture, and by other characters.

FEMALE.— Length 1.8–2.5 mm, 1.9 times as long as wide; color black.

Frons as in *rude* except frontal granules much smaller and more widely spaced.

Pronotum 0.80 times as long as wide; widest at base, sides weakly arcuate, strongly converging to prominent constriction just before broadly rounded anterior margin; surface rather finely, shallowly punctured near center, punctures largely replaced in basal and lateral areas by small, irregularly formed, rounded granules or rugae, with rather coarse reticulation interspersed in depressions; vestiture fine, rather short, hairlike.

Elytra 1.2 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal half, rather narrowly rounded behind; striae strongly impressed, punctures rather fine; interstriae three or more times as wide as striae, surface strongly reticulate, rather densely armed by isolated, confused granules. Declivity convex, moderately steep; interstriae less than twice as wide as striae, tubercles less definite, uniseriate. Vestiture reddish yellow, consisting of rather abundant fine, short, interstrial hair, and a row of longer bristles on each interstriae; bristles fine toward base, course on declivity, almost twice as long as ground vestiture, about two-thirds as long as distance between rows.

MALE.— Distinguished from female only by differences in posterior abdominal terga.

DISTRIBUTION.— Costa Rica and Panama to Colombia and (?)Brazil.

COSTA RICA: Moravia, Cartago, 11-III-64, 500 m, no. 470, *Symphonia globulifera*, S. L. Wood; Río Damitas, Dota Mountains, San José, 18-II-64, 500 m, No. 434, *Symphonia globulifera*, S. L. Wood. PANAMA: Gatún, Canal Zone, 7-IV-11, Schwarz. OTHER COUNTRIES: Colombia, (?)Brazil (one doubtful specimen in the Canadian Nat. Coll.).

HOST.— *Symphonia globulifera*, *Rheedia madruño* (Colombia).

BIOLOGY.— Felled trees about 25–35 cm in diameter were attacked in large numbers. The larvae almost completely consumed the phloem tissues. Apparently the adult galleries were biramous and transverse; they scarcely engraved the wood.

NOTES.— Examples from Moravia used for the above treatment were compared to the type. For this study 36 specimens were examined.

### 3. *Phrixosoma minor* Wood
Fig. 98

*Phrixosoma minor* Wood, 1956, Canadian Ent. 88:248 (Holotype, male; La Ceiba, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *clusiae* Wood by characters summarized in the above key.

FEMALE.— Length 1.6–2.0 mm, 2.0 times as long as wide; color black.

Frons below upper level of eyes as in *obesum* except carina shorter, often absent, vestiture above more conspicuous; lateral area of vertex just above and behind eye with margin of facial sculpture strongly sinuate, very weakly impressed; impression continuing along pubescent margin of vertex to a slight sinuation on median line, dorsolateral margin of pronotum with a matching, less well developed sinuation.

Pronotum 0.77 times as long as wide; widest at base, weakly arcuate and feebly converging on basal third, then strongly, arcuately converging to moderate constriction just before broadly rounded anterior margin; surface finely, very closely, shallowly punctured, very finely, obscurely granulate behind, obscurely reticulate in most areas, minutely asperate in anterior areas; vestiture of fine, semirecumbent hair and rather coarse, erect hair.

Elytra 1.3 times as long as wide, 1.8 times as long as pronotum; outline as in *obesum*; striae impressed, punctures small, moderately deep; interstriae about twice as wide as striae, surface reticulate, armed by closely set, isolated granules, these confused on basal third, in three distinct ranks to declivity, two marginal ranks gradually reduced on declivity and obsolete before middle. Declivity convex, moderately steep; interstriae not wider than striae, more nearly convex, each with a median row of obscure granules. Vestiture of coarse, short setae, largely in three rows on each interstriae, median bristle a third longer

than lateral setae and about two-thirds as long as distance between rows of bristles.

MALE.— Similar to female except vertex and anterior margin of pronotum not modified by impression or sinuation.

DISTRIBUTION.— Honduras to Panama, Colombia, and Venezuela.

HONDURAS: La Ceiba, Atlantida, 20, 26, 29-V, 1, 10-VI, 26-VIII-49, at light, E. C. Becker. COSTA RICA: Santa Ana, San José, 30-VIII, 8-IX-63, 1300 m, Nos. 157, 254, *Rheedia edulis*, S. L. Wood; Playón, Puntarenas, 25 m, No. 453, *Symphonia globulifera*, S. L. Wood. PANAMA: Barro Colorado Island, Canal Zone, 70 m, No. 234, *Symphonia globulifera*, S. L. Wood. OTHER COUNTRIES: Colombia, Brazil, Venezuela.

HOSTS.— *Rheedia edulis* and *Symphonia globulifera*.

BIOLOGY.— The bole and branches down to about 3 cm in diameter are attacked. The egg galleries are primarily biramous and transverse, although diagonal or even partly longitudinal systems were not uncommon and several were triramous. The larval mines were rather short and wandered indiscriminately.

NOTES.— The holotype, allotype, six paratypes, and 216 other specimens were examined. Those from Costa Rica and Panama tended to have the impression on the female vertex more strongly developed, but the difference was slight.

### 4. *Phrixosoma clusiae* Wood

*Phrixosoma clusiae* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):1 (Holotype, female; Zamorano, Morazán, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *minor* Wood by the larger size, by the much more strongly impressed female vertex, and by other characters mentioned in the above key.

FEMALE.— Length 1.9–2.5 mm, 1.9 times as long as wide; color black.

Frons broadly convex with epistomal margin to upper level of eyes; rather strongly, transversely, arcuately impressed from just above upper level of eyes to vertex, upper margin of this groove abruptly angled; lateral angles of groove produced laterally, causing a pronounced sinuation in line where pubescent and nonpubescent areas meet; vestiture hairlike, short, rather abundant, extending to vertex.

Pronotum 0.80 times as long as wide; widest at base, sides uniformly, convergently arcuate to weak constriction just before rather narrowly rounded anterior margin; anterior third very minutely asperate, asperities on margin somewhat larger; surface rather closely marked by low, subtuberculate, short, irregular rugae (remnants of interspaces between obsolete punctures), depressed areas reticulate; vestiture consisting of very fine, short hair.

Elytra 1.2 times as long as wide; 1.7 times as long as pronotum; outline as in *obesum*; striae narrowly impressed, punctures small, distinct; interstriae almost three times as wide as striae, reticulate, granules rather large rounded, three-ranked almost to base except on 2, marginal rows of granules becoming smaller by middle of disc and obsolete by upper fourth of declivity. Declivity and vestiture as in *minor*.

MALE.— Similar to female except frontal carina absent, vertex and anterior margin of pronotum not modified, and asperities on anterior third of pronotum almost obsolete.

DISTRIBUTION.— Honduras.

HONDURAS: Zamorano, Morazán, 18-VI-64, 700 m, No. 561, *Clusia flava*, S. L. Wood.

HOST.— *Clusia flava*.

BIOLOGY.— Essentially as described above for *minor*.

NOTES.— The above treatment was modified from the original description and was based on the type series of 12 specimens.

## Tribe BOTHROSTERNINI

Bothrosterni Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):120 (Type-genus: *Bothrosternus* Eichhoff, 1868)

Anatomical features.— The frons is usually sexually dimorphic, the eye is entire, the antennal funicle is 6-segmented, the club symmetrical, moderately flattened, the sutures are indicated, the procoxae are moderately separated, the pronotum is unarmed, the protibia bears a bifid process on the outer apical angle that exceeds the inner apical angle, crenulations on the elytral bases are poorly developed, and the metatergum is fused to its postnotum and at least the median half of the suture is obliterated.

Biological features.— All species are thought to be monogamous; however, there are indications that some type of parthenogenesis occurs in *Bothrosternus*. Most species are pith borers in twigs and small branches, except *Pagiocerus* breeds in large seeds and *Bothrosternus* apparently is mycetophagous in pith tunnels. *Cnesinus annectens* Wood forms a connecting link between the biramous tunnels in the cambium and the pith feeding habits (see the biology of that species). The eggs are usually placed loosely or packed indiscriminantly in frass in part of the parental tunnel; the larvae usually feed communally as they extend the parental gallery.

Taxonomy.— This tribe is restricted to the American tropics, although two species extend their ranges into the southeastern United States. Their closest relatives appear to be the Diamerini of Africa and the Indo-Australian area. Although this tribe is unique in the American fauna, the genera within the tribe differ from one another only slightly and may be recognized with difficulty in some instances.

### Genus *CNESINUS* LeConte

*Cnesinus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:171 (Type-Species: *Cnesinus stigicollis* LeConte, monobasic)

*Nemophilus* Chapuis, 1869, Synopis des Scolytides, p. 27 (Type-species: *Nemophilus strigillatus* Chapuis = *Cnesinus strigicollis* LeConte, subsequent designation by Hopkins, 1914:125); LeConte, 1876, Proc. Amer. Philos. Soc. 15:378. *Synonymy*

Diagnosis.— Within the Bothrosternini this genus is distinguished by the rounded lateral margins of the pronotum and by the straight, transverse sutures of the antennal club.

Description.— Length 1.6–3.5 mm, 2.4–2.8 times as long as wide; male frons flattened to moderately excavated on lower half and usually ornamented, sometimes elaborately, by setae, female frons shallowly impressed to strongly convex, the sculpture often simple, but in many species variously armed by tubercles, carinae, and setae. Eye sinuate to shallowly emarginate on anterior margin, often oval and widely separated, at times very elongate and subcontiguous. Antennal funicle 6-segmented; club slender, symmetrical, about two to three times as long as wide, about equally divided by three straight, transverse sutures, suture 3 obsolete in some species. Pronotum varying from smooth, with fine punctures, to coarsely, longitudinally strigose; usually unarmed. Scutellum small, round. Crenulations on elytral bases small, close, abundant, obscurely defined laterally in most species, in most primitive species elytral bases transversely carinate with punctures positioned just behind points where crenulations should be located; striae varying from unimpressed with normal punctures to narrowly, deeply impressed with confluent or even obsolete punctures; interstriae usually weakly convex, subcarinate in two species. Declivity convex to shallowly impressed, unarmed except for small tubercles in a few species. Vestiture varying from almost total absence to very abundant; usually hairlike, rarely with scales.

DISTRIBUTION.— Southeastern United States and central Mexico to Argentina. Approximately 70 species are known; 38 are from Mexico and Central America, one species occurs in the United States.

BIOLOGY.— The adult female bores in small twigs, branches, or woody vines usually 0.5–2.0 cm in diameter, where she is joined by a male, then constructs a simple, unbranched, axial tunnel that may extend in either or both directions from the entrance tunnel. Eggs are scattered in the frass in the tunnel, usually near the ends. The larvae widen and extend the parental gallery and do not construct individual mines. The young adults normally emerge through the parental entrance hole. One species (*annectens* Wood) departs radically from the usual habits and provides an interesting and perhaps significant behavioral connection to other bark beetles. A mated female evidently can construct a second or perhaps even a third parental gallery without the aid of a male. In some local populations of certain species males are uncommon or entirely absent. The disproportionate number of females suggests partial parthenogenesis, although this has not been demonstrated.

## Key to the Species of *Cnesinus*
(Modified from Wood 1968)

1. Elytral vestiture largely confined to declivity (except *degener*), hairlike; pronotal punctures usually elongate but ordinarily not strongly strigose; female frons without a transverse carina, an epistomal elevation may occur in either sex; striae usually less strongly impressed, punctures larger and usually impressed individually (except *retifer*); interstrial punctures tending to be uniseriate (several exceptions) ..... 2

— Elytral vestiture abundant, normally extending to base, essentially scalelike, less commonly hairlike; pronotum longitudinally strigose (except *frontalis*); frons of one sex or both commonly with a carina or other prominent elevation; striae commonly abruptly, deeply impressed, punctures usually partly confluent or even obsolete; interstrial punctures usually more abundant, confused ..... 23

2(1). Frons devoid of an epistomal elevation in both sexes, male without conspicuous epistomal vestiture; entire frontal area dull, reticulate, lower area at most flattened, upper area rather strongly, broadly convex; small species, 1.6–2.2 mm .... 3

— Frons with a conspicuous epistomal callus or other elevation, male, sometimes also female, with at least one transverse row of stout setae on upper margin or upper slope of callus; frontal area usually partly or entirely shining, moderately to strongly impressed on at least part of lower half; size variable, 1.5–3.5 mm ..... 6

3(2). Interstriae on posterior half of disc and on declivity narrowly costate, discal surface dull, minutely rugose-reticulate over striae and interstriae; pronotal disc with long, fine, rather abundant hair; Costa Rica; 2.5 mm ..... 1. ***bicostatus*** **Schedl**

— Interstriae flat to moderately convex, except bicostate from base in *costulatus* and *porcatus* ..... 4

4(3). Surface of pronotum and elytra reticulate, dull; strial punctures confluent, almost entirely obsolete; declivital bristles stout, spaced within a row by distances equal to two-thirds length of a bristle, between rows by length of a bristle; Panama; 1.8–2.0 mm ..... 2. ***retifer*** **Wood**

— Surface of pronotum and elytra shining; strial punctures distinct; declivital bristles somewhat more slender, spaced within rows and between rows by length of a bristle ..... 5

5(4). Eyes separated by 2.2 times width of an eye; female frons between upper part of eyes transversely convex and ornamented by abundant, fine, moderately long, yellowish hair; convexity of male frons more pronounced and extensive, not more than lower third flattened; declivital striae 2 and 3 equally impressed; interstriae 2 devoid of granules, 3 sometimes with a few minute granules; Honduras to Colombia; 1.8–2.1 mm ..... 3. ***gracilis*** **Blandford**

— Eyes separated by 1.5 times width of an eye; female frons transversely flat, vestiture sparse, inconspicuous; lower half of male frons flattened; declivital striae 1 much more strongly impressed than 2, interstriae 2 and 3 each armed by a row of rounded granules; Guatemala to Panama; 1.5–1.8 mm ..... 4. ***pullus*** **Blandford**

6(2). Male epistomal callus unarmed by tubercles, female callus bearing on dorsal slope a tuft of uniformly short, stout, decorative bristles (except only one row in *electus* in which eyes separated by much less than width of an eye); smaller species, 1.6–2.9 mm ..... 7

— Female epistomal callus armed by a pair of pointed tubercles or by a large, unpaired elevation, male callus ornamented by not more than one uniseriate, transverse row of only slightly modified decorative bristles; eyes always separated by a distance at least as great as width of an eye; larger species, 2.5–3.9 mm ..... 13

7(6). Eyes separated above by less than 1.0 times width of an eye ..... 8

— Eyes separated by more than 2.0 times width of an eye ..... 10

8(7). Female epistomal callus poorly developed, its lower slope descending gradually, upper slope ornamented by only one transverse row of ornamental bristles; declivital interstriae 1 to 3 feebly if at all convex; declivital interstrial vestiture consisting of rows of erect bristles and moderately sparse, fine, supplemental hair; Costa Rica; 2.3–2.6 mm ..... 5. ***electus*** **Wood**

— Epistomal callus of male abruptly precipitous below, its upper slope ornamented by numerous bristles not confined to a single row; declivital interstriae rather narrowly convex; declivital vestiture consisting entirely of rows of erect, interstrial bristles; smaller species ..... 9

9(8). Ornamental bristles on female epistomal callus longer, about equal in length, thickness, and color to those on other frontal areas above; punctures on anterolateral area of pronotum elongate, rarely confluent; punctures of pronotum and elytra very slightly larger; Costa Rica to Panama; 1.6–1.9 mm ..... 6. ***intermedius*** **Schedl**

— Ornamental bristles on female epistomal callus reddish in color, about half as long as more slender yellowish setae on other frontal areas; punctures on anterolateral area of pronotum elongate and many confluent, appearing more nearly substrigose; punctures of pronotum and elytra very slightly smaller, Veracruz to Colombia; 1.7–1.9 mm ..... 7. ***blackmani*** **Schedl**

10(7). Body stout, less than 2.1 times as long as wide; Puebla to Panama; 2.3–3.0 mm ..... 8. ***punctatus*** **Blandford**

— Body more slender, at least 2.4 times as long as wide; smaller species, 2.0–2.5 mm ..... 11

11(10). Pronotum rather deeply, coarsely punctured, punctures mostly very elongate (about three or more times as long as wide), substrigose; interstriae more narrowly convex, only slightly wider than striae; Panama; 2.0–2.5 mm ..... 9. ***niger*** **Wood**

— Pronotum with rather fine, shallow punctures, punctures oval, rarely as much as twice as long as wide (one specimen very shallowly, minutely substrigose); interstriae less strongly convex, almost twice as wide as striae ..... 12

12(11). Lower margin of female epistomal callus sharply, rather precipitously defined along an almost straight, transverse line; body 2.6 times as long as wide, pronotum with minute points between punctures (at 40X magnification); striae less strongly impressed; Jalisco; 2.1–2.5 mm ..... 10. ***electinus*** **Wood**

— Lower margin of female epistomal callus not sharply defined, with a fine median tubercle (absent in a few specimens) on lower margin; body 2.4 times as long as wide; pronotum with minute points scarcely visible at 80X; striae more strongly impressed; Puebla; 2.0–2.4 mm ..... 11. ***myelitis*** **Wood**

13(6). Female epistomal callus armed by a pair of pointed tubercles; declivital interstriae feebly if at all convex, armed by rows of fine setiferous granules ..... 14

— Female epistomal area armed by an unpaired median elevation; declivital interstriae narrowly convex, not high, entirely unarmed ..... 20

14(13). Frons concavely impressed to slightly above upper level of eyes, female epistomal tubercles very large; pronotal punctures obsolete, surface strongly, longitudinally strigose; discal interstriae each armed by median row of rounded granules; Michoacán to Morelia; 3.3–3.8 mm ..... 12. ***bicornus*** **Wood**

— Frontal impression ending well below upper level of eyes, female epistomal tubercles much smaller; pronotum substrigose, elongate punctures distinct; discal interstriae unarmed by granules (except *degener*); smaller species ..... 15

15(14). Elytral vestiture extending to disc, ground vestiture rather abundant, stout; discal interstriae with fine granules; body stout, 2.4–2.5 (*brighti* 2.7) times as long as wide ..... 16

— Elytral vestiture usually absent on disc, ground vestiture (when present) fine, hairlike; body more slender, more than 2.7 (*coracinus* 2.5) times as long as wide; female frons usually more strongly convex between eyes; mostly larger, 2.1–3.4 mm ..... 18

16(15). Discal interstriae almost flat, without evident granules; body slender, 2.7 times as long as wide; discal strial punctures small, separately impressed; elytral vestiture abundant, rather coarse, length of each seta about equal to width of interstriae; Chiapas; 2.2–2.6 mm ..... 15. ***brighti*** **Wood**

— Discal interstriae each with a row of fine granules; body slightly stouter ..... 17

17(16). Smaller; interstrial bristles about as long as width of one interstriae; declivity with strial punctures rather coarse and interstriae 2 and 3 with distinct granules; Oaxaca to Veracruz; 2.0–2.3 mm ..... 13. ***degener*** **Wood**

— Larger; interstrial bristles at least twice as long as width of one interstriae; declivity with strial punctures rather fine, interstriae 1–3 without evident granules; Guatemala; 2.8 mm ..... 14. ***paleatus*** **Blandford**

18(15). Pronotum almost smooth, punctures oval to elongate, rarely confluent; frontal pubescence long, evidently more abundant; Puebla and Veracruz to Panama and Venezuela; 2.4–2.8 mm (see also 17. ***theocallus***) ..... 16. ***elegans*** **Blandford**

— Pronotum moderately strigose, most punctures longitudinally confluent; frontal pubescence much shorter, less abundant, rather inconspicuous ..... 19

19(18). Larger, more slender; declivital setae more slender, at least twice as long as distance between rows; declivital interstrial granules almost obsolete; Chiapas to Guatemala; 3.0–3.4 mm ..... 18. ***elegantis*** **Wood**

— Smaller, stouter; declivital bristles rather stout, in definite rows, each as long as distance between rows; declivital interstrial granules conspicuous on all interstriae; Chiapas; 2.1–2.3 mm ..... 19. ***coracinus*** **Wood**

20(13). Epistoma armed by a rather small, median tubercle; pronotal punctures oval, not extended by longitudinal strigose lines; punctures obsolete on declivital striae 1–3; Morelos(?); 2.3 mm ..... 20. ***garrulus*** **Schedl**

— Median epistomal elevation large, flattened on its summit, its sides precipitous; pronotal punctures elongate, usually extended by longitudinally strigose lines; strial punctures evident on declivity ..... 21

21(20). Epistoma armed by a large, median, pentagonal elevation, its sides precipitous, flattened on its summit, its two dorsal sides pubescent; declivital interstriae 2 convex, its punctures displaced to its mesal base, its convexity impunctate; Costa Rica; 2.8–3.5 mm ..... 23. ***gibbosus*** **Wood**

— Epistoma armed by a large, median, subtriangular elevation, its sides precipitous, its summit flattened, its lower margin arcuate, its upper margins straight and pubescent; declivital interstriae 2 convex and punctured along its summit ..... 22

22(21). Larger; pronotal punctures oval, feebly if at all strigose, almost never confluent; eyes more narrowly spaced; central area of frons smooth, brightly shining; "Mexico"; 3.0 mm ..... 21. ***quaesitus*** **Schedl**

— Smaller; pronotal punctures much more strongly strigose, about a third of them longitudinally confluent; eyes more widely spaced; central area of frons minutely, transversely strigose; Costa Rica; 2.4–2.8 mm ..... 22. ***gibbulus*** **Wood**

23(1). Female frons not armed by a transverse carina; male frons rather broadly impressed at least on lower half, extending in some species to above upper level of eyes; male epistoma variable, ornamental bristles usually more extensive (entirely absent in *annectens*) ..... 24

— Female frons armed by a transverse carina well above epistomal area and below upper level of eyes; males of several species lack a frontal impression, impression never extending more than half distance from epistomal margin to upper level of eyes; male epistoma ornamented by only one uniseriate, transverse row of bristles (a double row in one species) ..... 27

24(23). Female frons flattened to well above upper level of eyes, lower two-thirds of median three-fourths occupied by a subcircular, very minutely, densely pilose area; male frons broadly, subconcavely impressed on lower two-thirds of area below upper level of eyes; vestiture on pronotum and on elytral disc fine, hairlike; Guatemala to Panama; 2.7–3.3 mm ..... 24. ***lecontei*** **Blandford**

— Female frons strongly impressed below, impression ending below upper level of eyes; epistomal callus developed, specialized bristles much less extensive, either entirely absent or much longer; epistomal callus evident in male and usually ornamented by a transverse row of setae on its upper margin; setae on elytral disc at least partly stout, almost scalelike; smaller ..... 25

25(24). Anterolateral angles of pronotum armed by a row of small, basally contiguous asperities; ground vestiture on elytral disc hairlike, median row of stout bristles on each interstriae at least as long as distance between rows and spaced within rows by similar distances; Costa Rica; 2.0–2.3 mm ..... 25. ***perplexus*** **Wood**

— Anterolateral angles of pronotum unarmed; elytral ground vestiture on disc stout, more than half as long as erect bristles, bristles more closely spaced within row, not more than two-thirds as long as distance between rows ..... 26

26(25). Female frontal impression extending two-thirds of distance to upper level of eyes, convex above; epistomal callus narrowly carinate, occupying median two-thirds, its upper slope and lower third (or more) of impressed area bearing long, reddish, ornamental bristles; female epistomal callus evident, one transverse row of simple setae present; pronotum more coarsely strigose; strial punctures largely confluent; declivital striae rather strongly impressed; Veracruz; 2.2–2.5 mm ..... 26. ***atavus*** **Wood**

— Female frontal impression extending to about upper level of eyes; epistomal callus reduced, not occupying more than median half in either sex, not ornamented by setae, except for long, fine hair on lateral and upper margins in impression of male; pronotum obscurely strigose, rather closely granulose; strial punctures mostly distinct; declivital striae only moderately impressed; Honduras; 1.9–2.5 mm ..... 27. ***annectens*** **Wood**

27(23). Elytral striae on disc very strongly impressed, sutural interstriae carinate, others essentially bicarinate, with median area subsulcate and uniseriately punctured between elevated margins, vestiture hairlike; female carina almost straight, extending from eye to eye at level of ocular emargination ..... 28

— Discal interstriae flat or convex, never carinate, punctures confused, vestiture usually abundant, somewhat scalelike; female carina crescent-shaped, its arms extending slightly dorsolaterad, usually shorter and usually located somewhat lower on frons ..... 29

28(27). Smaller, 2.0–2.3 mm; female frons above carina shining, usually with a few minute impressed points; ground vestiture on elytral declivity less abundant, major setae usually finer and longer; pronotal rugae usually slightly coarser; Costa Rica to Panama and Colombia ..... 28. ***costulatus*** **Blandford**

— Larger, 2.8–3.1 mm; female frons above carina reticulate, dull; declivital ground vestiture more abundant, major setae usually coarser and shorter; pronotal rugae usually finer; Guatemala to Venezuela ..... 29. ***porcatus*** **Blandford**

29(27). Elytral apices extended posteriorly and broadly emarginate at suture; declivital interstriae 1, 5, and 9 elevated; discal ground vestiture on elytra consisting of broad scales, each scale almost as wide as long; Costa Rica to Panama and Venezuela; 1.7–2.1 mm ..... 30. ***squamosus*** **Wood**

— Elytra rather broadly rounded behind, discal vestiture on elytra more slender, each seta at least four times as long as wide; declivital interstriae not conspicuously elevated ..... 30

30(29). Female transverse frontal carina occupying more than two-thirds width of frontal area (at level of antennal bases), its lower margin (in median area) at level of antennal insertion; punctures of pronotum rather large, not oriented in longitudinal rows, rarely confluent; elytral vestiture consisting of rows of long slender bristles to base, very short, sparse, ground vestiture confined to declivity; Costa Rica; 2.0–2.3 mm ..... 31. ***frontalis*** **Wood**

— Female carina much shorter, usually located well above level of antennal bases; punctures of pronotum mostly oriented in longitudinal rows of four or more or entirely obliterated by longitudinal confluence; ground vestiture on elytra more widely distributed and usually proportionately longer ..... 31

31(30). Eyes more widely separated, separated by at least 1.8 times width of an eye ..... 32

— Eyes more narrowly separated, separated by less than 1.6 times width of an eye (if doubtful female frontal carina short) ..... 37

32(31). Female transverse frontal carina narrow, width of frons at level of antennal insertion more than 4.0 times transverse length of carina ..... 33

— Female carina broad, width of frons at level of antennal insertion less than 2.9 times transverse length of carina ..... 35

33(32). Female frons rather strongly, transversely impressed immediately above carina, rather strongly convex at and above upper level of eyes; female carina very strongly elevated, almost as high as transverse length of its apex; most of setae in declivital ground vestiture amost as wide as long, longer, erect setae almost twice as long as ground vestiture; Costa Rica and Panama to Venezuela; 1.8–1.9 mm ..... 32. ***denotatus*** **Wood**

— Female frons more nearly flattened, carina much less strongly elevated; setae in declivital ground vestiture slender, usually four or more times as long as wide and two-thirds or more times as long as major setae ..... 34

34(33). Female frons weakly convex above carina; female carina conspicuously elevated; eyes separated by 1.8 times width of an eye; declivital striae feebly impressed; Veracruz; 2.5–3.3 mm (see also 34. ***prominulus*** **Wood,** Jalisco) ..... ..... 33. ***minax*** **Schedl**

— Female frons flattened from just below carina to above upper level of eyes; female frontal carina low, feebly elevated; eyes separated by 2.2 times width of an eye; declivital striae rather strongly impressed; Honduras; 2.0–2.3 mm ..... ..... 35. ***adustus*** **Schedl**

35(32). Discal vestiture on elytra fine, major erect setae usually pointed, not expanded distally; female frontal carina shorter, distance between eyes 2.4 times length of carina; interstrial granules on declivity absent; Michoacán; 2.5–3.1 mm ..... ..... 38. ***carinatus*** **Wood**

— Discal vestiture on elytra rather coarse, major, erect setae blunt, each seta wider distally; female frontal carina longer, distance between eyes only 1.8 times length of carina; interstrial granules on declivity moderately large ..... 36

36(35). Larger, stouter; erect interstrial bristles much less abundant, each conspicuously shorter than distance between bristles within a row; female frons below carina less strongly impressed, impunctate area above carina larger; Sinaloa; 3.1 mm ..... 36. ***pilatus*** **Wood**

— Smaller, more slender; erect interstrial bristles more abundant, longer, conspicuously longer than distance between bristles within a row; female frons more strongly impressed below carina, impunctate area above carina smaller; Michigan and New York to Texas and Florida, Chiapas; 2.2–2.7 mm ..... ..... 37. ***strigicollis*** **LeConte**

37(31). Striae on elytral declivity more strongly impressed, interstriae rather narrowly convex (except lower half of 2 in some specimens) and each armed by a row of small rounded granules; distance between eyes exceedingly variable, 0.6–1.6 times width of an eye, but commonly constant within a series, possibly a polytypic species; Colima and Tamaulipas to Panama; 1.8–2.6 mm ..... ..... 39. ***setulosus*** **Blandford**

— Declivital striae feebly if at all impressed, interstriae not elevated or armed by granules (occasional males with feeble granules on upper half); eyes separated by 1.0 or more times width of an eye; larger species ..... 38

38(37). Frontal carina in female short, low, distance between eyes more than five times greater than length of carina; discal interstriae devoid of granules; longest bristles on elytral declivity usually much less than twice as long as ground vestiture; Costa Rica; 3.0–3.5 mm ..... 40. ***minitropis*** **Wood**

— Frontal carina in female longer, distance between eyes less than 3.5 times as long as carina; discal interstriae armed by sparse rows of very fine, rounded granules; longest declivital bristles usually much more than twice as long as ground scales; Honduras to Colombia; 2.6–3.3 mm ..... 41. ***adusticus*** **Wood**

### 1. *Cnesinus bicostatus* Schedl

*Cnesinus bicostatus* Schedl, 1936, Arch. Inst. Biol. Veg. Río de Janeiro 3:106 (Holotype, male; Turrialba, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species would be placed in *Sternobothrus* except that the lateral margins of the pronotum are not acutely costate. The costate elytral interstriae resemble those of *S. sculpturatus* (Blandford), not *Cnesinus porcatus* Blandford or *costulatus* Blandford. It is distinguished from all other Central American *Cnesinus* by the median interstrial costae that begin on the disc one-fourth of the elytral length from the base and continue to near the apex of the declivity, their greatest height being on the declivity.

MALE.— Length 2.5 mm, 2.2 times as long as wide; color almost black.

Frons broadly convex, a rather abrupt, transverse impression just above level of antennal insertion; surface rugose-reticulate except rather obscurely reticulate on median third on upper half; vestiture restricted to sides and lower third, of short, moderately stout hair; vestiture similar to male *Sternobothrus bicaudatus* (Blandford)

Pronotum 0.85 times as long as wide; widest just behind middle, sides on basal half weakly arcuate, diverging slightly, more strongly arcuate on anterior half, very broadly rounded in front; surface strongly, closely, longitudinally aciculate, ridges very narrow, acutely rounded, shining, half as wide as grooves, grooves apparently subreticulate, mostly longitudinally confluent. Vestiture of very fine, long hair, rather abundant and unusually long in discal area.

Elytra 1.5 times as long as wide, 2.0 times as long as pronotum; sides feebly arcuate on basal two-thirds, rather narrowly rounded behind; striae shallowly impressed as continuous grooves, punctures not clearly evident; interstriae almost flat on basal fourth of disc, gradually becoming narrowly costate toward declivity; discal surface dull, minutely rugose-reticulate over striae and interstriae, except costae smooth, shining. Declivity moderately steep, convex, very slightly inflated near apex; strial grooves deeper and slightly wider than on disc, punctures clearly impressed; interstriae as wide as striae and narrowly costate on upper two-thirds, about as high as wide, becoming subserrate below, 1–3 continuing to near apex. Vestiture largely confined to declivital interstriae, short, fine and longer coarser hair arising from margins of costae.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Turrialba, 800 m, SLG, Schedl.

NOTES.— The above treatment was based on the holotype.

### 2. *Cnesinus retifer* Wood

Fig. 85

*Cnesinus retifer* Wood, 1967, Great Basin Nat. 27:85 (Holotype, male; Ft. Clayton, Canal Zone, Panama; Wood Coll.).

DIAGNOSIS.— This species is distinguished from *gracilis* Blandford by the very strongly convex frons, by the completely reticulate pronotum and elytra, and by the confluent punctures of the declivital striae.

MALE.— Length 1.9–2.0 mm, 2.9 times as long as wide; color very dark brown.

Frons strongly convex almost to epistoma; surface coarsely reticulate, with minute, rather sparse granules; vestiture short, sparse, inconspicuous.

Pronotum 1.1 times as long as wide; sides straight, diverging slightly from base to widest point two-fifths length from anterior margin, broadly rounded in front; a conspicuous, smooth, shining callus extending from anterolateral angles more than half distance toward median line just behind anterior margin; remainder of surface reticulate, dull, with rather large, shallow, oval punctures in posterior area, and small, deep, elongate punctures anteriorly; anterior punctures often confluent, posterior punctures usually separate; glabrous.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; sides straight and subparallel to base of declivity, rather narrowly

rounded behind; bases marginally and submarginally rugose, feebly elevated, crenulations obscure if not entirely absent; striae moderately impressed, punctures confluent; interstriae about one and one-half times as wide as striae, except 1 narrower, punctures very fine, deep, uniseriate except at base of 3. Declivity convex, rather steep; interstriae narrower than striae, convex, 1 very slightly more strongly elevated. Vestiture confined to declivity, consisting of interstrial rows of flattened bristles; each bristle as long as distance between rows of bristles.

DISTRIBUTION.— Panama.

PANAMA: Ft. Clayton, Canal Zone, 22-XII-63, 30 mm, S. L. Wood.

HOST.— A woody vine, possibly *Serjania* sp.

BIOLOGY.— Collected from new, incomplete, axial tunnels in a recently cut vine about 5 mm in diameter.

NOTES.— The above treatment was based on the six males in the type series.

### 3. *Cnesinus gracilis* Blandford
Fig. 85

*Cnesinus gracilis* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):141 (Holotype, female; Volcan de Chiriqui, Chiriqui, Panama; British Mus. Nat. Hist.)

*Cnesinus substrigatus* Blackman, 1943, Proc. U.S. Nat. Mus. 94:376 (Holotype, female; Santander, Colombia; U.S. Nat. Mus., 56554); Wood, 1971, Great Basin Nat. 31:144. *Synonymy*

DIAGNOSIS.— This species is distinguished from the allied *pullus* as indicated in the above key. It is much more closely related to *nitidus* Eggers (from Bolivia and Peru), from which males differ by the less strongly convex frons, by the almost total confluence of punctures on discal striae 1, by the less strongly, more narrowly impressed elytral declivity, by the more narrowly convex declivital interstriae 3; and by the slightly smaller size (2.4–2.6 mm in *nitidus*; only males examined).

FEMALE.— Length 1.8–2.1 mm, 2.7 times as long as wide; color black.

Frons transversely impressed on lower third, rather strongly, broadly convex on upper third of area below upper level of eyes; epistomal margin shining, slightly elevated, remaining surface reticulate-granulate with a few larger granules on upper third; surface from epistoma to just below upper level of eyes bearing rather abundant, reddish, subplumose hair of uniform length, its length about equal to half width of eye, these setae most conspicuous in central area.

Pronotum 1.1 times as long as wide; sides straight and subparallel on basal two-thirds, rather broadly rounded in front; surface obscurely reticulate-granulate on posterior third becoming coarsely rugose-reticulate by anterior fourth, punctures isolated, longitudinally elongate, about twice as wide on basal fourth as on anterior fourth, sepated by half width of a puncture on posterior area, by more than width of a puncture on anterior third. Glabrous.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel to declivital base, somewhat narrowly rounded behind; declivity confined to posterior fourth; basal crenulations small, poorly defined; striae 1 moderately, others rather weakly impressed, punctures on 1 almost totally confluent, their positions obscurely indicated, small but rather clearly indicated on other striae; interstriae about twice as wide as striae, almost smooth, punctures slightly more than half as large as those of striae, essentially uniseriate except more staggered on 2. Declivity rather steep, convex, except almost flat on lower two-thirds between third interstriae; strial punctures deeper than on disc; interstriae 1, 3, and lateral half of 2 convex, weakly elevated, 2 and 3 armed by rather widely spaced, rounded granules, 1 with minute granules indicated on upper half. Vestiture confined to declivity, consisting of rows of erect, flattened bristles, spaced in rows and between rows by about two-thrids length of a bristle.

MALE.— Similar to female except frontal convexity a little more extensive, frontal vestiture almost entirely absent; granules on declivital interstriae 1 and 2 almost entirely obsolete, reduced on 3.

DISTRIBUTION.— Honduras to Colombia.

HONDURAS: La Ceiba, Atlantida, 28-VI-49, at light, E. C. Becker. COSTA RICA: Finca Gromaco, Puntarenas, 14-VII-63, 500 m, No. 64 woody vine, No. 76 from broken twig, S. L. Wood; San Ignacio de Acosta, San José, 5-VII-63, 1500 m, No. 28 broken twig of cultivated tree, S. L. Wood. PANAMA: Ft. Clayton, Canal Zone, 22-XII-63, 30 m, No. 319, from *Serjania*, No. 329, from a cut vine. COLOMBIA: Santander, 700–1300 m, *Coffea arabica*, R. P. Roba.

HOSTS.— *Coffea arabica*, *Serjania* sp., etc.

BIOLOGY.— Specimens were taken from tunnels in the pith of stems smaller than 1 cm in diameter. The larvae are pith feeders.

NOTES.— The holotypes of *gracilis* and *substrigatus* and 38 other specimens were examined. The above description was based on my female homotypes of *gracilis* and of *substriatus*. The female from Honduras has the frontal impression very slightly deeper and more extensive than those from Costa Rica to Colombia.

### 4. *Cnesinus pullus* Blandford
Fig. 85

*Cnesinus pullus* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):141 (Lectotype, female; Cerro Zunil, Guatemala: British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is allied to *gracilis* Blandford as indicated in the above key. It also has the anterior margins of the elytra acutely costiform, not crenulate in the usual fashion.

FEMALE.— Length 1.5–1.8 mm, 2.5 times as long as wide; color black, declivity and occasionally elytra a lighter brown.

Frons flattened and transversely impressed on lower half of area below upper level of eyes, very weakly, longitudinally convex and transversely flat on upper half; surface reticulate and very minutely, sparsely punctured; vestiture short, sparse, inconspicuous.

Pronotum 1.06 times as long as wide; sides very feebly constricted on posterior third, surface less strongly reticulate, more nearly shining, otherwise as in *gracilis*.

Elytra 1.6 times as long as wide, 1.8 times as long as pronotum; dorsal profile as in *gracilis*; elytral bases elevated and acutely costiform, not crenulate; striae moderately impressed, punctures rather large, deep; interstriae slightly less than twice as wide as striae, somewhat irregular, shining, punctures uniseriate. Declivity rather steep, convex; striae 1 strongly, 2 weakly impressed; interstriae feely convex, 1 very slightly elevated, 2 and 3 each armed by a row of rounded granules. Vestiture mostly confined to declivity, but some on disc; consisting of erect interstrial bristles, not flattened, spaced about as in *gracilis*, with sparse, short, hairlike ground vestiture.

MALE.— Similar to female except frontal impression less pronounced on lower half, more nearly convex above; discal interstriae 1, 3, and possibly 5 each with a few obscure granules, closer on 1; declivital granules and bristles a little coarser.

DISTRIBUTION.— Guatemala to Panama.

GUATEMALA: Cerro Zunil, G. C. Champion. PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, Nos. 379, 380, twigs of two tree species, S. L. Wood.

HOSTS.— Unidentified trees with large, simple leaves.

BIOLOGY.— As in *gracilis*.

NOTES.— The above treatment is based on my series of 11 specimens from Panama. Blandford's series of 4 females differ in having the frons weakly convex between the eyes; the convexity continues as a distinct callus on the median third to the epistomal margin, the lateral areas are impressed and obscurely punctured, and the surface is not reticulate. In addition, the pronotum of Blandford's series is more finely punctured. The differences suggest different taxonomic entities; however, they involve features that might be expected to vary from series to series. Until more material is available for study, only one species should be recognized.

The first of Blandford's four female syntypes, from Cerro Zunil, Guatemala, has been regarded as the type and is here designated as the lectotype of *Cnesinus pullus* Blandford as indicated above.

### 5. *Cnesinus electus* Wood
Fig. 85

*Cnesinus electus* Wood, 1975, Great Basin Nat. 35:23 (Holotype, male; Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *intermedius* Schedl by characters mentioned in the above key.

FEMALE.— Length 2.3–2.6 mm, 2.8 times as long as wide; color dark brown, elytra usually reddish brown.

Frons strongly, transversely impressed at level of antennal insertion, convex above, somewhat flattened below this point, epistomal process poorly developed and devoid of granules or tubercles; eyes separated above by half greatest width of an eye; surface of frons rugulose, rather coarsely punctured along lateral margins and on epistoma; vestiture limited to lateral and epistomal areas.

Pronotum 1.1 times as long as wide; dorsal profile as in *pullus*; surface dull, subshining, more distinctly shining toward base, punctures almost round at base, becoming increasingly elongate anteriorly, occasionally confluent in anterior area. Glabrous.

Elytra 1.7 times as long as wide, 1.8 times as long as pronotum; outline as in *gracilis*; basal margins raised, feebly crenulate; striae 1 rather strongly, others moderately, not abruptly impressed, punctures small, not confluent except on 1, distinctly, rather strongly impressed; interstriae shining, punctures irregular in size, almost uniseriate. Declivity convex, except moderately impressed between third interstriae; striae feebly impressed, punctures rather small but impressed; interstriae 1 abruptly elevated to apex, about half as high as wide; others almost flat; all interstriae armed by uniseriate rows of moderately large, rounded, setiferous granules, each granule about as high as wide. Vestiture confined to declivity except on interstriae 1, consisting of rows of rather coarse, moderately long, interstrial bristles, and short, fine, strial hair.

MALE.— Similar to female except epistomal callus more prominent.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Cartago, Cartago, 29-VII-63, 500 m, woody vine, and 2-VIII-63, 1500 m, melastomaceous tree twig; Peralta, Cartago, 10-III-64, 500 m, tree seedling; all were taken by me.

HOSTS.— Not identified; two tree spp., and one woody vine.

BIOLOGY.— All specimens were taken in stems less than 1 cm in diameter from axial tunnels in the pith.

NOTES.— The above treatment was based on the type series of 27 specimens.

### 6. *Cnesinus intermedius* Schedl

Fig. 85

*Cnesinus intermedius* Schedl, 1936, Arch. Inst. Biol. Veget. Río de Janeiro 3:105 (Holotype, male; Turrialba, Cartago, Costa Rica; Schedl Coll.).

DIAGNOSIS.— This species is distinguished from *blackmani* Schedl by characters mentioned in the above key; in addition, the elytral vestiture is shorter and less abundant, and the elytral and pronotal punctures are slightly smaller.

FEMALE.— Length 1.6–1.9 mm, 2.5 times as long as wide; color of pronotum black, remaining areas dark reddish brown.

Frons convex on upper half of area below upper level of eyes, rather strongly, transversely impressed between levels of antennal insertion and ocular emargination, somewhat flattened below; epistomal callus subcarinate, about equal in length to distance between eyes, its summit partly interrupted at median line, its sculpture and vestiture not conspicuously modified on its upper slope; surface reticulate, punctures minute, shallow, obscure; eyes narrowly separated above by a distance equal to 0.8 (variable, 0.7–1.5 times; see below) times greatest width of an eye; vestiture sparse, short, rather uniformly distributed except glabrous on median area of upper half.

Pronotum 1.04 times as long as wide; outline as in *retifer*; surface smooth, shining, punctures deep, rather coarse, broadly oval on basal third, slightly smaller and more elongate anteriorly, separated by distances slightly less than width of a puncture. Glabrous.

Elytra 1.5 times as long as wide, 1.7 times as long as pronotum; sides almost straight, very slightly wider at base of declivity, rather narrowly rounded behind, declivity occupying posterior third; crenulations on elytral bases distinct, not separate, a slight suggestion of overlapping, each with a rather large puncture on its posterior slope; striae moderately impressed, punctures rather large and deep, largely confluent on 1; interstriae weakly convex, as wide as striae, shining but somewhat irregular, the punctures almost uniseriate, near base about half as large as those of striae, smaller posteriorly. Declivity moderately steep, laterally convex, very shallowly sulcate between third interstriae; striae narrower than on disc, punctures rather deep; interstriae rather narrowly convex, 1, 2, and 3 about equally elevated (half as high as wide), but 3 higher due to broad declivital impression; each interstriae bearing small, setiferous punctures, those on 2 and 3 very feebly elevated on anterior margins. Vestiture consisting of rows of interstrial bristles, smaller and usually abraded on 1, and a few minute, strial hairs; bristles separated in rows

and between rows by slightly more than half length of a bristle.

MALE.— Similar to female except frons much more brightly shining; epistomal callus higher and more extensive, occupying 85 percent of width of frons at level of antennal insertion, subtriangular, lower margins almost straight and upper margins abruptly oblique, slope more gradual above, ornamented on upper slope by dense, dark, reddish brown, ornamental setae of uniformly short length; rudimentary interstrial granules on elytral declivity very slightly larger.

DISTRIBUTION. Costa Rica to Panama.

COSTA RICA: Volcán, Puntarenas, 11-XII-63, 1000 m, twigs of a broken branch; Pandora, Limón, 23-VIII-63, 50 m, No. 149, twigs of a broken branch; all taken by me. PANAMA: Barro Colorado Island, 24-VII-63.

HOST.— Presumably *Nectandra* sp.

BIOLOGY.— The specimens were associated with *Sternobothrus sculpturatus* (Blandford) on two of the three times they were collected. Evidently both species are host specific to a common tree presumed to be *Nectandra* sp. This species constructed pith tunnels in the central axis of small branches and twigs.

NOTES.— The above treatment was based on 30 specimens, including a male and female examined by Schedl and compared by both Schedl and myself to the type.

In specimens from Limón Province, on the Atlantic slope, the eyes were more widely separated (1.1–1.5 times width of an eye) than those from Puntarenas Province, on the Pacific Slope (0.7–0.9 times). The difference appears too slight and too inconsistent to recognize subspecies based on the material at hand.

### 7. *Cnesinus blackmani* Schedl

Figs. 84, 85

*Cnesinus nitidus* Blackman, 1943 (nec. Eggers, 1943), Proc. U.S. Nat. Mus. 94:377 (Tampico, Veracruz, Mexico; U.S. Nat. Mus.). *Preoccupied.*

*Cnesinus blackmani* Schedl, 1949, Rev. Brasil. Biol. 9:268 (*Replacement name*)

*Cnesinus mexicanus* Nunberg, 1956, Ann. Zool., Warsaw 16:207 (*Replacement name*)

DIAGNOSIS.— This species is allied to *intermedius* Schedl, but it may be distinguished by characters summarized in the above key and by the additional characters mentioned in the diagnosis of *intermedius*.

FEMALE.— Length 1.7–1.9 mm, 2.6 times as long as wide; color of pronotum dark brown to black, elytra and other areas a lighter brown to reddish brown.

Frons as in *intermedius* with epistomal callus not as high, but more uniformly elevated, surface more nearly rugulose; eyes separated by 0.6 times greatest width of an eye (more widely spaced on type).

Pronotum 1.05 times as long as wide; sides straight on basal three-fifths and diverging slightly to widest point two-fifths of length from rather broadly rounded anterior margin; surface shining, smooth, with rather large, deep punctures, punctures broadly oval toward base, more narrowly elongate anteriorly, separated by distances as great or greater than width of a puncture. Glabrous.

Elytra 2.0 times as long as wide, 2.2 times as long as pronotum; basal margins continuously carinate, crenulations not indicated except possibly in lateral area; striae narrowly impressed, punctures subconfluent; interstriae shining, slightly irregular, almost twice as wide as striae, punctures fine, almost uniseriate. Declivity rather steep, convex with a slight impression between third interstriae; striae 1 strongly, others moderately impressed, punctures smaller and deeper than on disc; interstriae convex, less than half as high as wide, small, setiferous punctures not granulate. Vestiture as in *intermedius*, declivital bristles twice as long as distance between bristles in rows and between rows.

MALE.— Similar to female except frons more nearly shining, epistomal callus higher and longer (not as high or as wide as in *intermedius*), vestiture evidently more abundant; ornamental setae on epistomal callus much longer and less highly modified than in *intermedius*; bristles on elytral declivity evidently longer.

DISTRIBUTION.— Veracruz to Columbia.

MEXICO: Veracruz: Tampico, E. A. Schwarz. GUATEMALA: Livingston, Izabal, H. S. Barber and E. A. Schwarz; Trece Aguas, Alta Verapaz, H. S. Barber and E. A. Schwarz. PANAMA: Porto Belo, Colón, A. Busck. Colombia: La Rivera, Caicedonia, Valles, 18-VI-59, guamo verde, J. Restrepo.

NOTES.— The above description was based on the male homotype from Colombia and seven other specimens taken in series with it.

### 8. *Cnesinus punctatus* Blandford

Fig. 85

*Cnesinus punctatus* Blandford, 1896, Biol. Centr.-Amer., Coleopt, 4(6):136 (Holotype, female; Volcán de Chiriquí, Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This distinctive species is somewhat allied to *niger*, but the stout body

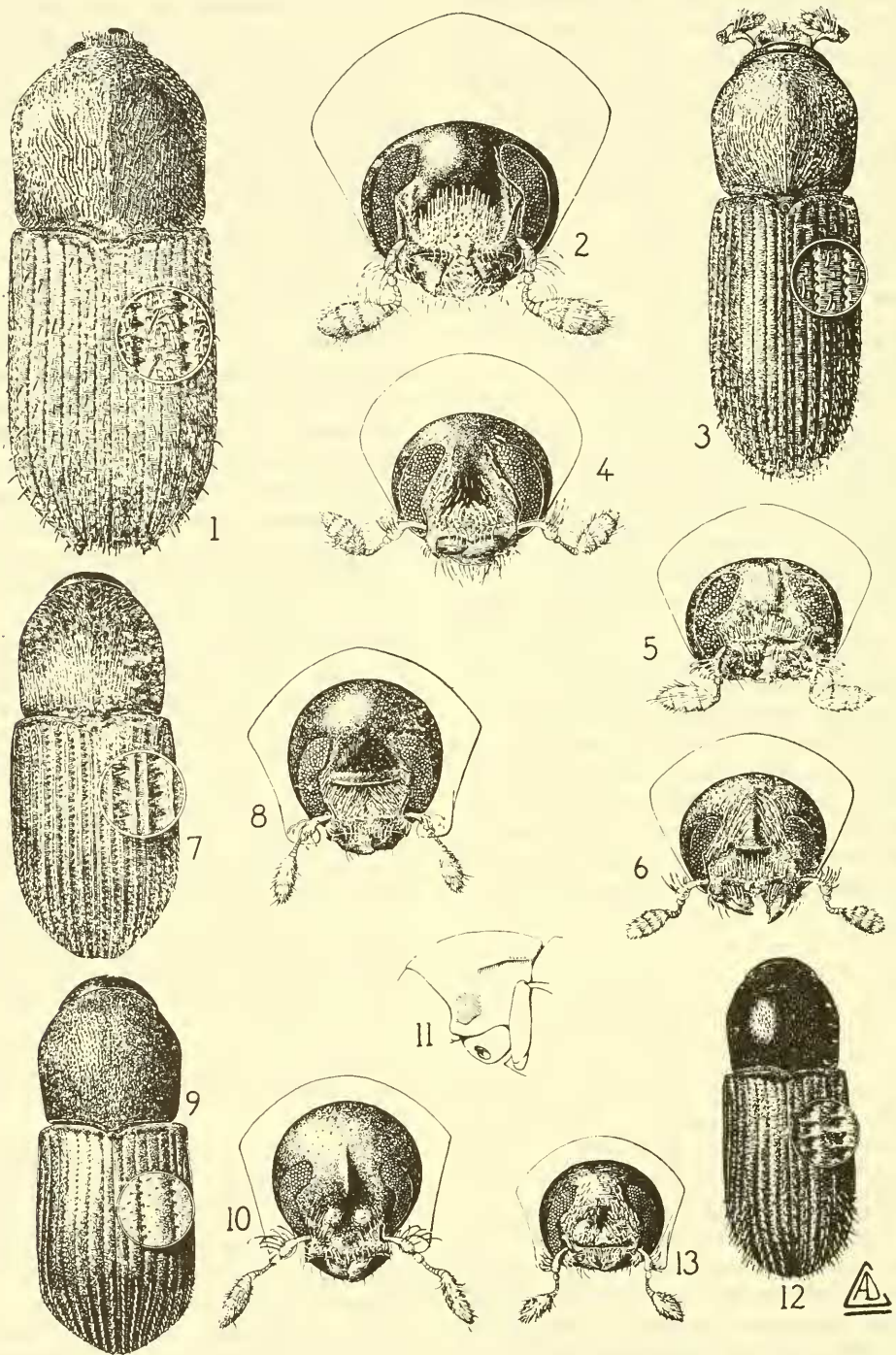



Fig. 84. *Cnesinus* and *Bothrosternus* spp.: 1–2, *C. cubensis*; 3–4, *C. setulosus*, male; 5, *C. robai*; 6, *C. setulosus*, female; 7–8, *C. costulatus*, female; 9–11, *B. foveatus*; 12–13, *C. blackmani*, female. (After Blackman 1943: pl. 15.)

form and other characters mentioned in the key serve to distinguish it.

FEMALE.— Length 2.3–3.0 mm, 2.1 times as long as wide; color very dark reddish brown.

Frons as in *intermedius*, except epistomal callus slightly higher on its lateral thirds, median third reduced, almost obsolete, and eyes separated by a distance equal to 2.3 times greatest width of an eye; vestiture sparse, of moderate length, only one row of setae on upper slope of epistomal callus.

Pronotum 1.0 times as long as wide; widest at middle, sides weakly arcuate on basal two-thirds, rather broadly rounded in front; surface smooth, shining, punctures small, deep, broadly oval posteriorly, more elongate anteriorly, separated by distances equal to one to three times width of a puncture. Glabrous.

Elytra 1.4 times as long as wide, 1.6 times as long as pronotum; sides very feebly arcuate on basal two-thirds to declivital margin, broadly rounded behind; basal margins slightly elevated, acutely costate, with a submarginal row of moderately large punctures on posterior slope of costa; striae moderatelly impressed, particularly 1, punctures rather small, not confluent except on 1; interstriae broadly convex, at least twice as wide as striae, smooth, shining, with sparse, transverse lines, punctures small, irregular in size, confused. Declivity moderately steep, broadly convex with a slight impression between third interstriae; striae not impressed, punctures moderately large, deep; interstriae 1 abruptly, rather weakly elevated, ascending gradually laterally to moderately convex interstriae 3, 2 and 3 each armed by a sparse row of moderately large, rounded tubercles, lateral interstriae also armed posteriorly by a few tubercles. Vestiture confined to declivity, consisting of interstrial rows of coarse, pointed bristles and a few short, fine, ground setae; each bristle at least twice as long as distances between bristles within rows and between rows; sutural row of bristles much shorter.

MALE.— Similar to female except epistomal callus much larger, equal to 0.6 width of frons at level of antennal insertion, acutely subprecipitous on its lower margin, upper slope gradual and densely covered by reddish ornamental setae of uniformly short length.

DISTRIBUTION.— Puebla to Panama.

MEXICO: Puebla: 10 km NE Teziutlan, 27-VI-53, 450 m No. 54, cut woody vine; 12 km W Villa Juárez, 25-VI-53, No. 36, twigs of a small cut tree. COSTA RICA: Escasu, San José, 2-X-63, 1300 m, No. 215, *Guazuma ulmifolia* twigs; San Ignacio de Acosta, San José, 5-VII-63, No. 28, broken branch; all by S. L. Wood. PANAMA: Volcán de Chiriquí, Chiriquí, G. C. Champion.

HOSTS.— *Guazuma ulmifolia*, two other trees, and a woody vine.

BIOLOGY.— Similar to the preceding species.

NOTES.— The above descriptions are based on 38 specimens, including a female homotype compared by me to the female type.

### 9. *Cnesinus niger* Wood
Fig. 85

*Cnesinus niger* Wood, 1967, Great Basin Nat. 27:83 (Holotype, male; Cerro Punta, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is allied to *punctatus* Blandford and *electinus* Wood; the above key summarizes the distinguishing characters.

FEMALE.— Length 2.0–2.5 mm, 2.6 times as long as wide; color almost black.

Fronx convex above, transversely impressed at level of ocular emargination; epistomal callus as in *intermedius*; surface subreticulate, shining, punctures obscurely evident below upper level of eyes; vestiture rather sparse and inconspicuous as in females of related species; eyes separated by a distance about equal to 2.5 times width of an eye.

Pronotum 1.04 times as long as wide; widest just behind middle; surface almost smooth and shining, punctures rather coarse, deep, close, almost round at base, more elongate anteriorly, separated by distance less than half width of a puncture except on median line, rarely confluent. Glabrous behind, a few short setae on anterior third (usually abraded).

Elytra 1.7 times as long as wide, 2.0 times as long as pronotum; outline as in *intermedius*; basal crenulations obscurely indicated, not isolated; striae impressed, punctures moderately large, deep, mostly separated from one another; interstriae as wide as striae, punctures fine, shallow, not strongly confused, surface subshining. Declivity rather steep, convex, rather weakly impressed between third interstriae; interstriae

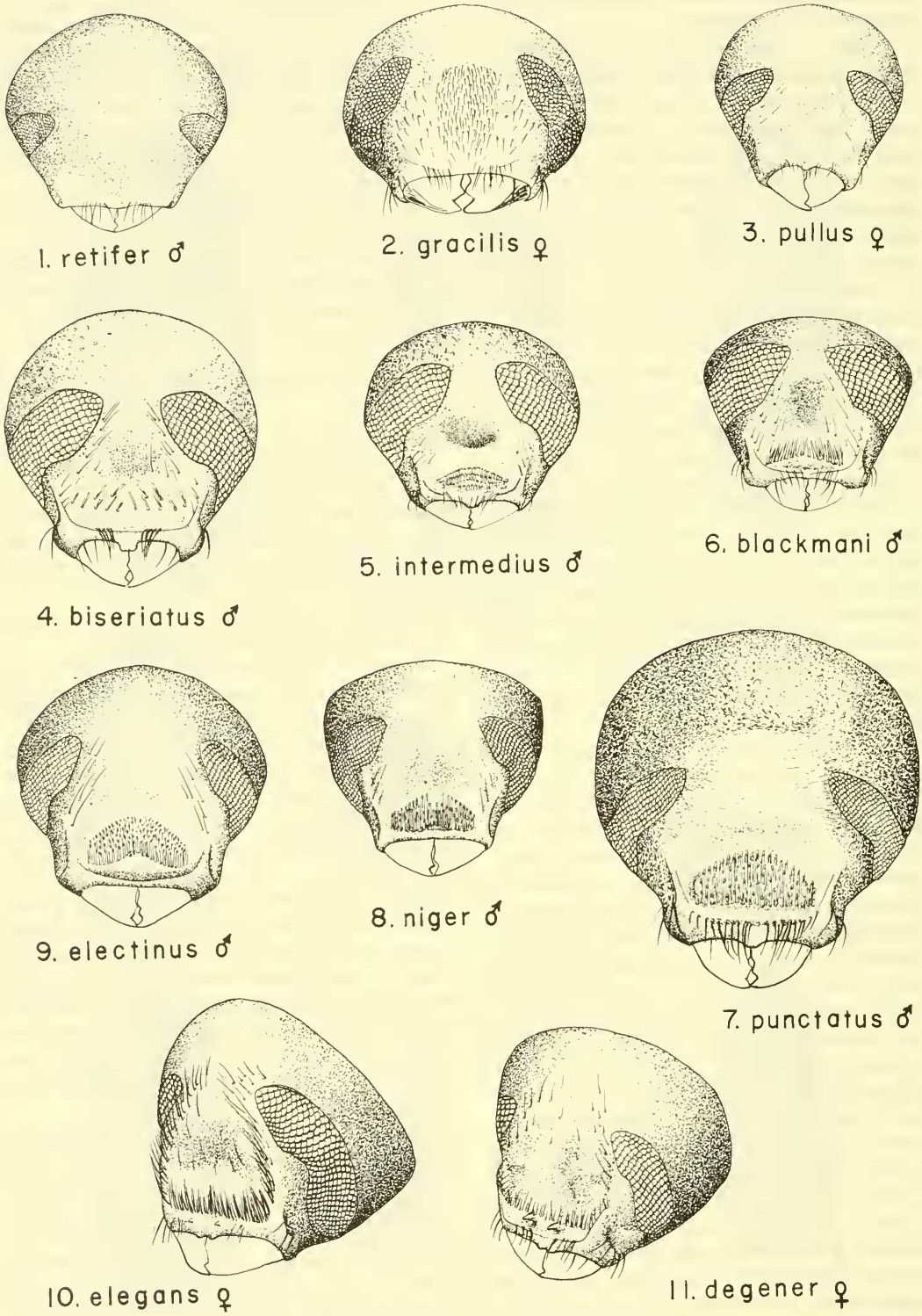



Fig. 85. *Cnesinus* spp., heads: 1, *retifer*; 2, *gracilis*; 3, *pullus*; 4, *electus* (not *biseriatus*); 5, *intermedius*; 6, *blackmani*; 7, *punctatus*; 8, *niger*; 9, *electinus*; 10, *elegans*; 11, *degener*. (After Wood 1968:90.)

1, 2, and 3 rather narrowly convex, 2 and 3 each bearing a row of fine granules. Vestiture confined to declivity, consisting of interstrial rows of moderately long, stout bristles, except missing on lower two-thirds of 1; each bristle twice as long as distance between bristles within and between rows.

MALE.— Similar to female except epistomal callus almost reaching lateral margins, sharply defined along its lower margin, upper slope gradually and densely covered by ornamental setae, with a median glabrous, triangular area on lower half below.

DISTRIBUTION.— Panama.

PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, Nos. 377, 379, 380, 388, twigs of three tree species, S. L. Wood.

BIOLOGY.— Similar to *intermedius*.

NOTES.— The above treatment was based on the type series of 42 specimens.

### 10. *Cnesinus electinus* Wood

Fig. 85

*Cnesinus electinus* Wood, 1967, Great Basin Nat. 27:82 (Holotype, male; Mazamitla, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is allied to *niger* Wood and *myelitus* Wood, but it may be distinguished by characters summarized in the above key.

FEMALE.— Length 2.1–2.5 mm, 2.7 times as long as wide; color dark brown, the elytra usually lighter.

Frons transversely impressed at level of ocular emargination, convex above, flattened below this point; epistomal callus weakly developed on more than median half; convex area almost smooth, subshining, impunctate except at sides and above; vestiture scanty, limited to lateral and epistomal areas; eyes separated by a distance slightly more than twice width of an eye.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on anterior two-thirds, very slightly wider in front of middle, anterior margin broadly rounded; surface smooth and shining, with rather numerous, minute points and moderately large, rather deep, oval punctures, punctures separated by about one to three times their own diameters, none confluent. Vestiture sparse, confined to marginal areas.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; basal crenulations evident but rather poorly formed; striae impressed, punctures moderately large, deep; interstriae almost twice as wide as striae, convex, punctures small and staggered in indefinite, uniseriate rows, punctures on 2, and near declivity on 1, 3 and 4 granulate. Declivity steep, weakly impressed between third interstriae; striae 1 strongly impressed, others not impressed, punctures moderately large and deep; interstriae 1 moderately elevated, 3 convex, 1 with fine punctures, 2 and 3 with moderately large, rounded granules. Vestiture almost restricted to declivity, consisting of rows of erect bristles on all interstriae except 1, each bristle one to two times as long as distance between rows of bristles.

MALE.— Similar to female except epistomal callus broad, weakly elevated, lower margin abrupt, a small, triangular, median area impunctate and glabrous, remaining area densely covered by erect, reddish ornamental bristles.

DISTRIBUTION.— Jalisco.

MEXICO: Jalisco: Mazamitla, 22-VI-65, 2400 m, No. 93, twigs of a small tree, S. L. Wood.

BIOLOGY.— Similar to *intermedius*.

NOTES.— The above treatment was based on the 30 specimens in the type series.

### 11. *Cnesinus myelitis* Wood

*Cnesinus myelitis* Wood, 1967, Great Basin Nat. 27:84 (Holotype, male; Teziutlan, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *electinus* Wood by characters summarized in the above key.

FEMALE.— Length 2.0–2.4 mm, 2.4 times as long as wide; color dark brown.

Frons transversely impressed at level of ocular emargination, convex above and flattened below this point; convex area minutely, transversely aciculate, lower area subreticulate; epistomal callus clearly evident but weakly elevated on median third; eyes separated by about twice width of an eye.

Pronotum 1.05 times as long as wide; sides feebly arcuate on basal two-thirds, very slightly wider in front of middle, anterior margin rather broadly rounded; surface subshining, evidently with very minute points

and moderately large, shallow, oval punctures, punctures largely confluent on anterior half, on posterior half separated by distances about equal to width of a puncture. Subglabrous.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides straight and parallel on anterior two-thirds, rather broadly rounded behind; basal margins elevated, crenulations indistinctly marked; striae rather strongly impressed, punctures moderately large, deep; interstriae about twice as wide as striae, convex, punctures uniseriate, fine in middle area, a few subcrenulate toward base, forming rather large, rounded granules on posterior third of 1 and posterior fourth of 2 and 3. Declivity rather steep, convex, with a shallow impression between third interstriae; striae 1 strongly impressed, others not impressed; interstriae 1 broadly convex, weakly elevated, 3 weakly convex, higher than 1, 1 punctured, 2 and 3 each armed by a row of rather large, rounded granules. Vestiture almost limited to declivity, except interstriae 1 on disc; consisting of interstrial rows of erect bristles, absent on lower three-fourths of 1; each bristle about one and one-half to two times as long as distance between rows.

MALE.— Similar to female except epistomal callus larger, broad, slightly elevated, covered by a brush of rather long, erect, reddish bristles, entire callus setiferous (smaller and less strongly elevated than in *punctatus*), its lower median margin armed by a small tubercle.

DISTRIBUTION.— Puebla.

MEXICO: **Puebla**: 10 km NE Teziutlán, Puebla, 27-VI-53, 1500 m, No. 54, woody vine, S. L. Wood.

BIOLOGY.— Similar to *intermedius*.

NOTES.— The above treatment was based on the type series of 18 specimens.

### 12. *Cnesinus bicornus* Wood

Fig. 86

*Cnesinus bicornus* Wood, 1967, Great Basin Nat. 27:80 (Holotype, female; Morelia, Michoacán, Mexico; Wood Coll.

DIAGNOSIS.— This species is distinguished from *elegans* Blandford by characters summarized in the above key.

FEMALE.— Length 3.3–3.8 mm, 2.5 times as long as wide; color dark reddish brown.

Frons rather deeply concave from eye to eye from vertex to epistoma, lateral margins acute below eye; epistoma armed by a pair of large, pointed, conical spines, each longer than half width of eye; concavity on lower half with a pair of lateral calluses; surface substrigose-reticulate, with small, rather sparse, obscurely granulate punctures; vestiture fine, obscure, except a row of rather long, erect, hairlike bristles on lateral margin; eyes separated by 2.7 times width of an eye.

Pronotum 1.1 times as long as wide; sides almost straight on basal two-thirds, very slightly wider in front of middle, broadly rounded in front; surface longitudinally strigose, punctures usually not evident, grooves dull, ridges shining; median line evident on posterior half. Vestiture hairlike, inconspicuous or absent except on all marginal areas.

Elytra 1.6 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel to declivital base, rather broadly rounded behind; basal margins poorly elevated, crenulations evident but obscure; striae narrowly, not strongly impressed, punctures small, impressed; interstriae three or more times as wide as striae; subcrenulate toward base, remaining surface shining, not clearly punctured, irregular, with small rounded granules in somewhat indefinite uniseriate rows. Declivity rather steep, convex, except flattened between third interstriae; striae 1 strongly, 2 moderately, 3 not impressed; interstriae subshining, weakly convex, about four or more times wider than strial punctures, each interstriae with a median row of rather large rounded granules. Vestiture hairlike, more abundant but not longer on declivity; consisting of median rows of fine, erect interstrial hair, and more abundant, almost equally long, semirecumbent hair; longest setae about equal to distance between median rows; somewhat coarser on declivity.

MALE.— Similar to female except frontal excavation slightly shallower and less extensive; epistomal callus developed but unarmed, bearing one transverse row of bristles on its upper slope.

DISTRIBUTION.— Michoacán to Morelia.

MEXICO: **Michoacán**: Morelia, 15-VI-65, 2300 m, No. 58, stems of a large herb, S. L. Wood. **Morelos**: Tlayacapan, 18-X-80, S-119, T. H. Atkinson.

BIOLOGY.— The egg tunnels were in the pith of the central axis of stems up to 3 cm in diameter in an herbaceous plant 2–3 m tall.

Eggs and young larvae were scattered at random toward the ends of the biramous egg gallery.

NOTES.— The above treatment was based on the type series of 45 specimens.

### 13. *Cnesinus degener* Wood
Fig. 85

*Cnesinus degener* Wood, 1968, Great Basin Nat. 28:105 (Holotype, female; Matías Romero, Oaxaca, Mexico; Wood Coll.).

DIAGNOSIS.— This species is intermediate between *bicornus* Wood and *elegantis* Wood; the size and other characters summarized in the above key serve to distinguish it.

FEMALE.— Length 2.0–2.3 mm, 2.4 times as long as wide; color dark reddish brown.

Frons as in *elegantis* except impression slightly deeper and more feebly convex, almost flat to well above upper level of eyes; details of sculpture, epistomal tubercles, and vestiture as in *elegantis*.

Pronotum 1.03 times as long as wide; as in *elegantis* except sculpture slightly coarser and with fine, sparse, hairlike setae over entire surface.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; sides almost straight and subparallel on basal two-thirds, rather broadly rounded behind, declivity occupying almost posterior half; basal crenulations distinctly formed on median third, becoming a continuous, acute costa laterally; striae slightly impressed, punctures larger than in *elegantis*, distinctly impressed, subconfluent on 1; interstriae less than twice as wide as striae, irregular, punctures moderately large, rather abundant, confused, an indefinite median row on each finely granulate. Declivity more gradual than in related species, convex, with impression between third interstriae not as deep as in *elegantis*; striae not impressed, punctures rather small, deep; interstriae 1 abruptly, rather weakly elevated, 3 slightly, broadly elevated, 2 and 3 each armed by a median row of fine granules. Vestiture rather abundant on disc and declivity, consisting of interstrial rows of erect, very stout bristles, each very slightly longer than distances between bristles within rows and between rows, and more abundant, semirecumbent, fine to very stout strial and interstrial ground setae, each about a third as long as the erect bristles.

MALE.— Similar to female except frontal impression not quite as deep, epistomal tubercles absent.

DISTRIBUTION.— Oaxaca to Veracruz.

MEXICO: Oaxaca: 11 km N Matías Romero, 24-VI-67, 200 m, No. 95, woody vine, and 39 km N Matías Romero, 29-VI-67, 140 m, No. 121, *Serjania*; all by S. L. Wood. Veracruz: Cordoba, A. Fenyes.

HOSTS.— *Serjania* sp., and another woody vine.

BIOLOGY.— Specimens were removed from the central axis of stems less than 5 mm in diameter. The habits appeared similar to most other species in the genus.

NOTES.— The above treatment was based on the type series of 10 specimens.

### 14. *Cnesinus paleatus* Blandford

*Cnesinus paleatus* Blandford, 1896, Biol. Centr.-Amer., Coleopt. 4(6):138 (Holotype, female; El Tumbador, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *degener* Wood by the much larger size, by the much longer, more slender, interstrial bristles, by the much more deeply impressed elytral declivity, and by other characters.

FEMALE.— Length 2.8 mm, 2.5 times as long as wide; color dark reddish brown.

Frons as in *elegantis* except epistomal setae in transverse row much stouter, closer. Eyes separated by 2.3 times width of an eye.

Pronotum 1.08 times as long as wide; outline and sculpture as in *elegantis* except impressed longitudinal grooves coarser, very slightly wider than interspaces; vestiture largely abraded, fine, hairlike on disc, course at sides and anteriorly, long anteriorly.

Elytra 1.5 times as long as wide, 1.7 times as long as pronotum; outline as in *elegantis* but stouter; basal margins slightly elevated, crenulations obscurely indicated; striae rather weakly impressed, punctures moderately course, deep, not confluent; interstriae twice as wide as striae, punctures very fine, rather abundant, confused, each interstriae with a uniseriate row of fine, rounded granules. Declivity steep, impressed between third interstriae similar to *degener* but slightly deeper; sutural striae slightly more strongly impressed; interstriae 1 weakly elevated, 2 almost flat, lateral area ascending to 4;

interstrial punctures moderately large, uniseriate, not at all granulate on 1–3, very finely granulate laterally. Vestiture largely abraded on disc of type; ground setae stout, four to six times as long as wide, their length up to two-thirds interstrial width; erect, uniseriate bristles very course, long, many at least twice as long as width of one interstriae, shorter on declivity but apparently broken by wear.

DISTRIBUTION.— Guatemala.

GUATEMALA: El Tumbador, G. C. Champion.

NOTE.— The above description was prepared from the female holotype. Nothing is known of the habits of this species.

### 15. *Cnesinus brighti* Wood

*Cnesinus brighti* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):6 (Holotype, female; 9 miles or 14 km SE Teopisca on Highway 24, Chiapas, Mexico; Canadian National Coll.)

DIAGNOSIS.— This species is distinguished from *elegantis* Wood by the smaller size, by the smaller female epistomal tubercles, by the coarser frontal vestiture, by the coarser pronotal striations, by the fine hair covering the pronotum, by the less strongly impressed striae, and by the discal pubescence.

FEMALE.— Length 2.2–2.6 mm, 2.7 times as long; color rather dark reddish brown.

Frons as in *elegantis* but with epistomal denticles much smaller and basally contiguous, vestiture stouter and slightly more abundant.

Pronotum 1.1 times as long as wide; striations coarser and wider than either *elegantis* or *coracinus*, punctures not evident. Vestiture of rather abundant, fine, short hair on disc, longer and coarser anteriorly.

Elytra 1.9 times as long as wide; as in *elegantis* except vestiture extends to base of disc, consisting of rather abundant, short, coarse, confused setae of about uniform length, not longer on declivity, each seta about equal in length to width of an interstriae.

MALE.— Similar to female except epistomal tubercles absent.

DISTRIBUTION.— Chiapas.

MEXICO: **Chiapas**: Lagos des Colores, 17-V-69, D. E. Bright; 9 miles or 14 km SE Teopisca, 14, 30-V-69, D. E. Bright.

NOTES.— The above treatment was based on the type series of 70 specimens.

### 16. *Cnesinus elegans* Blandford

Fig. 85

*Cnesinus elegans* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):140 (Lectotype, female; Cerro Zunil, Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished from the closely related *elegantis* Wood by characters summarized in the above key.

FEMALE.— Length 2.4–2.8 mm, 2.9 times as long as wide; very dark reddish brown, the pronotum often almost black.

Frons convex above level of ocular emargination, lower area moderately concave, lateral margins acute; epistomal callus poorly developed, armed by two small tubercles, each as high as wide, tubercles separated by a distance about equal to three times basal width of a tubercle; surface minutely reticulate-granulate, fine punctures obscure; vestiture consisting of moderately abundant, coarse, rather long setae across upper margin of epistomal callus and on lateral margins to upper level of eyes; eyes separated by a distance equal to 1.7 times width of an eye.

Pronotum 1.17 times as long as wide; sides straight to widest point two-thirds length from base, then rather broadly rounded in front; surface shining, punctures dull, punctures moderately large, rather deep, about twice as long as wide, most marginally confluent with at least one other puncture. Vestiture confined to marginal areas.

Elytra 1.9 times as long as wide, 2.0 times as long as pronotum; sides almost straight and parallel to declivital base, rather narrowly rounded behind, declivity confined to posterior fourth; crenulations on basal margins poorly formed; striae shallowly impressed, 1 stronger, punctures rather small, moderately deep, confluent on 1; interstriae 1 and 2 as wide as striae, others wider, 1 and 2 weakly convex, surface shining, punctures fine, obscure, uniseriate; a few granules on interstriae near declivity, two or three extend to middle of disc on 3. Declivity rather steep, convex, with a shallow impression between third interstriae; striae 1 impressed, others not impressed, punctures small, rather deep; interstriae 1 abruptly elevated, almost half as high as wide, 3 weakly convex, 1 punctured, 2 and 3 each with a row of small, rounded

granules. Vestiture largely confined to declivity (about a dozen bristles on disc) consisting of interstrial rows of erect bristles and fine, sparse, semirecumbent strial and interstrial hair; each bristle up to twice as long as distance between rows of bristles.

MALE.— Similar to female except epistomal callus somewhat reduced and unarmed by tubercles; declivital impression evidently deeper.

DISTRIBUTION.— Puebla to Venezuela.

MEXICO: Chiapas: 10 km SE Teopisca, 18-V-69, *Arbutus*, D. E. Bright. Puebla: 10 km NE Tezuitlán, 27-VI-53, 1600 m, No. 44, and 2-VII-67, No. 154, woody vine, and No. 142, in *Rubus* sp., S. L. Wood. Veracruz: Jalapa, Höge; 1 km west Las Vigas, 5-VII-67, No. 160, in *Alnus* twigs, S. L. Wood; Oaxaca: 10 km S Huajuapan, 16-VI-67, No. 45, *Serjania*, S. L. Wood. GUATEMALA: Cerro Zunil, G. C. Champion. HONDURAS: Zamorano, Morazán, 18-IV-64, No. 511, broken twigs, S. L. Wood. PANAMA: Volcán, Chiriquí. Schedl (1940:331) adds Panama and Venezuela without further data.

HOSTS.— *Arbutus* sp., *Rubus* sp., *Serjania* sp., another woody vine, and a shrub.

BIOLOGY.— As in preceding species.

NOTES.— The above descriptions were based on 115 specimens, including the female lectotype from Cerro Zunil, Guatemala, a female lectoparatype from Volcán Chiriquí, Panama, a male lectoparatype from Jalapa, Mexico, and a male and female from Zamorano, Honduras, compared by both Schedl and myself to a lectoparatype. The entire type series was examined, but comparisons to my material were indirect.

Blandford's female syntype, used for his Figure 11 on Table VI, from Cerro Zunil, was selected from the type series of six specimens and is here designated as the lectotype of *Cnesinus elegans* Blandford.

### 17. *Cnesinus theocallus* Bright

*Cnesinus theocallus* Bright, 1972, Canadian Ent. 104:1493 (Holotype, female; 24 km or 15 miles S Valle Nacional, Oaxaca, Mexico; Canadian Nat. Coll., 12607)

In all probability *theocallus* Bright is a synonym of *elegans* Blandford. The only difference is in the frontal width separating the eyes. This distance in *elegans* varies from 1.0–1.5 times the width of an eye, except for one Costa Rican specimen that is 0.90 times as wide; the holotype of *theocallus* is 0.46 times as wide. In the absence of supporting characters, and, because of the unavailability of material from southern Mexico, I am reluctant to recognize this form as a species.

Only the type series of three specimens of *theocallus* is known from **Oaxaca**: 24 km or 16 miles S Valle Nacional, 20-V-71, 1300 m, D. E. Bright. The holotype is 2.7 mm in length.

### 18. *Cnesinus elegantis* Wood

*Cnesinus elegantis* Wood, 1967, Great Basin Nat. 27:79 (Holotype, female; Volcán Zunil, Quezaltenango, Guatemala; Wood Coll.)

*Cnesinus zapotecus* Bright, 1972, Canadian Ent. 104:1493 (Holotype, female; 5 km or 3 miles N Suchixtepec, Oaxaca, Mexico; Canadian Nat. Coll.); Wood, 1973, Great Basin Nat. 33:174. *Synonymy*

DIAGNOSIS.— This species is distinguished from the closely related *elegans* Blandford by characters summarized in the above key.

FEMALE.— Length 3.0–3.4 mm, 2.7 times as long as wide; color brown.

Frons strongly, transversely impressed at level of antennal bases, convex above, impressed area shallowly concave, with a pair of sublateral calluses on either side of deepest point of impression; epistomal callus evident, armed by a pair of rather widely placed, large pointed tubercles larger than those of *elegans* but smaller than in *bicornus*; surface reticulate, minutely, sparsely punctured; vestiture fine, hairlike, mostly on marginal areas; eyes separated by a distance equal to twice greatest width of an eye.

Pronotum 1.06 times as long as wide; sides almost straight posteriorly, widest in front of middle; surface with closely set, deep, elongate punctures, most at least partly longitudinally confluent. Glabrous.

Elytra 1.8 times as long as wide, 1.9 times as long as pronotum; sides straight and subparallel to declivital base, rather broadly rounded behind; basal crenulations low, obscure; striae moderately impressed, punctures rather small, deep, interstriae twice as wide as striae, punctures small, variable in size, rather confused. Declivity rather steep, rather strongly impressed between third interstriae; striae not impressed except 1, punctures clearly, rather deeply impressed; interstriae 1 moderately elevated, 2 almost flat, ascending laterally, wider than 1 or 3, all armed by a few fine, rounded, irregularly placed granules. Vestiture largely confined to

declivity, consisting of long, rather fine interstrial bristles and shorter strial and interstrial hair; longest bristles equal in length to combined width of interstriae 2 and 3.

MALE.— Similar to female except frontal callus slightly more prominent and unarmed.

DISTRIBUTION.— Chiapas to Guatemala.

MEXICO: Chiapas: 11 km E San Cristóbal, 26-V-69, *Arbutus*, D. E. Bright. GUATEMALA: Volcán Zunil, Quezaltenango, 27-V-64, 1000 m, No. 629, *Quercus* twigs, S. L. Wood.

HOST.— *Arbutus* sp., *Quercus* sp.

BIOLOGY.— Similar to preceding species.

NOTES.— The above treatment was based on the type series of 33 specimens of *elegantis*, on the holotype and six paratypes of *zapotecus*, and on one other specimen.

## 19. *Cnesinus coracinus* Wood

*Cnesinus coracinus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):6 (Holotype, female; 5 miles or 8 km S Simojovel, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *elegantis* Wood by the smaller size, by the stouter body, by the finer, closer female epistomal tubercles, by the finer frontal vestiture, by the slightly coarser pronotal striation, by the coarser strial punctures, and by the shorter, stouter declivital setae.

FEMALE.— Length 2.1–2.3 mm, 2.5 times as long as wide; color black.

Frons as in *elegantis* except epistomal tubercles smaller, much closer, concavity not quite as deep, extending slightly nearer upper level of frons, surface obscurely punctured, vestiture finer, less abundant.

Pronotum 1.04 times as long as wide; much as in *elegantis* but with striations more distinctly punctured and wider.

Elytra 1.6 times as long as wide; strial punctures slightly larger and deeper than in *elegantis*, interstriae feebly convex; declivity less strongly impressed, interstriae each with a row of granules. Vestiture confined to declivity, consisting of sparse, short, ground vestiture of rather fine hair, and rows of interstrial bristles; each bristle about as long as distance between rows, more closely spaced within a row.

DISTRIBUTION.— Chiapas.

MEXICO: Chiapas: 5 miles or 8 km S Simojovel, 4-VII-69, D. E. Bright.

NOTES.— The above treatment was based on the type series of six specimens.

## 20. *Cnesinus garrulus* Schedl

*Cnesinus garrulus* Schedl, 1940, An. Esc. Nac. Cienc. Biol., Mexico 1:332 (Holotype, female; Yautepec, presumably Morelos, Mexico; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *gibbulus* Wood by the median epistomal tubercle, by the oval pronotal punctures that are not extended by strigose lines, and by the obsolete punctures on declivital striae 1–3.

FEMALE.— Length 2.3 mm, 2.6 times as long as wide; color rather dark reddish brown.

Frons convex above, broadly, rather deeply, concavely impressed from slightly below upper level of eyes to epistomal area; submarginal area of epistoma slightly elevated, ornamented by a uniseriate, transverse row of stout bristles, with a pointed median tubercle about equal in height and width to twice diameter of a facet of eye; vestiture sparse, consisting of transverse row mentioned above, and a few hairs on lateral margins.

Pronotum as in *gibbulus* except punctures oval, each about twice as long as wide, without strigose extensions, rarely confluent, separated by distances equal to or slightly less than diameter of a puncture; surface smooth, shining. Glabrous except at margins.

Elytra outline as in *gibbulus*; basal margins more strongly elevated; striae distinctly, rather weakly impressed, punctures small, impressed; interstriae two and one-half times as wide as striae, feebly convex, shining, almost smooth, punctures minute, a few obscure points also indicated. Declivity rather steep, convex except flat on median half of lower two-thirds; punctures obsolete on striae 1–4; upper half of interstriae 2 and 3 each with a row of very fine granules. Vestiture abraded, a few broken setae on margins of declivity.

DISTRIBUTION.— Morelos?

The holotype is labeled "Yautepec, Flohr; Yaw"; not Uecatan as reported by Schedl. It is presumed this locality is Yautepec, Morelos.

NOTES.— The above treatment was based on the holotype.

### 21. *Cnesinus quaesitus* Schedl

*Cnesinus quaesitus* Schedl, 1940, An. Esc. Nac. Cienc. Biol., Mexico 1:331 (Holotype, female; "Tibayes," Mexico; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from the almost identical *gibbulus* Wood by the distinctly larger size, by the much less strigose punctures of the pronotum, and by the different sculpture of the frons.

FEMALE.— Length 3.0 mm, 2.6 times as long as wide; color dark reddish brown.

Frons as in *gibbulus* except eyes separated by 1.6 times width of an eye (2.4 times in *gibbulus*), central area smooth and brightly shining; epistomal elevation with its flattened area larger, its upper slope more gradual.

Pronotal punctures feebly strigose (about twice as long as wide), rarely if ever confluent, their size and spacing as in *gibbulus*. Elytra as in *gibbulus*.

DISTRIBUTION.— "Tibayes," Mexico.

NOTES.— The above treatment was based on the female holotype. The label bears one word very poorly written in script in washable ink, presumably "Tibayes." Because I am unable to find such a locality on any map or in a gazetteer, I suggest that it could be a contraction or misspelling or Tacubaya, a location in the Distrito Federal.

### 22. *Cnesinus gibbulus* Wood

Fig. 86

*Cnesinus gibbulus* Wood, 1968, Great Basin Nat. 28:100 (Holotype, female; Villa Mills, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *gibbosus* Wood by characters mentioned in the above key.

FEMALE.— Length 2.4–2.8 mm, 2.5 times as long as wide; color dark brown.

Frons transversely, concavely impressed at level of antennal bases, convex above, lower area largely occupied by a large, median, rhomboidal (subtriangular in some specimens) elevation, wider than long, with its lower sides precipitous, its upper two sides closely pubescent, elevation near but not attaining epistomal margin; flattened surface of elevation and convex surface above very minutely, transversely substrigose, lateral areas and vertex with fine punctures; vestiture other than brush of elevation, sparse, inconspicuous, limited to lateral areas.

Pronotum 1.06 times as long as wide; sides straight and parallel on basal two-thirds, broadly rounded in front; punctures rather small, deep, mostly less than twice as long as wide, about a third of them longitudinally confluent; scanty vestiture limited to anterior area and margins.

Elytra 1.6 times as long as wide, 1.9 times as long as pronotum; sides almost straight and parallel to declivital base, broadly rounded behind; bases of interstriae 2 and 3 with a few obscure marginal and submarginal crenulations; striae impressed, punctures rather small, individually, rather deeply impressed; interstriae about twice as wide as striae, marked by a few irregularly placed transverse lines, punctures small, shallow, in rather indefinite rows. Declivity convex, steep; striae 1 rather strongly impressed, others less strongly impressed, impression re duced toward apex; interstriae moderately convex, with small, deep punctures. Vestiture largely confined to declivity, fine, hairlike, rather long, mostly in interstrial rows except absent on sutural interstriae.

MALE.— Similar to female except frontal elevation reduced to a low, transverse, medially impressed ridge, pubescence equal to female; transverse frontal impression longer and with a pair of small, rounded, lateral calluses; elytral declivity more strongly impressed medially.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Villa Mills on Cerro de la Muerte, Cartago, 26-VI-66, 3100 m, No. 8, *Quercus* twigs, S. L. Wood.

BIOLOGY.— Essentially as in other species of this genus.

NOTES.— The above treatment was based on the type series of 16 specimens.

### 23. *Cnesinus gibbosus* Wood

Fig. 86

*Cnesinus gibbosus* Wood, 1968, Great Basin Nat. 28:101 (Holotype, female; Volcán Poas, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the closely allied *gibbulus* Wood by characters summarized in the above key.

FEMALE.— Length 2.8–3.5 mm, 2.5 times as long as wide; color dark brown.

Frons strongly, transversely impressed just above level of antennal bases, convex above,

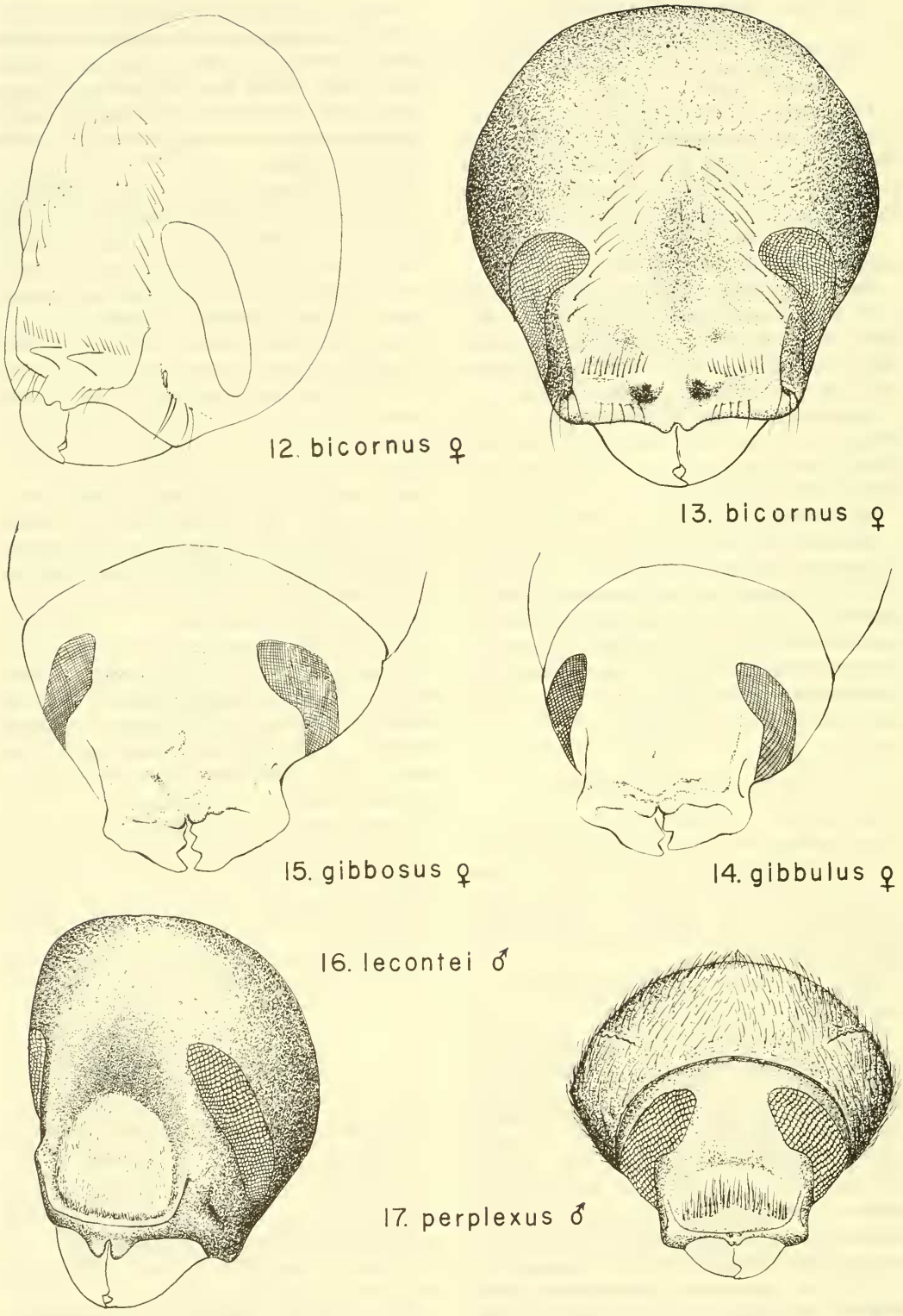



Fig. 86. *Cnesinus* spp., heads: 12–13, *bicornus*; 14, *gibbulus*; 15, *gibbosus*; 16, *lecontei*; 17, *perplexus*. (After Wood 1968:93.)

flattened below, with median half occupied by an abruptly elevated, flat, pentagonal elevation reaching almost to epistomal margin, upper two sides ornamented by a row of stout ornamental bristles, process higher and narrower than in *gibbulus*; upper area almost smooth, with a few punctures and inconspicuous setae in lateral areas and on vertex.

Pronotum 1.06 times as long as wide; sides almost straight and parallel on more than basal half, broadly rounded in front; punctures fine, deep, each three or four times as long as wide, about two-thirds of them longitudinally confluent; vestiture inconspicuous except at margins, but covering entire surface.

Elytra 1.5 times as long as wide, 1.7 times as long as pronotum; sides straight and parallel to base of declivity, rather broadly rounded behind; basal margins not elevated, several small marginal and submarginal tubercles present; striae impressed, punctures small, obscurely impressed; interstriae about twice as wide as striae, dull, punctures small, rather numerous, confused. Declivity shallowly impressed between third interstriae, steep; striae impressed, punctures small, deep; interstriae convex, 1 with a row of fine punctures, 2 and 3 almost impunctate, each with a row of closely set interstrial bristles arising from mesal margin. Vestiture mostly confined to declivital area, consisting of interstrial rows of long, fine hair and some short, fine, recumbent hair; interstrial bristles absent on 1; longest bristles almost equal to twice distance between rows.

MALE.— Similar to female except frontal elevation reduced to a broad, transverse, medially impressed callus, its upper margin ornamented by a straight row of reddish bristles; frontal impression longer deeper, concave, with a pair of rounded lateral calluses.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Poas, Heredia, 14-VII-63, 2500 m, No. 45, woody vine, S. L. Wood.

BIOLOGY.— Presumably as in the preceding species. The entire pith region of a stem 0.5 cm in diameter had been consumed by the young adults.

NOTES.— The above treatment was based on the type series of 31 specimens.

### 24. *Cnesinus lecontei* Blandford

Fig. 86

*Cnesinus lecontei* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):138 (Lectotype, male: Quiché Mts., El Quiché, Guatemala; British Mus. Nat. Hist., present designation).

DIAGNOSIS.— This large, distinctive species is not closely related to any other Central American species. The size, the abundant, rather short, almost hairlike vestiture, and the very different male frons distinguish it from allied species.

FEMALE.— Length 2.7–3.3 mm, 2.1 times as long as wide; color dark brown.

Frons broadly, very shallowly concave from epistomal margin to upper level of eyes; epistomal margin weakly elevated, shining, remaining surface finely reticulate, with small, obscure punctures; vestiture consisting of rather sparse, uniformly distributed, short bristles; eyes widely separated.

Pronotum 0.92 times as long as wide; widest at middle, sides rather strongly arcuate, rather strongly constricted just before broadly rounded anterior margin; surface closely, rather finely, longitudinally strigose, individual punctures obscure, ridges smooth, shining, impressions irregular, subshining. Vestiture consisting of minute, fine hair over entire surface.

Elytra 1.4 times as long as wide, 1.6 times as long as pronotum; sides weakly arcuate to declivital base, rather narrowly rounded behind, declivity occupying posterior third; crenulations on basal margins low, distinct on median third, with one or two irregular rows of small, submarginal crenulations at bases of interstriae 2–4; striae narrowly, deeply impressed, punctures small, obscure; interstriae about three times as wide as striae, surface rather finely granulose, punctures obscure. Declivity moderately steep, broadly convex; essentially as on disc, with interstriae somewhat narrower, their granules less abundant and slightly larger; entire surface reticulate. Vestiture fine on disc, rather coarse on declivity; consisting of interstrial rows of erect bristles, each bristle slightly shorter than distances between adjacent bristles within and between rows, and more abundant ground vestiture about half as long as bristles.

MALE.— Similar to female except frons less deeply impressed, lower two-thirds with a

large, median, subtriangular, densely, minutely pilose area three-fourths as wide as frons below level of antennal insertion, upper third immediately above pilose area glabrous, subshining, minutely etched; longer (but short) setae confined to marginal areas.

DISTRIBUTION.— Guatemala to Panama.

GUATEMALA: Quiché Mountains, El Quiché, G. C. Champion. COSTA RICA: San Ignacio de Acosta, 5-VII-63, 1600 m, No. 26; San Isidro del General, 13-XII-63, 1000 m, No. 312, *Croton* sp.; San José, 22-X-63, 1300 m, No. 167; all from San José Province, in *Croton gossypiifolia* (exception noted), by S. L. Wood. PANAMA: Volcán de Chiriquí, Chiriquí, G. C. Champion.

HOSTS.— *Croton gossypiifolia*, and *Croton* sp.

BIOLOGY.— This species is very common in fence-row plantings of the host tree at elevations of 1000–2000 m. It bores in the pith of recently cut or broken branches about 1–4 cm in diameter. From the entrance tunnel the female parent excavates an axial tunnel 1–6 cm or more, in either or both directions. Eggs are scattered near the ends of the tunnel and the larvae extend the tunnel along the axis of the branch. The larvae feed communally and almost never make individual tunnels.

NOTES.— Of Blandford's original series of nine specimens, only six were in the British Museum (Natural History) in July 1964. One of these, a male, was selected and is here designated as the lectotype of the species. The lectotype, my male homotype, and the other Costa Rican specimens were used to prepare the above description. For this study 77 mounted specimens and more than a 100 preserved specimens were examined.

### 25. *Cnesinus perplexus* Wood
Fig. 86

*Cnesinus perplexus* Wood, 1968, Great Basin Nat. 28:102 (Holotype, male; San Ignacio de Acosta, San José, Costa rica; Wood Coll.)

DIAGNOSIS.— The row of small asperities on the anterolateral angles of the pronotum distinguish this species from all other Central American species of the genus. It is closely related to *robai* Blackman and *coffeae* Schedl, both from Colombia, but it differs in having the declivital striae and interstriae very obscurely punctured; the tuberculate frontal carina of female *robai* is absent; and the declivity is much more shallowly excavated than in *coffeae*.

FEMALE.— Length 2.0–2.3 mm, 2.5 times as long as wide; color dark brown, elytra slightly lighter.

Frons transversely, concavely impressed at level of ocular emargination, convex above; epistomal callus broad but poorly developed, bearing one transverse row of setae; upper area subreticulate, a few punctures and setae in lateral areas; lateral margins below fundus of impression acute.

Pronotum 1.06 times as long as wide; sides straight and parallel on more than basal half, broadly rounded in front; anterolateral angles armed by a row of about seven small, basally contiguous asperities; median line narrowly, rather acutely elevated over basal two-thirds; surface coarsely, shallowly punctured, most punctures longitudinally confluent; vestiture short, coarse, conspicuous, covering entire surface.

Elytra 1.6 times as long as wide, 1.7 times as long as pronotum; sides straight and parallel to base of declivity, rather broadly rounded behind; basal margins acutely elevated, crenulations poorly defined; striae impressed, punctures small, largely confluent toward suture, discernible; interstriae twice as wide as striae, setiferous punctures small, in rows, mostly finely granulate. Declivity steep, convex except flattened or weakly impressed between third interstriae; striae 1 narrowly impressed, others weakly, rather indefinitely impressed; interstriae 1 weakly elevated, all with a row of fine, subgranulate, setiferous punctures, surface subreticulate, subshining. Vestiture of long, erect, stout, interstrial bristles from base to apex, and finer, recumbent, rather long strial and interstrial setae; bristles about as long as distance between bristles within a row and between rows.

MALE.— Similar to female except epistomal callus broad, higher, its upper slope ornamented by a broad, dense brush of erect, rather long, reddish hair, slightly less extensive than in *coffeae*; elytral declivity a little less coarsely punctured.

DISTRIBUTION.— Costa Rica.

COSTA RICA: San Ignacio de Acosta, San José, 5-VII-63, 1000 m, No. 27, 28, tree twigs, S. L. Wood.

BIOLOGY.— This species was taken from pith tunnels in twigs 3–5 mm in diameter. As nearly as could be determined, a larva

completed its development on a volume of pith about two to three times that of its own body. It was not possible to distinguish the parental tunnel from the areas enlarged by the larvae.

NOTES.— The above treatment was based on the type series of 34 specimens. Comparisons to *robai* were based on myhomotypes; those to *coffeae* were based on specimens bearing data identical to that of the type and agreeing in all details to the original description and to notes sent by Schedl comparing *perplexus* to the type of *coffeae*.

### 26. *Cnesinus atavus* Wood

*Cnesinus atavus* Wood, 1968, Great Basin Nat. 28:106 (Holotype, male; Rinconada, Veracruz, Mexico; Wood Coll.)

DIAGNOSIS.— Although not at all closely related, this species is more nearly allied to *annectens* Wood than to other known forms. It is easily distinguished by the presence of an epistomal callus in both sexes and ornamented in the male by numerous specialized bristles, by the less extensive frontal impression, by the more coarsely strigose pronotum, and by other characters mentioned in the above key.

FEMALE.— Length 2.2–2.4 mm, 2.4 times as long as wide; color dark brown.

Frons transversely impressed at level of ocular emargination, convex above, flattened below that level; epistomal callus rather high, transversely, rather broadly carinate on slightly more than median half, ornamented by coarse hair in an indefinite patch; surface of convex area to just above upper level of eyes minutely, transversely etched, granulate above; vestiture, in addition to that in impressed area, confined to sides, not conspicuous; eyes rather widely separated.

Pronotum 0.97 times as long as wide, widest just in front of middle, sides feebly arcuate on basal half, rather broadly rounded in front; surface shining, coarsely, longitudinally strigose, grooves somewhat irregular but punctures not indicated. Vestiture short, fine, mostly abraded in central area, coarser and more conspicuous on margins.

Elytra 1.5 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds to base of declivity, somewhat narrowly rounded behind; basal margins armed by rather well developed, overlapping crenulations, an indefinite row of smaller, submarginal crenulations also present; striae impressed, small punctures indicated but largely confluent; interstriae almost twice as wide as striae, closely marked by small, confused, subgranulate punctures. Declivity moderately steep, convex, except very shallowly impressed between third interstriae; striae impressed, perhaps wider than on disc, punctures obscure; interstriae rather narrowly convex on upper half, convexity greatly reduced below, surface irregular, subgranulate. Vestiture abundant, stout, short, with median interstrial rows of erect, slightly longer bristles, each bristle a little shorter than distance between rows.

MALE.— Similar to female except epistomal callus narrowly carinate, slightly higher, its upper slope ornamented by a large patch of long, reddish, specialized bristles.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: 3 km S Rinconada, 6-VII-67, 270 m, No. 170, large (2 m), dead, herbaceous plant characterized by a strong, distinctive order, by S. L. Wood.

BIOLOGY.— Specimens were taken from pith tunnels in the smaller stems. The habits evidently are similar to most other species in the genus.

NOTES.— The above treatment was based on the type series of 22 specimens.

### 27. *Cnesinus annectens* Wood

*Cnesinus annectens* Wood, 1967, Great Basin Nat. 27:86 (Holotype, female; Zamorano, Morazán, Honduras; Wood Coll.)

DIAGNOSIS.— The absence of anatomical specialization makes characterization of this species difficult. Biologically it is unique; it is the only representative of the Bothrosternini that constructs biramous egg tunnels in the cambium region of the host in the usual hylesinine fashion (see below). According to Schedl (pers. comm.), it is allied to *guadeloupensis* Eggers; however, declivital interstriae 2 is not narrowed or eliminated before the apex as in *guadeloupensis*.

FEMALE.— Length 1.9–2.5 mm, 2.2 times as long as wide; color brown with white vestiture.

Frons broadly impressed, almost concave, from upper level of eyes to epistoma, an obscure epistomal callus indicated; surface reticulate, obscurely below, coarsely above, with

small indefinite punctures rather uniformly, not closely spaced; vestiture rather widely distributed, consisting of fine, long, yellow hair, much longer above; distance between eyes equal to twice greatest width of an eye.

Pronotum 0.93 times as long as wide; very slightly wider at base, sides very feebly arcuate on about basal two-thirds, broadly rounded in front; surface coarsely, not deeply punctured, punctures evidently reticulate, almost all longitudinally confluent, very narrow, irregular interspaces smooth, shining; median line narrow, weakly raised from anterior fourth to base. Vestiture short, abundant, fine except almost scalelike near all margins.

Elytra 1.4 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds to declivital base, rather broadly rounded behind; basal crenulations small, distinct; striae rather shallowly impressed, punctures moderately large, deep; interstriae about twice as wide as striae, convex, punctures small, numerous, subgranulate, in three obscure ranks. Declivity rather steep, laterally convex, impressed between third interstriae; striae and strial punctures impressed, not reduced; interstriae as wide as striae, with granules slightly larger than on disc, uniseriate, 1 and 2 continuing to apex, 3 obscured on lower third. Vestiture abundant, erect, consisting of stout interstrial bristles, median row on each interstriae a third longer than ground cover, but shorter than distance between rows.

MALE.— Similar to female except frontal impression shorter, not as deep, frontal vestiture much shorter, some setae on upper frons three-fourths as long as distance between eyes.

DISTRIBUTION.— Honduras.

HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 566, *Verbisina agriculorum*, S. L. Wood.

BIOLOGY.— Just above the ground level in the green base of dying plants up to 4 cm in diameter, or up to a meter above the ground in larger, almost green host plants, the transverse, biramous parental tunnel was cut about half in the xylem and half in the phloem tissues. The tunnels were broad, somewhat cavelike, primitively biramous excavations with three to eight egg niches placed along one or more sides. The eggs were mixed with frass and packed in the niches. The larvae fed more or less communally in the phloem tissues, scarcely engraving the wood, until approximately the end of the second instar. By this time the female parent had cut a tunnel from the egg chamber to the pith at the central axis of the stem. All third instar larvae present were in the pith tunnels. Larvae older than the third instar were not present in the sample studied. After cutting the tunnel into the pith the parent adults appeared to abandon the tunnels, evidently to begin a second brood.

NOTES.— The above treatment was based on the type series of 118 specimens.

### 28. *Cnesinus costulatus* Blandford

Figs. 84, 87

*Cnesinus costulatus* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):137 (Lectotype, female; Volcán de Chiriquí, Chiriquí, Panama; British Mus. Nat. Hist., present designation)

*Cnesinus similis* Blackman, 1943, Proc. U.S. Nat. Mus. 94:375 (Holotype, female; Panama; U.S. Nat. Mus.); Wood, 1971, Great Basin Nat. 31:144. *Synonymy*

DIAGNOSIS.— The sulcate, bicarinate discal interstriae of this species and of *porcatus* Blandford, coupled with the long, transverse frontal carina in the female, distinguish these two species from all others in the Central American fauna. However, this species and *porcatus* are almost indistinguishable except for size and the female frons. Some individuals are distinguished with ease by characters mentioned by Blandford and in the above key, but in the series at hand every character breaks down on at least some specimens, except size (see diagnosis of *porcatus* below).

FEMALE.— Length 2.0–2.3 mm (Mexican series 2.2–2.7 mm), 2.24 times as long as wide; color black.

Frons transversely divided by an acute, high carina at level of ocular emargination, carina slightly longer than narrowest distance between eyes, a semicircular, smooth, shining area with a few minute points extending from carina to upper level of eyes, reticulate-granulate above and laterally; area below carina rather strongly impressed, flattened, subshining, closely, rather finely punctured; vestiture fine, rather sparse, shiny area above carina glabrous; eyes rather widely separated.

Pronotum 0.93 times as long as wide; widest just behind middle, sides weakly

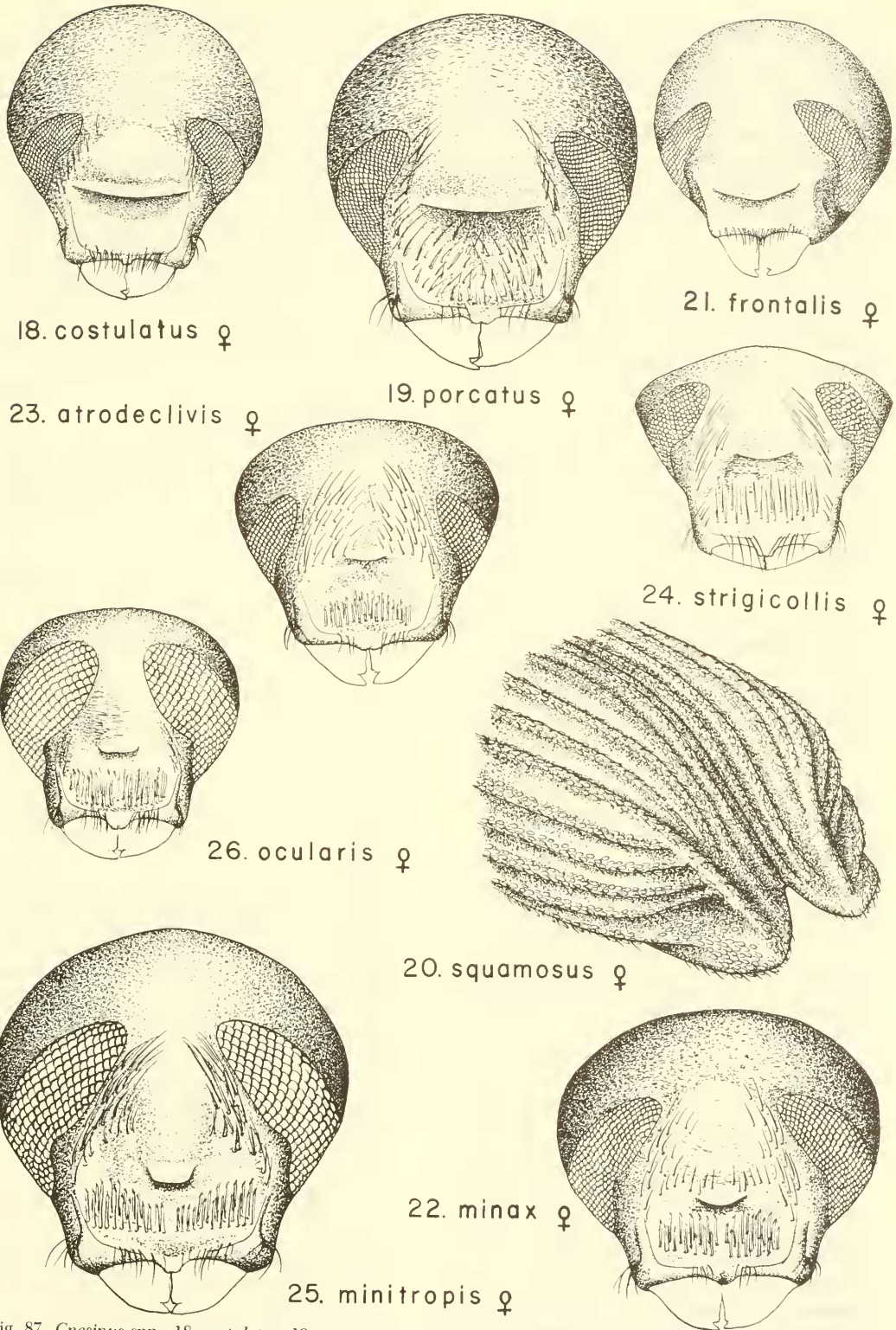



Fig. 87. *Cnesinus* spp.: 18, *costulatus*; 19, *porcatus*; 20, *squamosus*; 21, *frontalis*; 22, *prominulus* (not *minax*); 23, *adustus* (not *atrodeclivis*); 24, *strigicollis*; 25, *minitropis*; 26, *setulosus* (not *ocularis*). (After Wood 1968:97.)

arcuate on posterior two-thirds, almost parallel, broadly rounded in front; surface coarsely, longitudinally strigose, ridges slender, shining, impressions wider, rather dull, punctures obsolete. Vestiture consisting of fine, sparse, long hair.

Elytra 1.5 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel to base of declivity, rather narrowly rounded behind, declivity occupying posterior third; basal margins acutely elevated in a continuous costa, crenulations not indicated; striae abruptly, rather deeply impressed, shining, punctures largely confluent but clearly indicated except on 1, rather large; interstriae as wide as striae, margins narrowly elevated, shining, median half sulcate, dull, punctures very fine, obscure. Declivity rather steep, convex; striae about as on disc; interstriae narrower, convex, with a single, median costa on upper third of each interstriae, costa broken into a series of small, subserrate granules below. Vestiture of very fine, hairlike setae on disc, somewhat coarser and more abundant on declivity; consisting of interstrial rows of very closely set, erect setae about as long as distance between rows, and sparse, finer, shorter, strial and interstrial hair.

MALE.— Similar to female except frontal carina absent, upper area uniformly reticulate, lower area less strongly impressed.

DISTRIBUTION.— Oaxaca to Colombia.

MEXICO: **Oaxaca**: 24 km S Valle Nacional, 20-V-71, 1300 m, D. E. Bright. COSTA RICA: Pandora, Limón, 23-VIII-63, 50 m, No. 141, dead tree seedling, No. 149, broken tree branch; Volcán, Puntarenas, 11-XII-63, 1000 m, No. 304, broken tree branch; San Ignacio de Acosta, San José, 5-VII-63, 1600 m, No. 37, woody vine; all by S. L. Wood. PANAMA: Bugaba and Volcán de Chiriquí, Chiriquí, G. C. Champion. OTHER COUNTRIES: Colombia.

HOSTS.— At least two tree species and a woody vine.

BIOLOGY.— Essentially as in most of the preceding species of this genus.

NOTES.— Two series of my Costa Rica specimens were compared directly to the remaining six of Blandford's original nine syntypic specimens now in the British Museum (Natural History). Blandford's first syntype, a female from Volcán de Chiriquí, is here designated as the lectotype of the species. In addition to the type series 43 other specimens were used to prepare the above treatment.

### 29. *Cnesinus porcatus* Blandford
Fig. 87

*Cnesinus porcatus* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):137 (Lectotype, female; Cerro Zunil, Volcán de Chiriquí, Panama; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— Distinguishing features as in the above diagnosis of *costulatus* Blandford. In addition, the lower area on the female frons is more strongly impressed, with the vestiture usually more abundant and longer; above the carina the frons is uniformly reticulate (in *costulatus* the transition from the smooth, shining area to the dull, reticulate area is abrupt.)

FEMALE.— Length 2.8–3.1 mm, 2.30 times as long as wide; color black.

Frons uniformly reticulate above carina, with minute punctures; below carina broadly, concavely impressed, lateral margins partly acute, otherwise as in *costulatus*. Pronotum and elytra as in *costulatus*.

MALE.— As in male of *costulatus* except lower frons more broadly, deeply impressed, punctures smaller, obscure.

DISTRIBUTION.— Guatemala to Venezuela.

GUATEMALA: Cerro Zumil, Quezaltenango, G. C. Champion; Volcán de Agua, Esquintla, 19-V-64, 1000 m, No. 619, cut woody vine, S. L. Wood. COSTA RICA: Escasu, San José, 2-X-63, 1300 m, No. 218 cut seedling, No. 219, *Orcopanax capitatus*; San Pedro de Monte de Oca, San José, 88-17978, R. Mendez. PANAMA: Volcán de Chiriquí, Chiriquí, G. C. Champion, and 11-I-64, 1800 m, No. 388 *Quercus* twig, No. 414 dead tree seedling, S. L. Wood. VENEZUELA: Exact locality not recorded, Moritz.

HOSTS.— *Oreopanax capitatus*, *Quercus* sp., two other tree species, and a woody vine.

NOTES.— The six syntypic specimens in the British Museum (Natural History) were compared directly to my Panama and Guatemala specimens. Since a type for this species has never been designated, I here designate a female from Volcán de Chiriquí as the lectotype of the species. The lectotype, 2 lectoparatypes, and 37 other specimens were used to prepare the above treatment.

### 30. *Cnesinus squamosus* Wood
Fig. 87

*Cnesinus squamosus* Wood, 1968, Great Basin Nat. 28:102 (Holotype, female; Lower Río Tempisque, Guanacaste, Costa Rica; Wood Coll.)

DIAGNOSIS.— This unique species is the most aberrant in the genus known to me. The

broad, scalelike ground vestiture, the strongly produced, suturally emarginate elytral spices, and the rather strongly elevated elytral interstriae 1, 5, and 9 distinguish it from all others.

FEMALE.— Length 1.7–2.1 mm, 2.5 times as long as wide; color brown.

Frons with a very low, crescent-shaped, transverse carina at level halfway between antennal bases and upper margins of eyes, convex above and moderately impressed below this carina; tufts of rather long, close, erect, reddish hair above epistomal area and at sides below carina largely obscure surface; surface granulose above, with a few short, recumbent, yellow scalelike and hairlike setae above carina; eyes separated by more than 2.5 times width of an eye; scape with a tuft of long, yellow hair.

Pronotum 1.0 times as long as wide; sides straight and parallel on basal two-thirds, rather abruptly narrowed then broadly rounded in front; surface coarsely, deeply, closely punctured, with rim of puncture of side opposite summit slightly elevated; vestiture abundant, covering entire surface, consisting of short scales, each about three or four times as long as wide, stouter posteriorly.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides straight and parallel to declivital base, posterior profile extended into a broad, emarginate process about half as long as wide; basal crenulations low, distinct; striae impressed, punctures moderately large, mostly obscured by confluence; interstriae slightly less than twice as wide as striae, surface obscured by vestiture but evidently rather coarsely, closely punctured, at least median row partly granulate. Declivity rather steep, ending below horizontal apical extension; interstriae 1, 2, and 5 reaching apex, 1 moderately, 5 strongly elevated, 3, 4, 6, 7, and 8 somewhat convex and ending near middle (3 ends in 5 in some specimens), 1 slightly elevated but ending at base of flange before attaining costal margin; costal margin raised from base of declivity to junction with rather strongly elevated 5, angulately, shallowly emarginate to suture; crests of interstriae evidently finely serrate, obscured by vestiture. Vestiture consisting of interstrial scales of two types; first, median rows of erect bristles on each interstriae about five or six times as long as wide, slightly shorter than distances between bristles between rows and within rows; second, broad scales, half as long as bristles, arranged with about one row on each side of row of bristles, anteriorly each scale slightly longer than wide, posteriorly each slightly wider than long; declivital interstriae 2 with one row of scales, no bristles.

MALE.— Similar to female except frontal carina and tufts of reddish hair absent; frontal impression greatly reduced; tuft of hair on scape reduced; elytral sculpture evidently coarser.

DISTRIBUTION.— Costa Rica, Panama, and Venezuela.

COSTA RICA: Near mouth of Río Tempisque, Guanacaste, 25-III-64, 15 m, No. 503, cut woody vine, S. L. Wood. PANAMA: Paraíso, Canal Zone, 5-III-11 and 11-V-11, E. A. Schwarz. OTHER COUNTRIES: Venezuela.

HOST.— *Serjania* spp.

BIOLOGY.— The specimens were taken from the central axis of stems less than 5 mm in diameter. The habits are similar to those of most other species in the genus.

NOTES.— The above treatment was based on the type series of 14 specimens and on 242 other specimens from Venezuela.

### 31. *Cnesinus frontalis* Wood
Fig. 87

*Cnesinus frontalis* Wood, 1968, Great Basin Nat. 28:104 (Holotype, female; Puerto Viejo, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is unique among known species in having the female carina much longer, more nearly angulate, and higher laterally but lower medially than in other species; both sexes lack specialized frontal vestiture. Other relationships are noted in the above key.

FEMALE.— Length 2.0–2.3 mm, 2.4 times as long as wide; color almost black.

Frons rather shallowly impressed at level of ocular emargination, convex above, below with a very strongly elevated, subangulate carina occupying median two-thirds, its lateral angles highest; short area below carina somewhat flattened, with median area distinctly raised; surface above carina reticulate; vestiture sparse, inconspicuous.

Pronotum 1.1 times as long as wide; sides straight on basal two-thirds, very slightly wider in front of middle, rather broadly rounded in front; surface rather coarsely, rather deeply punctured, each puncture about twice as long as wide, many confluent; vestiture hairlike, inconspicuous except in front and at sides.

Elytra 1.4 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel to declivital base, rather broadly rounded behind; bases slightly elevated, crenulations not indicated except for submarginal, coarse punctures; striae very weakly impressed, punctures rather large, moderately deep, close, completely confluent on posterior third of disc; interstriae about twice as wide as striae, almost flat, punctures fine, deep, abundant, confused. Declivity steep, convex, somewhat flattened in median area; striae 1 slightly impressed, others not impressed, punctures small, deep; interstriae 1 slightly elevated, 3 very slightly convex, all armed by rows of rather large, rounded granules. Vestiture largely restricted to declivity, consisting of moderately long, interstrial rows of bristles and short, more abundant, similar bristles, longer ones about equal in length to distance between rows.

MALE.— Similar to female except frontal carina absent, a broad, transverse, epistomal callus present with a scanty brush of erect hair on its upper margin; a pair of small rounded calluses in frontal impression.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Puerto Viejo, Heredia, 12-III-64, 70 m, No. 479, woody vine; Peralta, Cartago, 10-III-64, about 70 m, No. 463, wood vine; all by S. L. Wood.

BIOLOGY.— Evidently similar to most other species in the genus.

NOTES.— The above treatment was based on the type series of 37 specimens.

### 32. *Cnesinus denotatus* Wood

*Cnesinus denotatus* Wood, 1968, Great Basin Nat. 28:107 (Holotype, female; Barro Colorado Island, Canal Zone, Panama; Wood Coll.)

DIAGNOSIS.— This species is allied to *frontalis* Wood, but it is easily distinguished by the smaller size, by the mroe finely punctured pronotum, and by the much narrower, higher female frontal carina.

FEMALE.— Length 1.8–1.9 mm, 2.4 times as long as wide; color dark reddish brown.

Frons rather strongly impressed at level of ocular emargination, convex above, flattened below this level, with a very strongly elevated, transverse carina at level of antennal insertion, its transverse length equal to about one-fourth distance between eyes, almost as high as wide; surface minutely reticulate-granulate; vestiture reduced, short, largely confined to lateral areas.

Pronotum 1.07 times as long as wide; sides straight and almost parallel on basal two-thirds, very slightly wider in front of middle, rather broadly rounded in front; surface shining, very closely, rather finely punctured, punctures slightly longer than wide, mostly longitudinally confluent. Vestiture mostly on marginal areas, short, stout.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds to declivital base, then rather narrowly rounded behind; crenulations on basal margins indistinct, marked by rather large, submarginal punctures; striae impressed, punctures moderately large, partly confluent; interstriae wider than striae, subshining, punctures fine, abundant, confused. Declivity moderately steep, convex except impressed between third interstriae; striae 1 moderately, others not impressed; interstriae 1 feebly elevated, 2 weakly impressed, 3 higher but feebly convex, each with a row of setiferous granules. Ground vestiture rather abundant, stout, hairlike on disc, scalelike and almost as wide as long on declivity; rows of interstrial bristles erect, each bristle stout, very slightly longer than distance between bristles within a row or between rows.

MALE.— Similar to female except frontal carina absent, a weak, shining, epistomal callus present; declivital bristles very slightly flattened.

DISTRIBUTION.— Costa Rica, Panama, and Venezuela.

COSTA RICA: Santa Ana, San José, 4-X-63, 1000 m, No. 219, *Oreopanax capitatus*, S. L. Wood. PANAMA: Barro Colorado Island, Canal Zone, 27-XII-63, 70 m, No. 341, blacklight, S. L. Wood.

BIOLOGY.— The allotype was taken from the central axis of a twig 5 mm in diameter. The habits evidently are similar to most other species in the genus.

NOTES.— The above treatment of this species was based on the type series of two specimens and on one other specimen.

### 33. *Cnesinus minax* Schedl

*Cnesinus minax* Schedl, 1952, Dusenia 3:352 (Holotype, female; Mexico; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *prominulus* Wood by the stouter body, by the smaller size, by the less abundant, longer vestiture, by the color, and by other minor details.

FEMALE.— Length 2.5 mm, 2.5 times as long as wide; color brown.

As in *prominulus* except as noted in the above diagnosis.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: Motzorongo.

NOTES.— The above treatment was based on the holotype labeled "Mexico, Flohr," and on two specimens in the British Museum (Natural History) from Motzorongo, Veracruz, reported by Blandford (1896:139) as *strigicollis*. The pins, mounting cards, glue, and condition of the specimens strongly suggest that all three specimens came originally from the same series.

### 34. *Cnesinus prominulus* Wood
Fig. 87

*Cnesinus prominulus* Wood, 1977, Great Basin Nat. 37:212 (Holotype, female; Volcán Colima, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is allied to *adustus* Schedl but is distinguished by characters mentioned in the above key and in the diagnosis of that species.

FEMALE.— Length 2.7–3.3 mm (males 2.4–3.1 mm), 2.7 times as long as wide; color dark brown, pronotum somewhat reddish.

Frons shallowly impressed at level of antennal bases, flattened and with acute lateral margins below, weakly convex above that point; transverse frontal carina at level of ocular emargination moderately high, short, about equal in width to one-fourth distance between eyes; median third above carina transversely etched, glabrous, lateral areas obscurely punctured, bearing rather abundant, long, course, yellow hair; epistomal callus absent, brush of reddish, ornamental bristles well developed.

Pronotum 1.07 time as long as wide; sides feebly arcuate, almost straight, from base to widest point two-thirds length from base, broadly rounded in front; surface longitudinally strigose, ridges irregularly sinuate, as wide as grooves, punctures of grooves entirely obsolete; median line narrowly elevated on more than basal half. Vestiture consisting of short, stout setae on entire surface, longer anteriorly.

Elytra 1.6 times as long as wide, 1.9 times as long as pronotum; sides almost straight and parallel on more than basal two-thirds to declivital base, rather narrowly rounded behind; basal crenulations low, distinct on median half, a few submarginal crenulations on interstriae 2–4; striae impressed, punctures small, shallow, separated by distances equal to their own diameters, interstriae about twice as wide as striae, subshining, confused setiferous punctures granulate. Declivity steep, convex except shallowly impressed between third interstriae; striae 1 impressed, others not impressed except above; interstriae 1 slightly elevated, 2 weakly impressed, 3 broadly convex, 3 armed by a row of fine granules. Vestiture abundant on disc and declivity, very slightly longer on declivity; consisting of rows of stout, erect, interstrial bristles, each bristle slightly shorter than distances between bristles within a row or between rows, and shorter, more abundant ground vestiture of fine to stout strial and interstrial setae, each seta up to two-thirds length of a bristle.

MALE.— Similar to female except frontal carina absent, impression more extensive, shallowly concave, deepest at level of ocular emargination, epistomal callus weakly indicated, its brush of ornamental bristles reduced to about one row of yellowish bristles.

DISTRIBUTION.— Jalisco.

MEXICO: Jalisco: Volcán Colima, 23-VI-65, 2500 m, No. 107, twigs of shrub, S. L. Wood.

BIOLOGY.— My series was taken from pith tunnels in small twigs. Evidently the habits are similar to most other species in the genus.

NOTES.— The above treatment was based on the type series of 32 specimens, on my homotype that was compared directly to the female holotype; and on 30 other specimens bearing identical data.

### 35. *Cnesinus adustus* Schedl
Fig. 87

*Cnesinus adustus* Schedl, 1949, Rev. Brasil Biol. 9:266 (Holotype, female; Turrialba, Costa Rica; Schedl Coll.)

*Cnesinus atrodeclivis* Wood, 1968, Great Basin Nat. 28:108 (Holotype, female; Zamorano, Morazán, Honduras; Wood Coll.); Wood, 1974, Great Basin Nat. 34:279. *Synonymy*

DIAGNOSIS.— This species is allied to *minax* Schedl, but it may be distinguished by the smaller size, by the coarser, shorter vestiture, by the more strongly impressed declivital striae, and by the more extensively flattened female frons.

FEMALE.— Length 2.0–2.3 mm, 2.5 times as long as wide; color dark reddish brown, declivity much darker.

Frons transversely impressed at level of antennal insertion, flattened above this level to upper level of eyes, except weakly transversely convex between eyes; armed at level of ocular emargination by a minute, crescent-shaped, transverse carina; transverse length of carina about equal to one-sixth distance between eyes; epistomal callus weakly developed, its upper slope ornamented by a rather large patch of reddish ornamental bristles; surface rather coarsely reticulate on median third, broad lateral areas above carina ornamented by rather numerous, very long, stout, yellow hair.

Pronotum 1.06 times as long as wide; shape, sculpture, and vestiture as in *denotatus* (above) except surface more nearly strigose, punctures virtually obsolete.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds to declivital base, rather narrowly rounded behind; basal crenulations very low, poorly formed, interstriae 2–4 bearing several submarginal, indistinct crenulations; striae impressed, punctures moderately large, most confluent on 1 and 2; interstriae wider than striae, punctures fine, numerous, confused, subgranulate. Declivity steep, convex except slightly flattened toward suture; striae impressed, punctures not reduced, largely confluent; interstriae convex, each with a median row of setiferous punctures. Vestiture rather abundant, stout; ground vestiture more than half as long as rows of interstrial bristles on disc; ground vestiture and bristles merge on declivity to form closly set, almost uniseriate rows of short bristles.

MALE.— Similar to female except frontal impression extending to level of ocular emargination, convex above this level, impressed area subconcave; frontal carina absent, its ornamental bristles reduced to a single, transverse row.

DISTRIBUTION.— Honduras.

HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 548, *Valeriana scandens*, S. L. Wood.

BIOLOGY.— All specimens were taken from pith tunnels in the central axis of stems less than 3 mm in diameter. Habits evidently are similar to most other species in the genus.

NOTES.— The above treatment was based on the holotype of *adustus* and on the type series of seven specimens of *atrodeclivis*.

### 36. *Cnesinus pilatus* Wood

*Cnesinus pilatus* Wood, 1975, Great Basin Nat. 35:24 (Holotype, female; 13 km W El Palmito, Sinaloa, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *strigicollis* LeConte by the larger size, by the stouter body form, by the different female frons, by the absence of tubercles on declivital interstriae 2, and by other characters noted below.

FEMALE.— Length 3.1 mm, 2.1 times as long as wide; color dark brown, elytra dark reddish brown.

Frons as in *strigicollis* except area below carina slightly less strongly impressed, distance between eyes 0.8 times as wide as width at level of antennal insertion (as in *strigicollis*), carina 0.5 times as wide as distance between eyes, median impunctate area above carina larger, extending above upper level of eyes, vestiture in lateral areas not extending above upper level of eyes and not on me dian third at vertex (extending well above eyes and almost to median line in *strigicollis*).

Pronotum 0.9 times as long as wide; about as in *strigicollis* except more closely, slightly more coarsely strigose.

Elytra 1.3 times as long as wide, 1.7 times as long as pronotum; similar to *strigicollis* except interstriae three times as wide as striae, declivity more broadly impressed, declivital interstriae 2 devoid of granules, vestiture about half as long, stouter, interstriae 2 on declivity with a row of punctures, each puncture about two-thirds as large as those of adjacent striae.

DISTRIBUTION.— Sinaloa.

MEXICO: Sinaloa: 13 km W El Palmito, 7-VIII-64, H. F. Howden.

NOTES.— The above treatment was based on the holotype.

### 37. *Cnesinus strigicollis* LeConte
Fig. 87

*Cnesinus strigicollis* LeConte, 1868, Trans. Amer. Ent. Soc. 2:171 (Lectotype, female; Illinois; Mus. Comp. Zool., 976, present designation)

*Nemophilus strigillatus* Chapuis, 1869, Synopsis des Scolytides, p. 27 (Syntypes; Amerique boreale, Texas; Brussels Mus.); LeConte, 1876, Proc. Amer. Philos. Soc. 15:378. *Synonymy*

DIAGNOSIS.— This species is distinguished from *carinatus* Wood by the smaller size, by the more narrowly separated eyes, by the coarser elytral vestiture, by the distribution and, in the female, by the shorter frons, the longer carina, and the much more strongly convex area above the carina.

FEMALE.— Length 2.2–2.7 mm, 2.5 times as long as wide; color dark reddish brown.

Frons strongly, transversely impressed immediately below level of ocular emargination, then abruptly elevated to transversely elevated, slightly procurved carina, convex above carina, impressed and flattened below; epistomal margin finely, weakly elevated, epistomal callus almost absent, impressed area bearing a rather large patch of reddish, ornamental bristles; median third of area above carina transversely etched, glabrous, lateral areas obscurely punctured, bearing numerous long, coarse, yellow setae; area above eyes finely granulate; eyes separated by 1.8 times width of an eye.

Pronotum 1.0 times as long as wide; widest near middle, sides weakly arcuate, almost parallel on basal two-thirds, broadly rounded in front; surface longitudinally, rather coarsely strigose, ridges shining, about equal in width to dull grooves, punctures obsolete. Vestiture short, fine, hairlike, longer and stouter in marginal areas.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds to declivital base, rather narrowly rounded behind; crenulations on basal margins low, distinct, overlapping, an indefinite row of submarginal crenulations on interstriae 2–6; striae impressed, punctures rather large, shallow, almost obsolete on 1 and 2; interstriae wider than striae, punctures small, confused, about a third of them subcrenulate. Declivity moderately steep; convex except shallowly impressed between third interstriae; striae 1 impressed; others impressed on upper half only; interstriae 1 moderately elevated, 2 weakly impressed, 3 convex, 3 and upper part of 2 each bearing a row of small, rounded granules. Vestiture rather abundant, moderately coarse; consisting of recumbent, rather abundant ground vestiture and interstrial rows of erect, slightly longer, somewhat coarser bristles; bristles on declivity as long as distance between rows, spaced slightly closer within row, slightly shorter on disc.

MALE.— Similar to female except frontal carina absent, convex area almost flat; epistomal callus more conspicuous, ornamental bristles reduced to one transverse row of coarse, yellow hair; frontal surface coarsely reticulate.

DISTRIBUTION.— Michigan and New York to Texas, Florida, and Chiapas.

USA: **District of Columbia**: Washington. **Florida**: Alachua Co., Capps, Gainesville, Highlands Hammock St. Pk., Jacksonville, Key Largo, Miami, Plantation Key. **Georgia**: Savannah. **Louisiana**: Bell Chase. **Maryland**: Bladensburg, Washington Co. **Michigan**: Grand Ledge. **Missouri**: "Missouri." **New Jersey**: Newark, Westville. **New York**: Flushing (Long Island), Staten Island, Orange Mts. **North Carolina**: Myrtle Beach, Tryon. **Ohio**: Cincinnati, Delaware Co., Westerville. **Pennsylvania**: Mt. Alto. **South Carolina**: Dorchester, Florence, Myrtle Beach. **Tennessee**: "Tenn." **Texas**: Columbus, Victoria. **Virginia**: Cape Henry, Lake Drummond, Ft. Monroe, Rosslyn. **West Virginia**: Monongalia Co., Upshur Co. MEXICO: **Chiapas**: Junction of Highways 190 and 195, Chiapa del Corzo.

HOSTS.— *Amerimonon brownei*, *Ardesia paniculata*, *Bumelia lanuginosa*, *Carya* spp., *Coccolobis laurifolia*, *Dipholis salicifolia*, *Fagus grandifolia*, *Liquidambar styraciflua*, *Magnolia glauca*, *Pyrus communis*, *Quercus* sp., *Smiliax* sp., *Toxoxylon pomiferum*.

BIOLOGY.— Schwarz (1891:79) observed a female of this species in a Sweet Gum branch 30 mm in diameter. A female cut a tunnel through the bark and about 6 mm into the wood, where the tunnel turned to continue an undulating course parallel to the grain of wood to a total length of 17 mm, ending 5 mm from the outer surface. This species ordinarily selects twigs or other woody stems considerably smaller than that observed by Schwarz, and the tunnels normally reach the central axis of the stem. All the stems I have seen attacked by this species were less than

10 mm in diameter. The larvae extend the parental tunnel and evidently always emerge through the original entrance hole.

NOTES.— The above treatment was based on two LeConte syntypes and on 294 other specimens. Consistent geographical variation was not apparent.

Blandford reported this species from Motzorongo, Veracruz, Mexico, in error. The Flohr specimens he reported actually are of *minax* Schedl. Of the two syntypes on which LeConte based his species, I here designate the first, a female, as the lectotype of *strigicollis*. Two specimens from Chiapas (Mexico) in the Canadian National Collection may be of this species. The female has the specialized bristles on the lower frons in a uniseriate, transverse row and the lateral setae above the carina are longer. More material is needed to determine the significance of these deviations.

### 38. *Cnesinus carinatus* Wood

*Cnesinus carinatus* Wood, 1967, Great Basin Nat. 27:88 (Holotype, female; Ciudad Hidalgo, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *minax* Schedl by the great reduction of pronotal and elytral vestiture, by the much more strongly impressed elytral declivity, by the smaller size, and, in the female, by the slightly wider frontal carina, with the frons more strongly impressed below the carina and less strongly impressed above.

FEMALE.— Length 2.5–3.1 mm, 2.7 times as long as wide; color brown.

Frons with a transverse carina at level of ocular emargination, eyes separated by 2.6 times its transverse length, rather weakly convex above carina, rather strongly impressed, flattened below this point; surface above and below carina reticulate, finely punctured and pubescent; vestiture above yellow, moderately long, abundant, shorter in median area, below carina reddish, erect, arranged in a narrow, transverse brush not reaching epistomal margin; eyes separated by a distance equal to 2.3 times greatest width of an eye.

Pronotum 1.09 times as long as wide; sides almost straight on basal two-thirds, very slightly wider in front of middle; surface rather coarsely, longitudinally strigose to base; punctures almost entirely obsolete; vestiture confined to marginal areas.

Elytra 1.8 times as long as wide, 2.0 times as long as pronotum; sides almost straight and parallel to base of declivity, rather broadly rounded behind; basal crenulations low, distinct, with a few small submarginal crenulations on interstriae 2–5; striae impressed, punctures small, impressed; interstriae about twice as wide as striae, convex, surface somewhat irregular, punctures fine, confused, median row evidently subgranulate. Declivity steep, rather strongly impressed between third interstriae as in *flavopilosus*; striae 1 moderately impressed, others not impressed, punctured reduced; interstriae 1 convex, moderately elevated, 2 impressed, elevated laterally, elevation continuing to moderately high summit on 3, each interstriae with a row of fine granules, granules very feeble except on 3. Vestiture hairlike, those on median row of each interstriae longer and stouter, particularly on declivital interstriae 3 and laterally; bristles on declivital interstriae 1 and 2 not longer than on disc, some of those on 3 twice as long.

MALE.— Similar to female except frontal carina absent; frons concavely impressed on lower two-thirds of area below upper level of eyes, entire frons pubescent, but setae longer and more abundant at sides and along smaller epistomal brush.

DISTRIBUTION.— Michoacán.

MEXICO: Michoacán: 6 km west Ciudad Hidalgo, 16-VII-53, 2000 m, No. 107, in twigs of a small rosaceous tree somewhat resembling apple, S. L. Wood.

BIOLOGY.— Young adults were removed from pith tunnels along the central axis of stems less than 1 cm in diameter. Evidently the habits are similar to most other species in the genus.

NOTES.— All 16 specimens in the type series were examined during this study.

### 39. *Cnesinus setulosus* Blandford

Figs. 84, 87

*Cnesinus setulosus* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):139 (Lectotype, male; Tolé, Chiriquí, Panama; British Mus. Nat. Hist., present designation)

*Cnesinus flavopilosus* Schedl, 1940, An. Esc. Nac. Cienc. Biol., Mexico 1:333 (Holotype, male?; Comitán, Mexico; Schedl Coll.); Wood, 1972, Great Basin Nat. 32:144. *Synonymy*

*Cnesinus panamensis* Blackman, 1943, Proc. U.S. Nat. Mus. 94:372 (Holotype, male, Panama; U.S. Nat. Mus., 56549); Wood, 1972, Great Basin Nat. 32:144. *Synonymy*

*Cnesinus cognatus* Blackman, 1943, Proc. U.S. Nat. Mus. 94:373 (Holotype, female; El Petén Province, Guatemala; U.S. Nat. Mus., 56550); Wood, 1971, Great Basin Nat. 31:144. *Synonymy*

DIAGNOSIS.— This species is closely related to *adusticus* Wood, but may be distinguished by characters summarized in the above key. The spacing between the eyes may be highly variable between and within series.

FEMALE.— Length 1.8–2.5 mm, 2.6 times as long as wide; color dark brown, vestiture almost white.

Frons with a slightly procurved, transverse carina at level of ocular emargination, its length equal to 1.7 times distance between eyes, weakly convex and coarsely reticulate above carina, transversely, rather strongly impressed and flattened below; epistomal callus very obscure, its upper margin marked by one transverse row of reddish, ornamental bristles; other vestiture confined to lateral areas from just below level of carina to upper level of eye, coarse, abundant, rather long; eyes separated by 0.6–1.6 times width of an eye (variable within and between series).

Pronotum 1.1 times as long as wide, very slightly wider anteriorly, sides almost straight and parallel on basal two-thirds, rather broadly rounded in front, coarsely, longitudinally strigose, most furrows rather short, subreticulate, ridges shining, mostly narrower than grooves, punctures obscurely evident (variable). Vestiture short, covering entire surface, very fine on disc, stout on all margins.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds to declivital base, rather narrowly rounded behind; crenulations on basal margins distinct, with smaller submarginal crenulations on interstriae 2–4; striae impressed, punctures incrasingly confluent toward suture; interstriae slightly wider than striae, punctures rather coarse, close, confused, their anterior margins very slightly elevated but not granulate. Declivity steep, convex except shallowly impressed between third interstriae; striae less strongly impressed, punctures clearly but not sharply impressed; interstriae 1 very feebly elevated, 2 weakly impressed, 3 slightly elevated, narrowly convex, setiferous punctures uniseriate on 1–3. Vestiture consisting of rows of rather short, stout, interstrial bristles, each not longer than distance between rows, usually not evident on basal half of disc, and slightly shorter, semirecumebnt, more abundant, interstrial ground vestiture, each seta at least as wide as bristles (except very slightly narrower in one Honduras series).

MALE.— Similar to female except frontal carina absent, transverse row of ornamental bristles yellowish, less strongly modified.

DISTRIBUTION.— Colima and Tamaulipas to Panama

MEXICO: **Chapuis**: 49 km W Lazardo Cardenes, 25-VI-69, Campbell and Bright. **Colima**: 3 km W Armeria, 28-VI-65, 70 m, No. 152, tree twigs, S. L. Wood. **Oaxaca**: 157 km N Oaxaca, 18-V-71, at light, D. E. Bright; 116 km S Oaxaca on Highway 131, 11-V-71, 2200 m, *Arbutus*, D. E. Bright. **Tamaulipas**: Victoria, 22-V-52, M. Cazier. GUATEMALA: El Petén Province, 8-IV-22, H. F. Loomis; Palin, Esquintla, 19-V-64, 350 m, No. 591, Cola de Pavo twigs, S. L. Wood. HONDURAS: Olanchito, Yoro, 7, 30-VII-49, at light, E. C. Becker; San Lucas, Paraíso, 22-IV-64, 800 m, *Serjania mexicana*, S. L. Wood; Zamorano, Morazan, 18-IV-64, 700 m, No. 546, *Acacia pennatula* twigs, S. L. Wood. PANAMA: Ancón, Canal Zone, IV-11, Kraft; "Panama."

HOSTS.— *Acacia pennatula*, *Serjania mexicana*, etc.

BIOLOGY.— Specimens were taken from axial pith tunnels in small twigs or vines. The habits appeared to be as in other species of the genus.

NOTES.— During this study 53 examples of this species were examined, including the lectotype of *setulosus* and the holotypes of *panamensis* and *cognatus*. A male and female from my Palin series were compared by Schedl to the type of *flavopilosus*. The above descriptions were prepared from a female homotype of *cognatus* from Olanchito, Honduras, a male homotype of *panamensis* from Ancon, Panama, and the male lectotype from Tolé, Panama, and a male lectoparatype from San Lorenzo, Panama, of *setulosus*.

From Blandford's series of three male syntypes, the first, from Tolé, Chiqiruí, Panama, has been considered the type for practical reasons. This male is here designated as the lectotype of *Cnesinus setulosus* Blandford.

This is a highly variable species; no two series were exactly alike. The eyes of Mexican and some Honduras specimens were

more narrowly separated and the declivital ground vestiture was more nearly scalelike. The Panama specimens tended to have the eyes more widely placed and the pronotum less strongly strigose, with most punctures clearly isolated. Specimens from intermediate localities usually exhibited intermediate characters, but each series was slightly different. Considerably more material from the area south of Guatemala must be examined before geographical races or other variant forms can be characterized. It is possible that *flavopilosus* represents a subspecies.

### 40. *Cnesinus minitropis* Wood
Fig. 87

*Cnesinus minitropis* Wood, 1968, Great Basin Nat. 28:105 (Holotype, female; San Ignacio de Acosta, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *minax* Schedl by the more closely placed eyes, by the finer pronotal and elytral vestiture, by the longer lateral bristles on the elytral declivity, by the presence of a transverse band of dark scales at the base of the elytral declivity, by the slightly wider impression on the elytral declivity, and, in the female, by the slightly smaller frontal carina.

FEMALE.— Length 3.0–3.2 mm, 2.5 times as long as wide; color very dark brown, elytra slightly lighter, vestiture almost white except for a narrow transverse band of dark setae across elytral base.

Frons flattened on lower half, convex above, a short, transverse, procurved carina occupying less than median third; epistoma ornamented by a dense brush of long, suberect, reddish bristles; surface of upper area minutely, transversely etched, punctured above upper level of eyes; vestiture limited to epistomal brush and sides above, setae in lateral areas very long, coarse, rather abundant near eyes; eyes separated by less than 1.1 times width of an eye, by 2.4 times width of frontal carina.

Pronotum 1.03 times as long as wide; sides almost straight on basal two-thirds, widest in front of middle, rather broadly rounded in front; surface rather coarsely, longitudinally strigose, narrow, impunctate median line slightly elevated; vestiture mostly of fine, short, inconspicuous hair, with some scalelike setae at base and on anterior third.

Elytra 1.6 times as long as wide, 1.7 times as long as pronotum; sides straight and parallel on basal two-thirds to base of declivity, rather broadly rounded behind; basal crenulations distinct, low, a few submarginal crenulations on interstriae 2–5; striae impressed, punctures partly confluent, usually distinct; interstriae about twice as wide as striae, weakly convex, surface irregular, punctures fine, abundant, confused, mostly subgranulate. Daclivity steep, convex except weakly impressed between third interstriae; striae 1 slightly impressed; interstriae 1 slightly elevated, punctures rather small, deep; interstriae with median rows of small, setiferous rounded granules. Vestiture consisting of interstrial rows of erect, stout bristles, bristles on disc separated within rows and between rows by distances equal to length of a bristle, slightly longer in lateral areas on declivity; ground vestiture more abundant, consisting of narrow scales about half as long as bristles, each scale about four times as long as wide, largely eliminated on declivity.

MALE.— Similar to female except frontal area concavely impressed over broad area, vestiture very slightly shorter.

DISTRIBUTION.— Costa Rica.

COSTA RICA: San Ignacio de Acosta, San José, 5-VII-63, 1000 m, twigs of a cultivated tree, S. L. Wood.

HOST.— A cultivated tree, probably *Annona* sp.

BIOLOGY.— The specimens were taken from pith tunnels in small twigs. Evidently the habits are similar to those of most other species in the genus.

NOTES.— The above treatment was based on the six specimens in the type series.

### 41. *Cnesinus adusticus* Wood

*Cnesinus adusticus* Wood, 1967, Great Basin Nat. 27:87 (Holotype, female; Los Amendros, Paraíso, Honduras; Wood Coll.)

DIAGNOSIS.— This species is allied to *setulosus* Blandford and *minitropis* Wood, but it may be distinguished by characters summarized in the above key.

FEMALE.— Length 2.6–3.3 mm, 2.4 times as long as wide; color reddish brown, with white and cinereous vestiture.

Frons with an arcuate, sharply elevated, transverse carina at level of ocular emargination occupying median one-third to one-half;

weakly convex above, flattened below carina; most of lower area covered by a brush of erect reddish bristles; upper area minutely, transversely strigose in central area, punctured and granulose at sides and above; lateral areas above carina and below upper level of eyes bearing rather abundant, long, erect, plumose, yellow setae; eyes separated by a distance equal to 1.0–1.6 times the greatest width of eye.

Pronotum 1.05 times as long as wide; widest in front of middle, sides weakly arcuate, strongly rounded anteriorly, then rather broadly rounded in front; surface longitudinally rather coarsely strigose, most punctures confluent; vestiture scanty except in marginal areas, partly almost scalelike at base and near anterior margin.

Elytra 1.5 times as long as wide, 1.5 times as long as pronotum; crenulations on elytral bases not well developed; striae impressed, punctures rather large, very close; interstriae about one and one-half times as wide as striae, surface irregular, punctures confused, some median ones partly granulate. Declivity moderately steep, impressed between third interstriae; striae not impressed, punctures rather large, deep; interstriae 1 rather weakly elevated, 2 impressed, essentially flat, 3 and evidently part of lateral area forming a rather abrupt, moderately high crest, lateral interstriae ending in this rounded summit, declining and obsolete before apex; each interstriae bearing a row of small setiferous granules. Vestiture fine, almost hairlike on anterior two-thirds of disc, becoming coarse and scalelike behind; consisting of rather abundant, short, interstrial setae and rows of longer, erect setae, none as long as distance between rows.

MALE.— Similar to female except frontal carina absent, upper area more strongly convex, reticulate, lower area more broadly flattened; epistomal brush somewhat reduced, yellow.

DISTRIBUTION.— Honduras to Colombia.

HONDURAS: Los Amendros, Paraíso (near Zamorano), 18-IV-64, 700 m, No. 546, *Acacia pennatula*, S. L. Wood. COSTA RICA: San José, San José, 22-X-63, 1300 m, No. 172, woody vine, S. L. Wood. OTHER COUNTRIES: Finca El Bosque, Caicedonia, Valles, Colombia, 20-VI-59, coffee, J. Restrepo.

HOSTS.— *Acacia pennatula*, *Coffea arabica*, and a woody vine.

HABITS.— Specimens were taken from twigs and small branches 5–40 mm in diameter. The pith tunnels indicated habits similar to those of most other species in the genus.

NOTES.— The above treatment was based on the holotype, allotype, 37 paratypes, and 13 additional specimens. See the above taxonomic notes under *setulosus* for possible confusion involving this species.

## GENUS *PAGIOCERUS* EICHHOFF

*Pagiocerus* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:148 (Type-species: *Pagiocerus rimosus* Eichhoff = *Bostrichus frontalis* Fabricius, subsequent designation, by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:126)

DIAGNOSIS.— This genus is distinguished from other Central American Bothrosternini by the procurved antennal sutures, by the rounded lateral margins of the prothorax, by the stout body form, by the distinctive frons, and by the seed-boring habit.

DESCRIPTION.— Length 1.9–2.6 mm, 1.9 times as long as wide; sexes almost identical; front moderately excavated on lower two-thirds, with lateral margins acute and a large, median, epistomal tubercle, subglabrous. Eyes sinuate, finely granulate; widely separated. Antennal funicle 7-segmented; club slender, 1.8 times as long as wide, basal half marked by two moderately procurved sutures, suture 3 entirely obsolete. Pronotum moderately constricted anteriorly, surface punctured, unarmed. Scutellum small, round. Crenulations on elytra obscure, very poorly developed, basal margins slightly elevated; striae impressed, punctures mostly distinct; interstriae irregular, punctured, unarmed. Declivity convex, moderately steep. Vestiture hairlike; short, mostly in interstrial rows on declivity.

DISTRIBUTION.— Southeastern United States to Argentina; occasionally intercepted in South American shipments of corn to other parts of the world. Five species are known, only one occurs north of South America.

BIOLOGY.— The adult beetle, presumably the female, bores into the large seeds of various trees or other plants, notably *Zea mays*,

where she is joined by a male and the brood is reared.

### *Pagiocerus frontalis* (Fabricius)
Fig. 88

*Bostrichus frontalis* Fabricius, 1801, Systema Eleutheratorum 2:389 (Syntypes; Carolina; Copenhagen Mus.)

*Pagiocerus frontalis*: Eggers, 1929, Wiener Ent. Ziet. 46:42

*Pagiocerus rimosus* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:148 (Syntypes?; Cuba; evidently destroyed in the Hamburg Mus.); Schedl, 1960, Coleopt. Bull. 14:6. *Synonymy*

*Bothrosternus hubbardi* Schwarz, 1886, Ent. Americana 2:54 (Holotype, sex?; St. Lucie, Florida; U.S. Nat. Mus.); Anderson, 1948, Proc. Ent. Soc. Washington 50:215. *Synonymy*

*Hylastinus fiorii* Eggers, 1908, Ent. Blätt. 4:215 (Holotype, sex?; Genoa, Italy; Andr. Fiori Coll., Bologna).

*Pagiocerus fiorii*: Eggers, 1940, Ent. Blätt. 36:62; Schedl, 1960, Coleopt. Bull. 14:6. *Synonymy*

*Pagiocerus zeae* Eggers, 1928, Archiv. Inst. Biol. 1:92 (Syntypes); Eggers, 1940, Ent. Blätt. 36:62 (*Synonymy*); Schedl, 1960, Coleopt. Bull. 14:6 (*Synonymy*); Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:36 (Lectotype, sex?; South American corn kernels; U.S. Nat. Mus. 60312)

*Pagiocerus chiriquensis* Eggers, 1928, Archiv. Inst. Biol. 1:92 (Holotype, sex?; Volcán, Chiriquí, Chiriquí, Panama; not in U.S. Nat. Mus., apparently on loan to Schedl); Schedl, 1960, Coleopt. Bull. 14:6. *Synonymy*

*Pagiocerus nitidus* Eggers, 1931, Ent. Blätt. 26:170 (Holotype, sex?; Caracas, Venezuela; Berlin Zool. Mus.); Schedl, 1960, Coleopt. Bull. 14:6. *Synonymy*

*Pagiocerus caraibicus* Eggers, 1940, Arb. Morph. Tax. Ent. Berlin-Dahlem 7:136 (Holotype, sex?; Trios Rivières, Guadeloupe, not in U.S. Nat. Mus., apparently on loan to Schedl); Schedl, 1960, Coleopt. Bull. 14:6. *Synonymy*

DIAGNOSIS.— This is the only representative of the genus known to occur outside of South America. The stout body, the bifid process on the anterior tibiae, the procurved antennal sutures, the distinctive frons, and other characters mentioned in the above generic key distinguish it from other North and Central American species.

FEMALE.— Length 1.9–2.6 mm, 1.9 times as long as wide; color very dark brown.

Frons impressed from upper level of eyes to just above epistoma, rather strongly concave on lower two-thirds of this area; lateral margins of deeply impressed area acutely elevated and slightly produced to form an indistinct tubercle at level of antennal insertion; epistomal margin armed by a rather large, median, pointed (usually) tubercle; impressed area at level of ocular emargination bearing a pair of small calluses and an obscure, median fovea immediately above them; surface smooth below, subreticulate above, with moderately abundant, fine punctures on all marginal areas; vestiture sparse, short, obscure except in marginal areas. Eyes separated by 2.2 times width of an eye.

Pronotum 0.97 times as long as wide; sides widest about one-third length from bisinuate basal margin, rather strongly arcuate then abruptly convergent to moderate constriction just behind narrowly rounded anterior margin; surface smooth and shining, with close, coarse, partly longitudinally confluent punctures, substrigose. Vestiture minute; usually abraded on disc.

Elytra 1.3 times as long as wide, 1.5 times as long as pronotum; slightly wider at base of declivity, sides almost straight, rather broadly rounded behind; basal margins weakly elevated, crenulations feebly indicated; striae impressed, punctures indicated, often largely confluent on 1 and 2; interstriae broadly convex, as wide or wider than striae, punctures moderately coarse, close, confused, surface irregular, shining. Declivity beginning near middle of elytra, convex, moderately steep; sculpture much as on disc except interstriae narrower and interstrial punctures uniseriate. Vestiture consisting of rows of short, close, interstrial bristles, each about two-thirds as long on declivity as distance between rows.

MALE.— Similar to female except abdominal tergum 8 not concealed by 7 as in female.

DISTRIBUTION.— North Carolina and Texas to Argentina.

USA: **Florida**: Amelia Isl., 13-VIII-06, Nighthawk stomach; Brevard Co., 3-I-30, trap, J. Howard; Gainesville, 5-I-39, Nos. 8311, 8359, J. R. Watson; Little River, 2-IX-18, *Ocotea catesbiana*; Miami, 1-X-06, Persea *borbonia* fruit, G. S. Fawcett; Satsuma Heights, Hopk. US 6732. **Georgia**: Savannah, 26-XII-34, *P. borbonia* seed. **North Carolina**: Specimens seen, data not recorded. **South Carolina**: Folly Beach, 4-IX-44, *Persea* fruit. **Texas**: Weslaco, 12-X-55, *P. americana* fruit, Williamsen and Allen. MEXICO. **Distrito Federal**: Mexico, 1-VII-45, *P. americana* seed. **Mexico**: Chapingo, IV-61, *Persea*, K. C. Padilla. **Nayarit**: 8 km S Santiago Ferry. **Puebla**: 24 km E Teziutlan, 5-6-VIII-60, H. F. Howden. GUATEMALA: At light in banana hold, 11-V-36. EL SALVADOR: San Andrea, 20–25-VII-44, E. V. Hambleton. COSTA RICA: Cativo seed pod, 15-VII-35; "Tucurrique," Schedl and Burgdorf. PANAMA: La Campana,

X-37, Trap, Zetek; Canal Zone, numerous records from light, one record from corn seed.

HOSTS.— *Ocotea* sp., *Persea* spp., and *Zea mays*.

BIOLOGY.— This species infests large seeds of various trees and other plants. It has commonly been reported from corn seed, where it has caused substantial economic loss in South America. The habits are known to me only from secondary sources.

NOTES.— The above treatment was based on a female from Tingo María, Peru, and a male from Pasto, Colombia, that had been compared to (1) the type series of *hubbardi*, (2) the type of *chiriquensis*, (3) the type of *zeae*, and (4) a specimen identified as *frontalis* by Schedl, and on 353 other specimens.

## GENUS *BOTHROSTERNUS* EICHHOFF

*Bothrosternus* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:150 (Type-species: *Bothrosternus truncatus* Eichhoff, monobasic)

DIAGNOSIS.— This genus and *Sternobothrus* differ from other representatives of the Bothrosternini by the acute lateral margins of the pronotum coupled with straight, transverse sutures of the antennal club. It differs from *Sternobothrus* by the excavated and densely pubescent proepisternal area, by the transverse, subcarinate ridge between the anterior coxae, and by the ambrosial habit; the elytral interstriae may be carinate.

DESCRIPTION.— Length 1.9–3.1 mm, 1.9–2.2 times as long as wide; color very dark brown to black; presumably partly parthenogenetic, males very rare or unknown; frons convex above, flattened below, carinate in species treated here. Eyes sinuate on anterior margin, finely granulate; widely separated. Antennal funicle 7-segmented; club slender, with two straight, transverse sutures. Pronotum unarmed, surface punctured to substrigose. Basal crenulations of elytra very poorly developed; striae impressed, punctures obscure; interstriae simple, unarmed, sometimes becoming carinate posteriorly. Declivity convex, rather steep. Vestiture of hairlike setae, becoming uniseriately bristlelike on declivity.

DISTRIBUTION.— Southern Mexico to southern Brazil. Ten species have been assigned to this genus, two of which occur in Mexico and Central America.

BIOLOGY.— The two species treated here construct pith tunnels in the central axis of small woody vines or twigs of various trees, where they cultivate a loose, fluffy fungus that is used for food by the brood and evidently also by the adults. The larvae do not extend the parental gallery.

### Key to the Species of *Bothrosternus*

1. Frons with a large, conspicuous, median longitudinal carina; elytral interstriae flat on disc, weakly arched on declivity; Veracruz to Costa Rica; 1.9–2.3 mm ..... 1. ***foveatus*** **(Blackman)**

— Frons with a transverse carina at level of antennal insertion in female, absent in male; elytral interstriae narrowly carinate posteriorly on disc and on declivity; Costa Rica to Panama; 2.9–3.1 mm ..... 2. ***definitus*** **Wood**

### 1. *Bothrosternus foveatus* (Blackman)

Fig. 84

*Cnesinus foveatus* Blackman, 1943, Proc. U.S. Nat. Mus. 94:375 (Holotype, female; Trece Aguas, Alta Verapaz, Guatemala; U.S. Nat. Mus., 56553)
*Bothrosternus foveatus*: Wood, 1968, Great Basin Nat. 28:110

DIAGNOSIS.— This is the only species in the genus known to me having a median frontal carina and a small proepisternal excavation.

FEMALE.— Length 1.9–2.3 mm, 2.2 times as long as wide; color very dark brown to black.

Frons convex on upper half, transversely impressed below, somewhat flattened; a conspicuous median carina extending from just below level of ocular emargination to well above upper level of eyes; a pair of small, sublateral calluses at level of antennal insertion; epistomal margin slightly elevated; surface dull, reticulate, with a few minute granules; vestiture sparse; inconspicuous.

Pronotum 0.98 times as long as wide; widest at middle, sides almost straight and diverging on basal third, then strongly arcuate to slight constriction just behind rather broadly rounded anterior margin; basal margin bisinuate; surface closely, rather coarsely punctured, about one and one-half to two

times as long as wide; surface inside punctures reticulate, dull, interspaces almost smooth, shining; subglabrous.

Elytra 1.3 times as long as wide, 1.5 times as long as pronotum; sides almost straight and subparallel on basal three-fourths to just behind level of declivital base, then broadly rounded behind; basal margin feebly elevated, crenulations scarcely indicated; striae abruptly, not deeply impressed, punctures indicated largely confluent; interstriae about twice as wide as striae, reticulate, dull, punctures fine, rather abundant, confused. Declivity convex, steep; striae more deeply impressed; interstriae narrower, as wide as striae, each with a uniseriate row of minute granules, reticulate. Vestiture largely confined to declivity, consisting of rows of interstrial bristles confused toward base, each bristle not longer than distance between rows.

MALE.— Not recognizable in material at hand.

DISTRIBUTION.— Veracruz to Costa Rica.

MEXICO: Veracruz: 1 km N Cerro Gordo, 29-VI-53, 1000 m, No. 61 and 6-VII-67, No. 166, *Serjania* sp. Oaxaca: 30 km N Matías Romero, 24-VI-67, 150 m, No. 97, S. L. Wood. GUATEMALA: Trece Aguas, Alta Verapaz, 300 m, H. G. Barber and E. A. Schwarz. EL SALVADOR: Tonocatepeque, 20-VI-58, L. S. Bottimer. COSTA RICA: Finca gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, Nos. 63, 67, woody vine; Santa Ana, San José, 1-VIII-63, No. 92, *Cupania guatemalensis*, 4-X-63, No. 219, *Oreopanax capitatus*, and 8-XI-63, No. 255, broken twig.

HOSTS.— *Cupania guatemalensis*, *Oreopanax capitatus*, *Serjania* sp., and an unidentified tree.

HABITS.— Specimens were collected in moist areas of 500–1300 m elevation from tunnels in the central axis of twigs and woody vines less than 1 cm in diameter. A fluffy white fungal mycelium was in each tunnel and apparently served as the principal, if not the only food of the larvae. From the entrance hole the tunnel extended directly inward to the pith, where it branched to follow the central axis in each direction for 2–3 cm. Evidently the larvae did not extend the parental tunnel but fed only upon the ambrosial fungus until the prepupal stage. Individual pupation chambers were then formed by partitioning off sections of the tunnel with plugs of mycelium and frass. The age distribution in these cells was not regular; the oldest young adult or pupa was not always nearest the entrance tunnel. Only one parent adult occurred in each gallery; males could not be recognized among the specimens collected.

NOTES.— The above treatment was based on the holotype and on 69 other pinned specimens and more than 200 specimens preserved in alcohol.

### 2. *Bothrosternus definitus* Wood
Fig. 88

*Bothrosternus definitus* Wood, 1968, Great Basin Nat. 28:109 (Holotype, female; Finca Gromaco on Río Coto Bus, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— Similar to a specimen from Peru tentatively identified as *cancellatus* Chapuis, but distinguished by the more coarsely, shallowly, substrigosely punctured pronotum and by the very different sculpture of the frons.

FEMALE.— Length 2.95–3.05 mm, 1.9 times as long a wide; color black.

Frons convex above antennal bases, flattened and transversely impressed below, with a fine, sharply raised transverse carina occupying median three-fourths at level of antennal bases; closely punctured and finely, closely pubescent from carina to epistomal margin and on area of similar size above carina; median two-thirds from pubescent area to vertex polished, marked only by minutely etched transverse lines; sides and above rugose-reticulate with shallow, indefinite punctures and short, sparse hair.

Pronotum 1.8 times as long as wide; widest behind middle, sides very strongly arcuate and strongly constricted before anterior margin, basal margin bisinuate and extending into scutellar notch; surface dull, closely, shallowly, coarsely punctured, punctures elliptically elongate, some twice as long as wide; glabrous.

Elytra 1.2 times as long as wide; sides almost straight and parallel on slightly more than basal half, rather broadly rounded behind; striae strongly, rather abruptly impressed, punctures almost obsolete; interstriae wider than striae on disc, moderately convex on basal half, becoming narrowly carinate behind and on declivity, punctures on basal half of disc small, shallow, confused, obscure. Declivity rather steep, convex; interstriae very narrowly carinate on upper

third, becoming finely beaded below; striae rugose-reticulate, punctures obscure, much wider than interstriae.

MALE.— Similar to female except frontal carina absent; frons with a short, transversely impressed, median, elevated summit halfway between level of antennal insertion and ocular emargination.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Peralta, Cartago, 10-III-64, 500 m, No. 461, woody vine; Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 63, woody vine; all taken by S. L. Wood. PANAMA: "Panama."

HOSTS.— Two very different species of woody vine.

BIOLOGY.— The habits appear to be very similar to those of *foveatus*, except that the mature larvae, pupae, and young adults were always arranged in their pupal cells with the most nearly mature nearest the parental entrance tunnel. They decreased in age or maturity regularly as the distance from the entrance hole increased. A loose, fluffy, white, fungal mycelium was conspicuous in all but the newest galleries. The males were rare among the brood; they did not occur in any tunnel with a female parent except as a matured representative of her brood.

NOTES.— The above treatment was based on a study of the 55 female and three male specimens that comprise the type series.

## GENUS *EUPAGIOCERUS* BLANDFORD

*Eupagiocerus* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):133 (Type-species: *Eupagiocerus dentipes* Blandford, monobasic); Wood, 1965, Great Basin Nat. 25:31 (Revision)

*Nemopagiocerus* Schedl, 1962, Mitt. Münchner Ent. Ges. 52:85 (Type species: *Eupagiocerus nevermannii* Schedl = *Eupagiocerus ater* Eggers, monobasic); Wood, 1965, Great Basin Nat. 25:31. *Synonymy*

DIAGNOSIS.— From other Central American Bothrosternini this genus is distinguished by the sharply elevated lateral margins of the pronotum, and by the procurved sutures of the antennal club.

DESCRIPTION.— Length 2.1–3.8 mm, 1.8–2.3 times as long as wide; frons convex above, flattened to shallowly concave below and often ornamented by setae and sculpture, sexually dimorphic. Eyes weakly sinuate, finely granulate; widely separated. Antennal funicle 7-segmented, club rather slender to moderately stout, with two procurved sutures on basal half. Pronotum punctured to substrigose; unarmed. Scutellum small, round. Elytral bases weakly elevated, marked either by a continuous costa or by feebly developed crenulations; striae impressed, punctures often obsolete; interstriae variable. Declivity convex, steep; armed by moderately large tubercles in one species.

DISTRIBUTION.— Guatemala to Venezuela and Peru. Four species.

BIOLOGY.— The adult female constructs a tunnel in the pith at the central axis of stems of small woody vines, where she is joined by the male. The larvae enlarge the parent gallery, pupate, and emerge through the original entrance hole. One species, *ater*, cultures a fungus in its tunnels on which the larvae feed.

### Key to the Species of *Eupagiocerus*

1. Sutures 1 and 2 of antennal club moderately procurved, with 2 not extending beyond basal third of club; declivital interstriae equally convex, each bearing a single row of rounded tubercles; declivital vestiture stout, almost scalelike; frons modified in both sexes; Costa Rica; 3.0–3.8 mm ..... 1. ***vastus*** **Wood**

— Sutures 1 and 2 of antennal club strongly procurved, with 2 extending at least to middle of club; declivital interstriae 2 impressed or at least less strongly elevated than either 1 or 3 and, except at upper margin, devoid of tubercles ..... 2

2(1). Larger, discal interstriae moderately convex, not ending abruptly, posteriorly; declivital interstriae 2 and perhaps lower part of 3 somewhat impressed or flat and devoid of tubercles; declivital tubercles small, rounded; Chiapas to Panama; 2.6–3.0 mm ..... 2. ***dentipes*** **Blandford**

— Smaller; discal interstriae strongly convex posteriorly, almost as high as wide at upper margin of declivity, each elevation ending posteriorly as a small, sharply pointed spine, a row of similar pointed tubercles continuing down each declivital interstriae (except 2); Costa Rica to Venezuela and Peru; 2.1–2.6 mm ..... 3. ***ater*** **Eggers**

### 1. *Eupagiocerus vastus* Wood
Fig. 88

*Eupagiocerus vastus* Wood, 1965, Great Basin Nat. 25:34 (Holotype, female; Puerto Viejo, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is very closely related to *dentipes* Blandford but may be distinguished by the characters summarized in the above key.

FEMALE.— Length 3.0–3.8 mm, 2.1 times as long as wide; color rather dark brown.

Frons shallowly concave on lower half, feebly convex above, with median third remarkably sculptured; lower half with lateral margins acute and slightly elevated, a narrow marginal and epistomal area irregularly punctured, this area marked dorsally by a deep, narrow, procurved, transverse groove and immediately above this a transversely elevated, low, median carina on median third; remaining area of lower half densely pilose; above groove and elevation a median, subhexagonal, impunctate area densely, very closely reticulate-granulate, a shallow transverse groove near lower margin of hexagonal area and immediately above rounded carina; lateral pubescence and median hexagonal area extended to upper level of eyes; dorsal areas of head subreticulate and finely, shallowly punctured. Antennal club narrowly ovate, 1.4 times as long as funicle; suture 1 broadly procurved, extending one-fifth club length from base, 2 narrowly subangulate, extending two-fifths club length from base.

Pronotum 0.9 times as long as wide; base bisinuate, sides on basal half straight to distinctly constricted, diverging anteriorly, then abruptly narrowed to a constriction just before very broadly rounded, subemarginate, anterior margin; surface dull, rather closely marked by moderately large, elongate punctures, each puncture about twice as long as wide, their size slightly smaller anteriorly and laterally; lateral margins acute on basal two-thirds, pleural areas rather coarsely punctured; glabrous.

Elytra 1.3 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal half, rather narrowly rounded behind; basal margins bisinuate, slightly elevated, not at all crenulate or carinate; striae very feebly impressed anteriorly on disc, somewhat more strongly impressed toward declivity, punctures indicated but very feebly impressed; interstriae more than twice as wide as striae, almost flat anteriorly, weakly convex at base of declivity, surface dull, densely, microscopically reticulate (at 80 diameters) and also finely, closely, confusedly punctured, about four to six punctures across width of an interstriae. Declivity moderately steep, convex, surface including striae closely reticulate-granulate, each interstriae bearing a median row of small but high, rounded granules, each granule as high as wide and spaced by distances about equal to distance between rows of granules. Vestiture consisting of rows of erect bristles, each arising from base of a granule, and forming a median row on each interstriae, each bristle almost as long as distance between rows; and irregular rows of shorter bristles about half as long as main rows, located on each side of median row. Interstriae 9 subacutely elevated.

MALE.— Similar to female except frons subconcavely impressed on lower half and densely pilose in impressed area, special sculpturing absent.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Puerto Viejo, Heredia, 12-III-64, 50 m, No. 477, and Peralta, Cartago, 10-III-64, 50 m, No. 462, S. L. Wood.

HOST.— An unidentifiable woody vine (liana).

BIOLOGY.— Specimens were removed from pith tunnels in the ventral axis of stems 4–5 cm in diameter. From the entrance tunnel,

which extended directly to the pith, the beetles constricted linear galleries along the central axis 2–4 cm in each direction. The larvae and young adults extended the parental tunnel. There was no evidence of fungal growth in the tunnels. The number of males was almost equal to that of the females.

NOTES.— The above treatment was based on the type series of 53 specimens.

### 2. *Eupagiocerus dentipes* Blandford
Figs. 21, 88

*Eupagiocerus dentipes* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):133 (Lectotype, male; El Tumbador, Guatemala; British Mus. Nat. Hist., present designation)

*Eupagiocerus clarus* Wood, 1965, Great Basin Nat. 25:33 (Río Viejo, Volcán Chiriquí, Panama; Wood Coll.); Wood, 1971, Great Basin Nat. 31:145. *Synonymy*

DIAGNOSIS.— This species is allied to *ater*, but it is readily distinguished by the larger size, by the more slender body form, by the elytral characters indicated in the above key, and by other features of the frons and prothorax.

FEMALE.— Length 2.6–3.0 mm, 2.3 times as long as wide; body color black.

Frons broadly, evenly convex above and broadly, shallowly concave below level of ocular emargination, abrupt, pseudocarinate line of separateion between these areas extended orad slightly in median area; upper area reticulate, dull below, subshining above; lower areas shallowly, evenly concave between subacute lateral margins to epistomal margin; epistomal margin slightly raised, shining, with a small bilobed process; concave area rather densely, minutely pilose; other vestiture inconspicuous. Antennal club 1.8 times as long as wide, sutures procurved, 1 extending to a point one-third club length from base, 2 extending three-fifths club length from base.

Pronotum 1.1 times as wide as long, sides almost straight on basal half, slightly wider near middle, then abruptly narrowed to the broadly rounded anterior margin; surface closely, finely, longitudinally strigose over entire dorsal surface; subshining; glabrous.

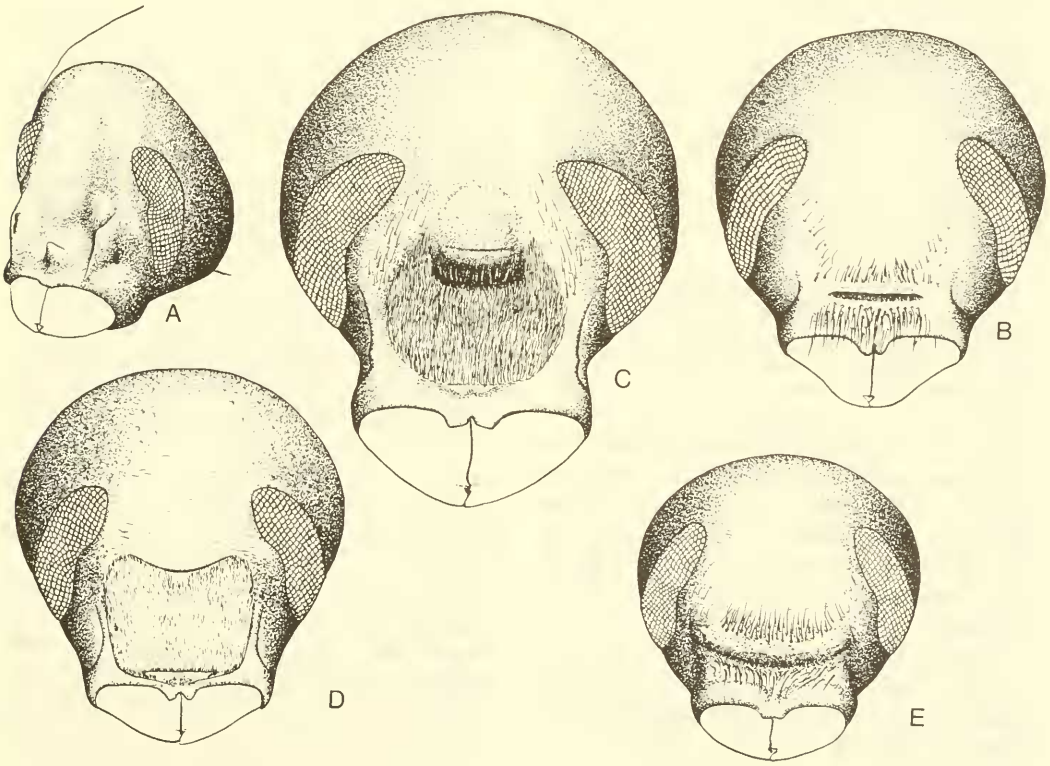



Fig. 88. Bothrosternini genera and species, male heads: A, *Pagiocerus frontalis*; B, *Bothrosternus definitus*; C, *Eupagiocerus vastus*; D, *Eupagiocerus dentipes*; E, *Eupagiocerus ater*.

Hairlike setae in anterior pleural area longer and conspicuous, but not forming a definite tuft as in *ater*.

Elytra 1.4 times as long as wide, sides feebly curved, somewhat narrowly rounded behind; basal margins slightly elevated, neither crenulate nor acutely produced; striae narrowly, rather deeply impressed, punctures very obscurely indicated; interstriae feebly convex anteriorly, moderately so at base of declivity, about three times as wide as striae, surface reticulate, subshining, with numerous confused, small, shallow punctures. Declivity moderately steep, somewhat flattened between third interstriae; interstriae 1 slightly elevated, uniseriately punctured, with a few punctures bearing small, obscure, rounded granules, 2 flat, appearing impressed, with confused fine punctures, 3 and 4 convex on upper half and bearing regular rounded tubercles on convex portion, becoming flattened on lower half and merging into impression of 2, 5 to 9 convex and each bearing a row of rounded tubercles. Vestiture scanty, restricted to a few hairlike setae in posterolateral areas.

MALE.— Similar to female except frons with transition from convex to concave areas gradual, concavity slightly deeper, not pilose, but with a continuous tuftlike row of erect plumose setae on lateral and lower margins, concave area with rather numerous, small, hairlike setae.

DISTRIBUTION.— Chiapas to Panama.

MEXICO: Chiapas: Palenque Ruins, 9-V-69, D. E. Bright. GUATEMALA: El Tumbador, G. C. Champion. PANAMA: Río Viejo at Volcán de Chiriquí, Chiriquí, 11-1-64, 1800 m, No. 412, vine, S. L. Wood.

HOST.— A woody vine.

HABITS.— The beetles were removed from pith tunnels in the central axis of a stem of a rough-barked woody vine 2 cm in diameter. There was no evidence of an ambrosial fungus; the larvae evidently enlarged the parental gallery as they do in most species of *Cnesinus*.

NOTES.— The above treatment was based on the 34 specimens in the type series of *clarus* and the 3 males in the syntypic series of *dentipes*, all of which were examined in this study.

While I was studying at the British Museum a black female *clarus* was compared to the teneral, reddish, male syntypes of *dentipes*. They differed not only in frontal sculpture, but in other features as well. Several years later, when teneral paratypes of *clarus* were compared to the syntypes, the synonymy was recognized. Because a type has not been designated from Blandford's series, I here designate the first specimen as the lectotype of *dentipes* Blandford.

### 3. *Eupagiocerus ater* Eggers
Fig. 88

*Eupagiocerus ater* Eggers, 1931, Ent. Blätt. 27:14 (Holotype, male; Caracas, Venezuela; Berlin Zool. Mus.).

*Eupagiocerus nevermanni* Schedl, 1952, Dusenia 3:350 (Holotype, female ?; Turrialba, Costa Rica; Schedl Coll.); Wood, 1965, Great Basin Nat. 25:32. *Synonymy*

*Eupagiocerus serratus* Wood, 1961, Great Basin Nat. 21:104 (Holotype, male; Paraíso, Canal Zone, Panama; U.S. Nat. Mus., 66509); Wood, 1965, Great Basin Nat. 25:32. *Synonymy*

DIAGNOSIS.— This distinctive species is somewhat allied to *dentipes*, but it is easily distinguished by characters summarized in the above key.

FEMALE.— Length 2.1–2.6 mm, 2.0 times as long as wide; color dark brown to black.

Frons above level of antennal bases convex, smooth and polished in central area, coarsely reticulate at sides and above; epistomal margin narrowly, weakly elevated, with a flattened, rugose-reticulate, sparsely punctured area immediately above; antennal bases connected by a broad, slightly procurved, rather high, acute, yellowish carina, subvertical on its lower side, moderately sloping, ornamentally punctured and pubescent on its supper slope; vestiture moderately abundant, longer and finer below, coarse and relatively short on upper slope of carina, a few setae along lateral margins above. Antennal club with suture 1 extending two-fifths and 2 two-thirds club length from base.

Pronotum 0.9 times as long as wide; widest at middle, sides almost straight, slightly diverging anteriorly on basal half, then rather strongly, arcuately rounded to broadly rounded anterior margin; surface subshining, with minute, rather obscure, longitudinal lines in interspacial areas, becoming reticulate laterally and basally, punctures elongate, rather coarse, close, shallow; glabrous.

Elytra 1.1 times as long as wide; sides straight and parallel on more than basal two-thirds, very broadly rounded posterior profile interrupted by declivital serrations and sutural emargination; basal margins of elytra acutely elevated along a continuous costa; striae impressed, weakly on anterior third, very strongly toward declivital margin, punctures obsolete; interstriae about one and one-half times as wide as striae at base, flattened basally, becoming strongly convex, almost as high as wide, toward declivity coarsely reticulate and somewhat irregular on basal third, punctures fine, confused, sparse on posterior half. Anterior half of pleural area from coxal flange to elevated margin of pronotum impressed, impression filled by dense yellow setae.

Declivity steep, flattened; surface granulose-reticulate over both punctures and serrations, strial punctures essentially obsolete, although position of some punctures indicated; sutural interstriae vertically, rather strongly elevated, declining in height on lower third, bearing about ten low, posteriorly directed serrations; interstriae 2 with a small, pointed serration at declivital base, weakly elevated below and sometimes bearing as many as four serrations, lower ones sometimes rounded; interstriae 4 to 9 each bearing about two to four rather coarse, posteriorly directed serrations. Vestiture consisting of a few short, fine to coarse setae on declivity.

MALE.— Similar to female except frontal carina entirely absent and replaced by a broad, shallow impression; setae on antennal scape less numerous; and declivital sculpture evidently finer.

DISTRIBUTION.— Costa Rica to Venezuela and Peru.

COSTA RICA: Peralta, Cartago, 10-III-64, 50 m, No. 463, woody vine, S. L. Wood; Turrialba, Cartago, 800 m, F. Nevermann; Monteverde, Puntarenas, 23-V-79, 140 m, H. and A. Howden. PANAMA: Ft. Clayton, Canal Zone, 22-III-63, 35 m, No. 319, *Serjania*, S. L. Wood; Paraíso, Canal Zone, 25-I-11, E. A. Schwarz. Specimens also seen by me include the type from Caracas, Venezuela, and a cotype from Peru.

HOSTS.— *Serjania* sp., and another woody vine.

BIOLOGY.— From the entrance hole in a stem 0.5–2.0 cm in diameter, axial tunnels in the pith region may extend in either or both directions from 1 to 3 cm. On the walls of the older tunnels a thick, fluffy mat of fungus mycelium grew on which the larvae fed. The larvae apparently did not extent the parental mine. In galleries containing only eggs the mycelium was not visible.

NOTES.— The above treatment was based on the type series of *serratus* (where the sexes were reversed), on the holotype of *ater*, on the type of *nevermanni*, and on 49 other specimens.

## GENUS *STERNOBOTHRUS* EGGERS

*Sternobothrus* Eggers, 1943, Mitt. Münchner Ent. Ges. 33:372 (Type-species: *Bothrosternus cancellatus* Chapuis, original designation)

DIAGNOSIS.— This genus appears more closely allied to *Cnesinus* than to other genera in the Bothrosternini; however, the combination of characters employed in the above key places it nearest *Bothrosternus*. From *Bothsternus* it is distinguished by the absence of an excavation and dense pubescence on the proepisternal area, by the absence of a transverse carina between the anterior coxae, by the carinate elytral interstriae, and by the pith-feeding habit that does not involve an ambrosial fungus.

DESCRIPTION.— Length 2.2–3.6 mm, 2.1–2.2 times as long as wide; color black; frons convex above, subconcavely impressed below and variously ornamented; sexually dimorphic. Eyes sinuate on anterior margin; finely granulate; widely separated. Antennal funicle 7-segmented; club with two straight sutures on anterior face. Pronotum unarmed, surface punctured. Basal margins of elytra marked by an acutely elevated costa or by very indistinct crenulations; striae impressed, punctures obsolete; interstriae weakly convex and punctured toward base, acutely carinate on declvity. Declivity convex, moderately steep. Vestiture minute, sparse.

DISTRIBUTION.— Costa Rica to Argentina. Nine species have been assigned to the genus; two of them occur in Central America.

BIOLOGY.— Both species construct pith tunnels in the central axis of small branches where the larvae extended the parental tunnel, essentially as they do in most species of *Cnesinus*.

Key to the Species of *Sternobothrus*

1. Elytral apex neither explanate, emarginate, nor serrate; declivital interstriae 3 near apex distinctly elevated; Costa Rica to Brazil; 2.6–3.6 mm ..... 1. ***sculpturatus*** **(Blandford)**

— Apices of elytra produced posteriorly into two short lobes, emarginate at suture, costal margins near suture finely serrate; declivital interstriae 3 not elevated; Panama to Venezuela, Brazil, and Peru; 2.0–2.5 mm ..... 2. ***bicaudatus*** **(Blandford)**

1. *Sternobothrus sculpturatus* (Blandford)

*Bothrosternus sculpturatus* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):132 (Lectotype, female; Bugaba, Chiriquí, Panama; British Mus. Nat. Hist., present designation)

*Sternobothrus sculpturatus*: Eggers, 1943, Mitt. Münchner Ent. Ges. 33:373

DIAGNOSIS.— Characters summarized in the above key serve to distinguish this species from *bicaudatus* (Blandford).

FEMALE.— Length 2.6–3.6 mm, 2.0 times as long as wide; mature color black.

Frons convex above level of ocular emargination, rather strongly, transversely, subconcavely impressed below, deepest just above level of antennal insertion; convex area finely punctured in marginal areas, central two-thirds impunctate, minutely, transversely etched (smooth in a few specimens); impressed area bearing a median, submarginal, epistomal tubercle, its dorsal margin continuing dorsad as a low median carina in most specimens to lower margin of convex area; lower surface punctured, largely concealed by a rather dense brush of reddish bristles of equal length, tubercles glabrous; punctured portions of convex area bearing less abundant, yellowish hair to upper level of eyes.

Pronotum 0.95 times as long as wide; widest just behind middle, sides weakly arcuate on basal half, strongly arcuate in front of middle to moderate constriction just behind broadly rounded anterior margin; surface subshining, minutely reticulate, punctures on disc fine, deep, moderately close, at least twice as large and with reticulate centers near lateral margins; glabrous.

Elytra 1.3 times as long as wide; 1.5 times as long as pronotum; sides very faintly constricted at level of middle of disc, widest at base of declivity, then broadly rounded behind except profile interrupted by elevated interstriae 3; basal margins finely, almost uniformly elevated on median half, a few small submarginal crenulations on interstriae 2–4; striae broadly impressed, punctures obsolete; interstriae rather broadly convex and obscurely punctured on basal third, becoming narrowly costiform before base of declivity and continuing to declivity; elytral surface coarsely reticulate except almost smooth and shining toward summits of costae. Declivity convex, rather steep, weakly impressed between third interstriae; striae and interstriae narrower than on disc; interstriae narrowly costiform, 3 very slightly higher, particularly as junction with 5, this elevation continuing transversely after junction with 9 and diminishing in height to junction with 1; interstriae 4, 6, and 8 end short of junctions with adjacent costae. Vestiture obsolete except for rows of minute hair on either side of each declivital costa.

MALE.— Evidently rare; one specimen presumed to be a male, similar to female except frontal exacavation slightly deeper and extending dorsad somewhat, vestiture greatly reduced, entirely yellowish.

DISTRIBUTION.— Costa Rica to S Brazil.

MEXICO: Oaxaca: 9 km S Valle Nacional, 18-V-71, 600 m, D. E. Bright. COSTA RICA: Guapiles, Limón, 14-IV-66, 50 m, No. 2; Pandora, Limón, 23-VIII-63, 50 m, No. 149; Volcán, Puntarenas, 11-XII-63, 1000 m, No. 304; all by S. L. Wood, from what appeared to be the same host tree species. PANAMA: Bugaba and Volcán de Chiriquí, Chiriquí, G. C. Champion.

HOST.— A large tree, probably *Nectandra* sp.

BIOLOGY.— Pith tunnels were constructed in the central axis of cut or broken branches 2–5 cm in diameter, similar to those of most *Cnesinus* species. The larvae extended the parent tunnel and fed upon the host tissues.

NOTES.— The above treatment was based on a female from the type series, on two of my homotypes, on 58 other Central American specimens, and on 158 South American

specimens. None of the material was as large as the 4 mm length reported by Blandford in the original description. The first female syntype in the Blandford series is here designated as the lectotype of *sculpturatus*.

### 2. *Sternobothrus bicaudatus* (Blandford)

*Bothrosternus bicaudatus* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):133 (Lectotype, Volcán de Chiriquí, Chiriquí, Panama; British Mus. Nat. Hist.)

*Sternobothrus bicaudatus*: Eggers, 1943, Mitt. Münchner, Ent. Ges. 33:373

DIAGNOSIS.— This species is readily distinguished from the only other Central American representative of the genus by characters summarized in the above key.

FEMALE.— Length 2.0–2.5 mm, 2.2 times as long as wide; color almost black.

Frons convex above length of ocular emargination, impunctate, smooth and polished on central three-fourths, marginal areas punctured; lower area transversely impressed as in *sculpturatus* except tubercle and median elevation absent, epistomal process transversely carinate on more than median half, its upper slope to level of antennal insertion densely ornamented by rather long, reddish setae; lateral areas almost to upper level of eyes bearing shorter, rather sparse, yellowish setae.

Pronotum about 1.0 times as long as wide; outline as in *sculpturatus*; surface reticulate, punctures deep, rather coarse on disc, smaller laterally, rather close; glabrous.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; sides almost straight, very slightly wider at base of declivity, then arcuately rounded to serrate, produced apices that occupy slightly more than median half, emarginate at suture; basal margins slightly elevated on a continuous costa; striae reticulate, impressed except at base, narrow on basal half, wider behind, punctures obsolete; interstriae feebly convex on basal half, rather narrowly convex at base of declivity, at least twice as wide as striae at elytral base, only slightly wider at base of declivity, punctures rather small, confused basally, tending to form uniseriate rows toward declivity on both margins of each interstriae except on 1. Declivity convex, rather steep except lower fourth produced posteriorly; striae and interstriae narrower than on disc; interstriae narrowly costiform on upper fourth, becoming serrate below; suture emarginate, costal margin of produced area subserrate. Minute vestiture confined to declivity on summits of interstriae.

MALE.— Similar to female except epistomal callus less well developed; ornamental epistomal setae reduced to one row, much shorter, color yellowish, central area of frons reticulate.

DISTRIBUTION.— Panama.

PANAMA: Volcán de Chiriquí, Chiriquí, G. C. Champion.

HOST.— *Nectandra* sp.

HABITS.— Specimens of a very closely related species were taken from pith tunnels in twigs of a broken branch. Habits resemble those of most *Cnesinus* species.

NOTES.— The above treatment was based on the syntypes of *bicaudatus* and on 22 other specimens.

## Tribe PHLOEOTRIBINI

Phloeotribidae Chapuis, 1869, Synopsis des Scolytides, p. 42 (Type-genus: *Phloeotribus* Latreille, 1796)
Phthorophloeides Nüsslin, 1912, Naturwiss. Zeitschr. Forst- und Landwirtschaft 1912:273 (Type-genus: *Phthorophloeus* Rey, 1883)

Anatomical features.— The frons is strongly, sexually dimorphic, with the male variously impressed, the female flat to convex; the eye is entire, the antennal funicle is 5-segmented, the club is strongly asymmetrical and deeply divided into three movable, sublammelate segments, the procoxae are contiguous, the prosternum has the lateral margins rounded, its costa obsolete; the pronotum may or may not be armed by asperities, and the metatergum is fused to its postnotum.

Biological features.— All species are monogamous and phloeophagous. The parental tunnels are usually biramous, but when monoramous there is a conspicuous turning niche near the entrance tunnel. Larval mines follow a definite course away from the parental gallery and rarely cross one another. Symbiotic relationships with fungi have not been reported.

Taxonomy.— This tribe appears to be of American origin. One genus (*Aricerus*, Australia, etc.) appears to have reached its present distribution from South America quite early in the history of the tribe. The other genus, *Phloeotribus*, occurs mostly in America except for a few species that reached Eurasia rather recently.

### Genus *PHLOEOTRIBUS* Latreille

*Phloiotribus* Latreille, 1796, Précis des caractères génériques des insects, p. 50; Latreille, 1802/3, Histoire naturelle, générale et particulaere des Crustacés et des Insects 3:204 (Type-species: *Hylesinus oleae* Fabricius = *Scolytus scarabaeoides* Bernard, monobasic)

*Phloeotribus* Latreille, 1804, Mag. f. Insekenk. 3:108 (Justified emendation, Internat. Comm. Zool. Nomencl. 1979:132)

*Phloeophthorus* Wollaston, 1854, Insecta Maderensia, p. 299 (Type-species: *Phloeophthorus perfoliatus* Wollaston, monobasic); Blackman, 1943, Proc. U.S. Nat. Mus. 94:384. *Synonymy*

*Dryotomus* Chapuis, 1869, Synopsis des Scolytides, p. 46 (Type-species: *Dryotomus puberulus* Chapuis, monobasic) (preoccupied); Schedl, 1962, Beitr. Ent: 12:487. *Synonymy*

*Phthorophleous* Rey, 1883, Rev. d'Ent. 2:128 (Type-species: *Phloeophthorus spinulosus* Rey, monobasic); Blackman, 1943, Proc. U.S. Nat. Mus. 94:384. *Synonymy*

*Elzearius* Guillebeau, 1893, Ann. Soc. Ent. France 62:64 (Type-species: *Elzearius crenatus* Guillebeau, monobasic); Balachowsky, 1949, Faune de France 50:108. *Synonymy*

*Eulytocerus* Blandford, 1897, Biol. Centr.-Amer., Coleopt. 4(6):161 (Type-species: *Eulytocerus championi* Blandford, monobasic); Wood, 1977, Great Basin Nat. 37:383. *Synonymy*

*Comesiella* Del Guercio, 1925, Atti Roy. Acad. Georgofilo (Florence) 22:218 (Type-species: *Comesiella sicula* Del Guercio = *Bostrichus brevicollis* Kolenati); Balachowsky, 1949, Faune de France 50:112. *Synonymy*

*Dryotomicus* Wood, 1962, Great Basin Nat. 22:76 (replacement for *Dryotomus* Chapuis)

Diagnosis.— This widely distributed, highly diversified, actively evolving genus is unique among the Hylesininae in having the antennal club divided into three movable segmental units that often have the inner margin very strongly extended in a pseudolammelate arrangement. Among American species this genus is allied to *Chramesus* LeConte, from which it is easily distinguished by the very different antennal club, by the broader third tarsal segments (variable), and usually by the hairlike vestiture.

Description.— Length 1.2–4.0 mm, body moderately slender to very stout; color dark brown to black. Frons dimorphic, male variously impressed to concave, female convex. Eye entire. Antennal scape long; funicle 5-segmented; club divided into three segmental units with median margin weakly to very strongly extended. Pronotum wider than

long, armed or not. Scutellum small, visible. Elytral bases each armed by 9 to 16 coarse crenulations; striae weakly to strongly impressed, punctures usually coarse; interstriae usually coarsely sculptured; declivity convex, steep, conservatively sculptured. Tibiae rather broad, bearing several small teeth; third tarsal segments varying from slender to deeply bilobed.

DISTRIBUTION.— Worldwide. A large number of names have been published for species in this genus; however, the amount of published and unpublished synonymy is so excessive an accurate estimate of valid species is impossible. In North and Central America 27 species were recognized.

BIOLOGY.— The winter is passed in northern areas by at least two species, *frontalis* and *liminaris*, as adults in special hibernation tunnels in living tissue. Adults of *lecontei* have been taken in extended larval mines and also in incomplete parental egg galleries. The male begins a new attack and is usually joined by a female before he reaches the cambium of the host. A biramous gallery system is constructed either transversely or diagonally with respect to the grain of the wood, which it engraves rather deeply. The egg niches are usually large and close. Larval mines are usually long, primarily in the phloem tissues, and wander excessively, although they tend to radiate from the parental tunnels parallel to the grain of the wood. Two generations annually occur in the United States for most species.

Key to the Species of *Phloeotribus*

1. Pronotum entirely devoid of asperities, rarely with a few small granules (*hystrix*); elytral vestiture abundant, confused at least on disc (uniseriate in *simplex*, *squamosus*); interstriae 9 usually not elevated or strongly serrate (except *hystrix*) ..... 2

— Pronotum asperate at least at anterolateral angles; elytral vestiture in uniseriate rows (except *furvus*, *scabratus*, *scabricollis*); interstriae 9 commonly narrowly elevated and serrate ..... 11

2(1). Elytral vestiture more abundant, confused on disc; elytral declivity variously modified; usually much larger than 1.5 mm ..... 3

— Elytral vestiture entirely limited to uniseriate interstrial rows of flattened bristles or scales; smaller than 1.5 mm ..... 10

3(2). Elytral setae of two types, some short and more abundant, others longer and forming a more or less median row on each interstriae ..... 4

— Elytral setae of uniform length, occasionally stouter on declivity ..... 7

4(3). Discal striae distinctly wider than interstriae; spines on declivital interstriae 7 and 9 much larger than those of other interstriae; pronotal punctures shallow, much larger; Costa Rica; 1.7–2.0 mm ..... 1. ***hystrix*** **Wood**

— Discal striae about half as wide as interstriae; declivital interstriae unarmed or equally armed by minute tubercles; pronotal punctures fine ..... 5

5(4). Interstriae devoid of granules on both disc and declivity; basal margins of elytra almost evenly costate; male frontal excavation extending to vertex; body stouter; Costa Rica to Panama; 3.6–3.7 mm ..... 2. ***championi*** **(Blandford)**

— Interstriae with at least a few granules or crenulations; basal margins of elytra clearly crenulate; male frontal excavation less extensive, ending at or slightly above upper level of eyes; body slightly more slender ..... 6

6(5). Smaller; rows of erect interstrial setae scalelike on declivity; discal interstriae closely, finely punctured, tubercles uniseriate, each about a third as wide as interstriae; Veracruz to Panama; 2.2–2.7 mm ..... 3. ***nubilus*** **Blandford**

– Larger; rows of erect interstrial setae hairlike on declivity; discal interstriae with broad, confused crenulations, some as wide as interstriae, comparatively few punctures evident; Costa Rica; *Clusia*, *Podocarpus*; 3.4–4.0 mm ..... 4. ***atavus*** **Wood**

7(3). Segments of antennal club not more than twice as wide as long; submarginal crenulations at elytral bases obsolete; punctures on basal half of pronotum rather coarse; *Quercus*; Durango to Hidalgo; 1.8–2.1 mm ..... 5. ***quercinus*** **Wood**

– Segments of antennal club more than four times as wide as long; a few submarginal crenulations at elytral bases rather well developed; punctures on basal half of pronotum rather fine ..... 8

8(7). Declivital bristles confused in female; declivital interstriae 1 and 3 rather coarsely dentate in male; male frons rather broadly, deeply impressed, with a moderately large, impunctate, epistomal callus; Chiapas to Panama; 1.5–2.5 mm ..... 6. ***discrepans*** **Blandford**

– Declivital setae in uniseriate rows in both sexes; declivital tubercles small, rounded in both sexes; male frons shallowly impressed on a limited area with or without an epistomal callus ..... 9

9(8). Declivital setae long and slender, little if any stouter than on disc, on declivity at least one and one-half times as long as distance between rows; tubercles on declivital interstriae 2 similar to those on 1 and 3; pronotal punctures slightly larger, shallow; Manitoba to Mississippi and east to Atlantic Coast; *Prunus*; 1.9–2.3 mm ..... 7. ***liminaris*** **(Harris)**

– Declivital setae much stouter than those on disc, slightly shorter than distance between rows; tubercles on declivital interstriae 2 usually obsolete (very small granules in some females); pronotal punctures smaller, deeper; North Dakota to Chiapas; *Prunus* 1.8–2.8 mm ..... 8. ***pruni*** **Wood**

10(2). Color brown; declivital bristles flattened, at least eight times as long as wide, slightly longer than distance between rows; Panama; 1.3–1.5 mm ..... 9. ***simplex*** **Wood**

– Color black; declivital scales about three times as long as wide, two-thirds as long as distance between rows; Costa Rica; 1.2–1.3 mm ..... 10. ***squamatus*** **Wood**

11(1). Lateral margin of male frons armed by a pair of large, sharply pointed tubercles at level of antennal insertion, scape devoid of a large tuft of hair (a small tuft in *texanus*); segments of antennal club usually less than three times as wide as long, terminal segment widest on apical third, apex usually broadly rounded (from Canada and United States, except *destructor*) ..... 12

– Lateral margin of male frons usually elevated but unarmed; male scape bearing a tuft of long hair (small in *scabratus*, *scabricollis*, *furvus*); segments of antennal club usually much more than three times as wide as long, terminal segment widest near middle, narrowly rounded at its apex (from Mexico and Central America, except *scabricollis*) ..... 17

12(11). Interstriae 9 moderately to strongly convex and serrate, serrations continuing without interruption at or near declivital base to suture ..... 13

– Interstriae 9 weakly or not at all convex, serrations, if present, interrupted by interstriae 2 before attaining suture ..... 16

13(12). Interstriae 3 and 9 slightly elevated and apically confluent, combined elevation continuing above apex to suture, 2 terminating before apex; vestiture rather coarse; discal interstriae at most finely granulate; on conifers ..... 14

— Interstriae 9 rather strongly elevated, joining costal margin before attaining suture, 2 terminating at apex; vestiture rather fine; discal interstriae rather coarsely crenulate; on broadleaf trees ..... 15

14(13). Declivital interstriae 1 and 3 convex, 2 impressed or flattened at least on lower half, its tubercles reduced, usually obsolete on lower half; strial punctures usually smaller, vestiture coarser; S British Columbia and S Alberta to Arizona and New Mexico; *Abies, Pseudotsuga, Picea*; 1.6–2.4 mm ..... 11. ***lecontei*** **Schedl**

— Declivital interstriae 1 to 3 about equally convex, 2 serrate to its apex; strial punctures coarser, deeper, vestiture finer; Yukon Territory to Quebec and Maine; *Picea*; 2.0–2.5 mm ..... 12. ***piceae*** **Swaine**

15(13). Declivital interstriae 1 to 9 tuberculate; posterior area of pronotum rather closely, coarsely punctured, interspaces marked by minute impressed points; Kansas and Texas to Pennsylvania and South Carolina; *Morus, Celtis* 1.7–2.4 mm ..... 13. ***frontalis*** **(Olivier)**

— Declivital interstriae 1 to 4 devoid of tubercles; posterior area of pronotum very coarsely, closely, punctured, very narrow interspaces devoid of points; Michoacán; *Prunus*; 1.8–2.4 mm ..... 14. ***destructor*** **Wood**

16(12). Declivital interstriae all armed by small rounded granules; striae feebly if at all impressed, punctures rather small, narrower than width of interstriae; interstrial granules on disc small, about half as wide as interstriae; North Dakota and Texas to Pennsylvania and Florida; *Celtis*; 1.2–1.6 mm ..... 15. ***dentifrons*** **(Blackman)**

— Declivital interstriae 1, 3, 5, 7, and 9 bearing moderately large, pointed teeth; discal striae impressed toward declivity, punctures coarse, deep, wider than interstriae; discal interstrial granules as wide as interstriae; Nuevo León and Texas to South Carolina and Florida; *Celtis, Condalia*; 1.5–1.9 mm ..... 16. ***texanus*** **Schaeffer**

17(11). Posterior margin of pronotum almost straight, not noticeably produced posteriorly on median fourth (slightly produced in *demessus*), scutellar notch smaller, more acute, less than three times as deep (including scutellum) as width of scutellum; body more slender, at least 1.8 times as long as wide; smaller, 1.4–2.4 mm ..... 18

— Posterior margin of pronotum strongly produced on median fourth to fit scutellar notch, scutellar notch more U-shaped, four or more times as deep (including scutellum) as width of scutellum; body very stout, less than 1.7 times as long as wide; larger, 2.5–3.3 mm ..... 25

18(17). Declivital interstriae 9 not strongly elevated, not joining costal margin toward sutural apex ..... 19

— Declivital interstriae 9 strongly elevated posteriorly, joining costal margin without interruption and continuing to sutural apex ..... 22

19(18). Elytral vestiture abundant, confused on disc, very fine to slender on pronotum ..... 20

— Elytral vestiture consisting of rows of stout, uniseriate, interstrial bristles on disc and declivity, pronotal setae equally stout ..... 21

20(19). Smaller; elytral vestiture hairlike at base, slender bristles on declivity; declivital vestiture confused; Ohio to Illinois; *Ptelea, Staphylea*; 2.0–2.3 mm ..... 17. ***scabricollis*** **(Hopkins)**

— Larger; elytral vestiture of slender scales, uniseriate on all declivital interstriae except 1; Panama; 2.5 mm ..... 18. ***scabratus*** **Blandford**

21(19). Discal interstriae smooth and shining except for uniseriate granules; basal margin of pronotum essentially straight; Jalisco to Costa Rica; *Ficus*, *Celtus*, *Serjania*; 1.4–1.9 mm ..... 19. ***opimus*** **Wood**

— Discal interstriae with numerous impressed points toward base, becoming minutely granulate toward and on declivity, dull; pronotum slightly produced posteriorly in median area; Veracruz to Panama; 1.6–2.3 mm ..... 20. ***demessus*** **Blandford**

22(18). Declivital interstriae 2 and 4 devoid of granules or tubercles, 1 and 3 strongly tuberculate, 9 more strongly elevated; Oaxaca to Colombia; 1.9–2.4 mm ..... 21. ***armatus*** **Blandford**

— Declivital interstriae 1 to 8 equally, rather finely tuberculate; interstriae 9 somewhat less strongly elevated ..... 23

23(22). Pronotal asperities confined to small area on anterior fourth, punctures smaller, more widely spaced; anterior margin of pronotum armed by very coarse teeth; interstrial crenulations on disc smaller, more widely spaced; Panama to Colombia and Venezuela; *Brosimum*; 2.0–2.5 mm ..... 22. ***biguttatus*** **Blandford**

— Pronotal asperities more numerous, more widely distributed on at least anterior half; anterior margin unarmed or finely, irregularly armed by one to three teeth; discal interstrial crenulations larger, closer, Veracruz to Costa Rica ..... 24

24(23). Interstriae 9 elevated and serrate to striae 3; male epistoma with a very strongly elevated, straight, transverse carina on median fourth; pronotal disc reticulate; Guatemala to Venezuela; 2.0–2.5 mm ..... 23. ***subovatus*** **Blandford**

— Interstriae 9 elevated and serrate to suture; male epistoma with a procurved, moderately elevated, transverse carina on more than median half; pronotal disc smooth; Veracruz to Peru and Brazil; *Celtis*, *Croton*, *Ficus*, etc.; 1.9–2.4 mm ..... 24. ***setulosus*** **Eichhoff**

25(17). Elytral striae almost as wide as interstriae, interstrial crenulations almost as wide as interstriae (except on basal half of 2), interstrial setae uniseriate; Veracruz to Costa Rica; 2.4–3.1 mm ..... 25. ***maurus*** **Wood**

— Elytral interstriae at least twice as wide as striae, interstrial crenulations less than half as wide as discal interstriae, interstrial setae confused on basal half of 2–4 ..... 26

26(25). Pronotal and elytral surfaces rugose-reticulate; declivity with rows of interstrial tubercles smaller, many obsolete, setae on discal interstriae 3–10 uniseriate except at base; Chiapas to Brazil and Peru; *Brosimum*; 2.6–3.3 mm ..... 26. ***pilula*** **Erichson**

— Pronotal and elytral surfaces shining, not reticulate; declivity with rows of interstrial tubercles larger; setae on all discal interstriae confused; Guatemala to Panama; 2.8–3.3 mm ..... 27. ***furvus*** **Wood**

### 1. *Phloeotribus hystrix* Wood

*Phloeotribus hystrix* Wood, 1969, Brigham Young Univ. Sci. Bull. 10(2):7 (Holotype, male; Río Damitas, Dota Mounains, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— Although this species is allied to *discrepans* Blandford, it is not closely related. It is distinguished from Blandford's species by the much wider discal interstriae, by the larger pronotal punctures, and by the rather coarse declivital denticles on interstriae 7 and 9.

MALE.— Length 1.7–2.0 mm, 2.1 times as long as wide; color brown.

Frons very shallowly concave below upper level of eyes, sides weakly elevated and armed at level of antennal insertion by a pair of small tubercles; surface coarsely reticulate,

punctures small, obscure; vestiture sparse, moderately long, coarse. Antennal club with segment 1 three times as wide as long.

Pronotum 0.9 times as long as wide; widest on basal half, sides weakly arcuate, almost parallel on basal half, then convergent to constriction just behind broadly rounded anterior margin; surface coarsely, deeply, closely, irregularly punctured, anterior and lateral areas subgranulate or even very finely asperate; vestiture short, stout, abundant, almost scalelike.

Elytra 1.4 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal three-fourths, obtusely angulate behind, with lateral declivital spines interrupting profile; striae sharply impressed, punctures large, deep, distinct; interstriae distinctly narrower than striae, irregular, each with a median row of fine setiferous granules and additional subgranulate setiferous punctures on each side. Declivity steep, convex; interstriae 1 weakly elevated, 5 with two, 7 with three, 9 with five large pointed tubercles, posteriormost one on each interstriae longer, 9 elevated slightly to final spine; costal margin near apex slightly elevated. Vestiture consisting of rather abundant interstrial subsquamose bristles, short except median row twice as long, erect; equally abundant on disc and declivity.

FEMALE.— Similar to male except frons weakly convex, unarmed; pronotum more nearly asperate in lateral areas.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Río Damitas, Dota Mountains, San José, 18-II-64, 250 m, No. 437, S. L. Wood.

BIOLOGY.— The transverse, biramous egg galleries were primarily in the phloem tissues of the stump 20 cm in diameter of an unidentified tree.

NOTES.— The above treatment was based on the type series of 22 specimens.

### 2. *Phloeotribus championi* (Blandford)

*Eulytocerus championi* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):161 (Holotype, male; Volcán de Chiriquí, Chiriquí, Panama; British Mus. Nat. Hist.)

*Eulytocerus substriatus* Schedl, 1935, Rev. de Ent. 5:344 (Holotype, male; Turrialba, Costa Rica; Schedl Coll.); Wood, 1977, Great Basin Nat. 37:387. *Synonymy*

DIAGNOSIS.— This species is distinguished from *nubilus* Blandford and *atavus* Wood by the costate basal margins of the elytra, by the absence of granules and crenulations from the elytral interstriae, and by the much more extensive excavated area on the male frons.

MALE.— Length 3.6–3.7 mm, 1.8 times as long as wide; color very dark brown, almost black.

Frons shallowly concave from vertex to epistoma from eye to eye (transversely flat to weakly concave between eyes), margins from level of antennal insertion to epistoma elevated, partly costate; a rather deep, short, median groove just above level of antennal insertion dividing a transverse callus; surface smooth and shining, rather densely, finely, uniformly punctured on upper two-thirds, less closely punctured on lower third; vestiture of fine, rather short, moderately abundant hair.

Pronotum 0.87 times as long as wide; widest one-third pronotum length from base, sides strongly arcuate from base, rather narrowly rounded in front; surface smooth, shining, densely, deeply, rather finely punctured, entirely devoid of asperities, median line impunctate on basal half. Disc with a few stout setae, more abundant at margins.

Elytra 1.2 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; basal margins costate, submarginal crenulations absent; striae distinctly, rather weakly impressed except more strongly impressed toward declivity, punctures varying from almost round to subquadrate, rather close; interstriae two to three times as wide as striae, moderately convex, shining, irregularly undulating or wrinkled on basal two-thirds, punctures rather fine, abundant, confused, many of them associated with irregular, transverse, impressed lines except near declivity. Declivity rather steep, convex; sculpture as on posterior part of disc. Vestiture of moderately abundant, small, erect scales and interstrial rows of longer bristles; each bristle three to five times as long as scales, half to two-thirds as long as distance between rows, similarly spaced within a row; bristles shorter on lower declivity.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Turrialba, 800 m, SLG. Schild. PANAMA: Volcán de Chiriquí, 3500–4000 ft (about 1200 m), G. C. Champion.

NOTES.— The above treatment was based on the holotypes of *championi* (3.7 mm) and *biseriatus* (3.6 mm). The frontal setae and erect elytral setae of *championi* are very slightly longer, and the interstrial punctures of *substriatus* are slightly larger and associated with slightly deeper undulations of surface contour; however, on the basis of these two specimens I recognize only one species.

### 3. *Phloeotribus nubilus* Blandford

*Phloeotribus nubilus* Blandford, 1897, Biol. Centr. Amer., Coleopt 4(6):163 (Lectotype, female; Cerro Zunil, Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is allied to *atavus* Wood, although the relationship is not close. It is distinguished by the smaller size, by the scalelike, uniseriate rows of erect interstrial setae on the posterior half of the elytra, by the narrow, uniseriate interstrial crenulations, and by the convex area of the female frons extending well below the level of the antennal insertions.

MALE.— Length 2.2–2.7 mm, 2.0 times as long as wide; color dark reddish brown.

Frons broadly, concavely impressed from upper level of eyes to epistoma, lateral margins armed by a pair of somewhat indefinite teeth at level of antennal insertion; surface reticulate, finely, rather closely punctured. Segments of antennal club four times as wide as long; scape with a small tuft of about a dozen long setae.

Pronotum 0.85 times as long as wide; widest at base, sides rather weakly arcuate, converging slightly anteriorly, broadly rounded in front; surface obscurely reticulate, anterolateral areas with isolated, very fine asperities, punctures moderately small, shallow, close; vestiture consisting of very fine, short, hairlike setae and slightly longer, coarser bristles.

Elytra 1.45 times as long as wide, 1.9 times as long as pronotum; sides straight and parallel on basal two-thirds, moderately constricted before narrowly rounded posterior margin; scutellum small, round, scutellar notch rather deep; basal margins armed by 14 rather coarse, overlapping crenulations; striae weakly impressed, punctures small, deep, very close, a few confluent; interstriae twice as wide as striae, weakly convex, punctures small, deep, confused, abundant, each interstriae bearing a uniseriate row of rather large subcrenulate granules, granules not more than a third as wide as an interstriae. Declivity convex, moderately steep; striae slightly deeper; interstriae as on disc except 9 weakly elevated then joining costal margin and continuing to apex. Vestiture consisting of rather abundant ground setae, hairlike at base, subplumose scales on posterior half of disc and on declivity; and uniseriate rows of longer, erect, interstrial bristles, slender at base, scalelike on declivity, on declivity twice as long as ground cover, about four times as long as wide.

DISTRIBUTION.— Veracruz to Panama.

MEXICO: Veracruz: Motzorongo, Flohr. GUATEMALA: Cerro Zunil, G. C. Champion. COSTA RICA: San Vito, Puntarenas, 21-I-68, 1500 m, H. Hespenheide. PANAMA: Volcán de Chiriquí, G. C. Champion.

NOTES.— The above treatment was based on the original Blandford series, and one additional specimen from Costa Rica. Because a lectotype has not been selected from the syntypic type series, I here designate as the lectotype of *nubilus* Blandford the first specimen in the series, a female from Cerro Zunil, Guatemala. This specimen has previously been regarded as the type.

### 4. *Phloeotribus atavus* Wood

*Phloeotribus atavus* Wood, 1969, Brigham Young Univ. Sci. Bull. 10(2):6 (Holotype, female; Laguna Volcán Poás, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is allied to *nubilus* Blandford, but it is distinguished by the larger size, by the hairlike, longer, uniseriate, interstrial setae, and by the coarser pronotal punctures.

MALE.— Length 3.4–4.0 mm, 2.0 times as long as wide; color very dark brown.

Frons convex above eyes, flattened to impressed below; lateral margins subacutely elevated from level of antennal insertion almost to epistomal margin, area between flattened; surface subreticulate, punctures rather coarse, close, very shallow; vestiture very fine, inconspicuous. Antennal club with segment 1 three times as wide as long, about as long as scape.

Pronotum 0.96 times as long as wide; widest at or just behind middle, sides rather strongly arcuate, converging very slightly anteriorly, rather strongly constricted just behind rather broadly rounded anterior margin; surface completely devoid of asperities, reticulate, punctures rather small, very close, deep; a faint median line weakly elevated; vestiture consisting of inconspicuous, very fine, short hair.

Elytra 1.4 times as long as wide, 1.8 times as long as pronotum; sides straight and parallel on basal two-thirds, broadly rounded and with apex rather narrowly extended on median third behind; striae narrowly impressed, punctures rather obscure, interstriae twice as wide as striae, crenulate on basal half, some crenulations as wide as interstriae, elevations becoming narrower and uniseriate behind, some fine punctures also present; shining. Declivity rather steep, convex; striae impressed; interstriae convex, 1 slightly elevated on lower half, apical costal margin and posterior part of 9 also slightly elevated, each interstriae with a row of very small tubercles. Vestiture consisting of moderately sparse, small scales on posterior half of disc and on declivity, and sparse median interstrial rows of fine long hair, longest hairs equal in length to distance between rows and to adjacent hairs within a row.

FEMALE.— Similar to male except frons convex to just above level of antennal insertion, impression less extensive, lateral margins less strongly elevated, punctures slightly deeper; elytral tubercles often very slightly larger.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Laguna Volcán Poás, 6-X-63, 14-VII-63, 19-VIII-66, 2700 m, Nos. 98 and 170 in *Clusia*, No. 47 in *Podocarpus*, S. L. Wood.

HOSTS.— *Clusia* sp., *Podocarpus oleifolius*.

BIOLOGY.— The biramous egg galleries were transverse and almost entirely in the phloem. This aggressive species attacked and apparently killed several *Clusia* trees; they also killed several buttress roots of a large *Podocarpus* tree.

NOTES.— The above treatment was based on the type series of 37 specimens.

### 5. *Phloeotribus quercinus* Wood

*Phloeotribus quercinus* Wood, 1969, Great Basin Nat. 29:123 (Holotype, female; Pachuca, Hidalgo, Mexico; Wood Coll.)

DIAGNOSIS.— This species is closely allied to *pruni* Wood, but it may be distinguished by the less strongly attenuate lateral extension of segments of the antennal club, by the absence of submarginal crenulations near the elytral bases, by the coarser pronotal punctures, and by the host.

FEMALE.— Length 1.8–2.1 mm, 1.9 times as long as wide; color black.

Frons evenly convex above level of antennal insertion, transversely impressed below, smooth epistomal margin slightly elevated; premandibular epistomal lobe small, distinct; surface strongly reticulate, punctures small, obscure, rather close; vestiture fine, hairlike, rather sparse. Antennal club with segments 1 and 2 each very slightly less than twice as wide as long.

Pronotum 0.82 times as long as wide; widest at base, sides arcuately converging to a slight constriction just before broadly rounded anterior margin; surface reticulate, devoid of all indications of asperities, punctures coarse, moderately deep, separated by distances up to diameter of a puncture; part of median line impunctate in front of middle; vestiture very fine, long.

Elytra 1.35 times as long as wide, 2.0 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; scutellum small, rounded, scutellar notch rather deep; basal margins each armed by 14 rather narrow, high crenulations, devoid of submarginal crenulations; striae weakly impressed toward declivity, punctures moderately coarse, deep, interstriae slightly wider than striae, devoid of punctures, moderately large, rounded granules somewhat confused. Declivity convex, steep; striae moderately impressed; interstriae feebly convex, not elevated, granules almost uniseriate. Vestiture consisting of fine, semirecumbent strial hair, and erect, confused interstrial setae of uniform length, fine at base, becoming stout and shorter toward declivity, each almost equal in length to width of an interstriae.

DISTRIBUTION.— Durango to Hidalgo.

MEXICO: Durango: 32 km E El Salto, 17-VI-71, H. F. Howden. Hidalgo: 16 km E Pachuca, 10-VI-67, 2600 m, No. 5, *Quercus*, S. L. Wood.

HOST.— *Quercus* sp.

BIOLOGY.— Diagonal, biramous galleries were being cut by adult females, engraving the wood rather deeply in small branches and twigs less than 2 cm in diameter. Neither eggs nor larvae were present. It is entirely possible these were maturation feeding tunnels formed while the males were elsewhere beginning primary galleries.

NOTES.— The type series of 23 specimens was used to prepare the above treatment.

### 6. *Phloeotribus discrepans* Blandford

*Phloeotribus discrepans* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):163 (Holotype, female; Volcán de Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is allied to *liminaris* Harris and *pruni* Wood, but it may be distinguished by the large epistomal callus of the male, by the armature of the male declivity, and, in the female, by the confused interstrial setae on the declivity.

MALE.— Length 1.5–2.5 mm, 1.9 times as long as wide; color dark brown.

Frons broadly, shallowly concave from near upper level of eyes to level of antennal insertion, median two-thirds of epistomal margin occupied by a large reticulate, impunctate callus extending to level of antennal insertion; remaining surface reticulate, punctures fine, deep, rather close; vestiture of fine, short, inconspicuous hair. Segment 1 of antennal club 3.8 times as wide as long.

Pronotum 0.88 times as long as wide; widest at base, sides arcuately converging to constriction just before broadly rounded anterior margin; entire surface reticulate, punctures rather fine, shallow to moderately deep, rather close, part of those (perhaps one-fourth) on anterior two-thirds very finely asperate, asperities not larger in lateral areas; vestiture consisting of rather abundant, fine, short hair.

Elytra 1.3 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on posterior two-thirds, rather broadly rounded behind, posterior profile interrupted by several declivital teeth; scutellar notch rather shallow, broad; anterior margins each armed by 11 to 13 coarse, overlapping crenulations; striae moderately impressed, punctures rather coarse, deep, distinct; interstriae wider than striae, slightly convex, punctures fine, deep, confused, their anterior margins weakly granulate. Declivity steep, convex; strial punctures deep but smaller than on declivity; interstriae 1 and 3 moderately convex, slightly elevated, 1 armed by four,3 by five rather coarse teeth, 2 impressed, as narrow as 1, with a uniseriate row of punctures, 5, 7, 8, and 9 each with one to about four small tubercles. Vestiture of suberect, stout, abundant bristles of uniform length on disc and declivity, each bristle equal in length to width of interstriae.

FEMALE.— Similar to male except frons convex, epistomal margin and transverse callus just above antennal insertions slightly elevated; interstrial granules on disc conspicuously larger; declivital interstriae equally, weakly convex, each (including 2) bearing a row of small tubercles; declivital bristles confused on all interstriae except 1.

DISTRIBUTION.— Chiapas to Panama.

MEXICO: Chiapas: 11 km E San Cristóbal, 13-V-69, D. E. Bright. GUATEMALA: Quezaltenango, Quezaltenango, 26-V-64, 1700 m, No. 626, S. L. Wood; Volcán de Agua, Esquintla, 19-V-64, 1000 m, No. 614, S. L. Wood. PANAMA: Cerro Punta (Volcán de Chiriquí), Chiriquí, 11-I-64, 1800 m, Nos. 389, 398, 417, 421, S. L. Wood.

HOSTS.— Several unidentified tree species.

BIOLOGY.— Similar to *liminaris*.

NOTES.— The above treatment was based on my female topotypic homotype and on 240 additional specimens. A distinctive group is formed within the genus by *quercinus, discrepans, liminaris*, and *pruni*.

### 7. *Phloeotribus liminaris* (Harris)

Figs. 89, 90

*Tomicus liminaris* Harris, 1852, A treatise on some of the insects of New England injurious to vegetation, p. 79 (Holotype, female; New England; Mus. Comp. Zool.)

*Phthorophlocus mississippiensis* Blackman, 1921, Mississippi Agric. Expt. Sta. Tech. Bull. 10:4 (Lectotype, female; Agricultural College or Starkville, Mississippi; U.S. Nat. Mus., 56930, designated by Wood, 1971, Great Basin Nat. 31:151). *Synonymy*

DIAGNOSIS.— This species is very closely related to *pruni* Wood, but it may be distinguished by the much finer, much longer pubescence, by the larger, less deeply impressed pronotal punctures, by the somewhat coarser

tubercles on declivital interstriae 2, and by the less strongly impressed male frons and larger epistomal callus.

MALE.— Length 1.9–2.3 mm, 1.9 times as long as wide; color dark brown.

Frons convex, a very feeble impression immediately above transverse callus at level of antennal insertion; epistomal margin slightly elevated with a moderately large, reticulate callus on median third (much as in *discrepans*) extending toward transverse callus above; surface elsewhere reticulate, punctures small, rather close, somewhat obscure; vestiture hairlike, fine, moderately long, inconspicuous. Antennal club segment 1 four times as wide as long.

Pronotum 0.80 times as long as wide; outline as in *discrepans*; entire surface reticulate, punctures moderately large, shallow, rather close, not at all granulate or asperate; vestiture of rather long, fine, abundant hair.

Elytra 1.3 times as long as wide, 1.8 times as long as pronotum; sides very feebly arcuate, diverging very slightly to declivital base, rather broadly rounded behind; scutellar notch rather shallow, broad; basal margins each armed by 10 to 11 coarse, overlapping crenulations; striae weakly impressed, punctures coarse, deep; interstriae as wide as striae, all punctures largely replaced by small, rounded, confused granules. Declivity steep, convex; striae more narrowly impressed, punctures very slightly smaller, deeper; interstriae slightly narrower than striae, convex, 1 weakly elevated, each equally armed by a uniseriate row of rounded tubercles. Vestiture hairlike, very slightly coarser on declivity, length of each seta one to two times greater than width of one interstriae.

FEMALE.— Similar to male except frons more nearly convex, reticulate epistomal

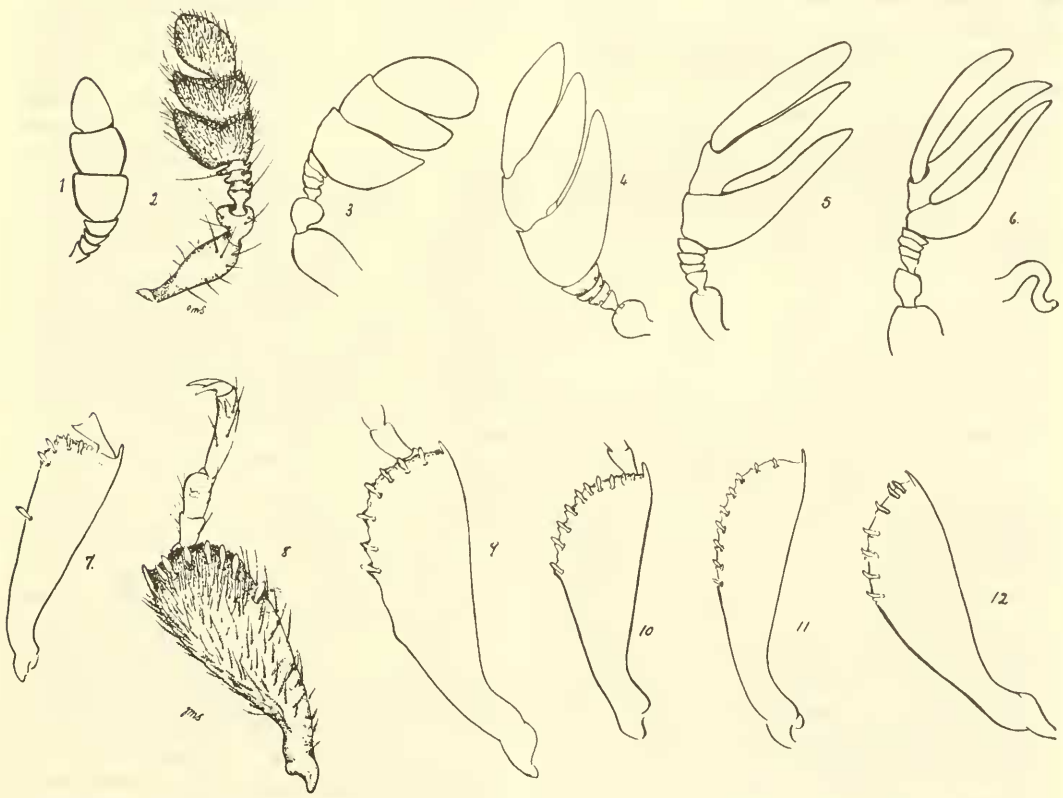



Fig. 89. *Phloeotribus* spp. antennae and protibiae: 1, 7, *rhododactylus*; 2, 8, *piceae*; 3, 9, *frontalis*; 4, 10, *liminaris*; 5, 11 *caucasicus*; 6, 12, *scarabaeoides*. (After Swaine 1911:224.)

callus absent; tubercles on elytral declivity evidently slightly smaller.

DISTRIBUTION.— Manitoba to Mississippi and east to the Atlantic Coast.

CANADA: Manitoba, New Brunswick, Ontario, Quebec. USA: Connecticut, District of Columbia, Florida, Iowa, Kentucky, Massachusetts, Michigan, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, West Virginia.

HOSTS.— *Prunus americana*, *P. angustifolia*, *P. persica*, *P. serotina*.

BIOLOGY.— This is the peach tree bark beetle that occasionally damages peach, cherry, and plum trees in the eastern United States and eastern Canada. Most of the adults overwinter in hibernation tunnels in healthy or injured bark of the host tree; a few evidently pass the winter in the brood galleries. In the spring the beetles emerge and attack unhealthy, injured, or cut limbs of the host, where biramous, transverse galleries engrave the wood rather deeply. Larval mines tend to follow the grain of the wood. Normally there are two generations each year, with at least a partial third generation in the southern part of its range.

NOTES.— The female holotype of *liminaris* has the pronotum damaged, but it is easily recognized as this species. The above treatment was based on my female homotype from Burning Well, Pennsylvania, on the type series of *mississippiensis*, and on 313 other specimens. It is replaced in the west by *pruni*.

## 8. *Phloeotribus pruni* Wood

*Phloeotribus pruni* Wood, 1956, Canadian Ent. 88:253 (Holotype, female; Chihuahua, Chihuahua, Mexico; Snow Ent. Coll., Univ. Kansas)

DIAGNOSIS.— This species is very closely related to *liminaris* (Harris), but it may be distinguished by the much shorter, stout vestiture, particularly on the elytral declivity, by the finer, less deeply impressed pronotal punctures, by the somewhat finer punctures on declivital interstriae 2, and by the more strongly impressed male frons with a considerably larger median, epistomal callus.

MALE.— Length 1.8–2.8 mm, 2.0 times as long as wide; color dark brown.

Frons shallowly concave on central half, with a pair of lateral calluses just above level of antennal insertion as in *liminaris* but not connected on median third; epistomal callus reticulate, extending on median half to level of antennal insertion, much larger and more conspicuous than in *liminaris*, remaining surface reticulate (north) to subrugulose (south), rather finely, obscurely punctured; vestiture of fine, sparse, inconspicuous hair. Segment 1 of antennal club 4.0 times as wide as long.

Pronotum 0.80 times as long as wide; as in *liminaris* except surface usually a little more coarsely sculptured with punctures tending to average slightly smaller, vestiture shorter.

Elytra 1.3 times as long as wide, 1.8 times as long as pronotum; as in *liminaris* except granules on declivital interstriae averaging smaller, particularly on 2, vestiture stout, of uniform length, bristles not longer than distance equal to width of one interstriae.

FEMALE.— Similar to male except frons more nearly convex, upper calluses higher, epistomal callus present, much smaller, its surface indistinctly reticulate.

DISTRIBUTION.— North Dakota to Chiapas.

USA: **Arizona**: 24-III-41, peach. **Colorado**: Fort Collins, 30-VIII-50, *Prunus virginiana*, S. L. Wood; Boulder, Hopk. U.S. 432, *Prunus*, A. D. Hopkins; N. Cheyenne Canyon, 27-VII-15, *P. emarginata*, G. Hofer. **New Mexico**: Fairacres, 30-IX-43, peach; Nogal; Silver City, 19-IX-55, peach; State College, 23-VIII-16. **North Dakota**: Bottineau Co., 16-VII-71, *Prunus virginiana*, D. A. Tagstad; Hettinger, 16-VII-71, *Prunus*, M. E. McKnight; McHenry Co.; 30-V-70, D. A. Tagstad. MEXICO: **Chiapas**: Mt. Tzontehuitz, 26-V-69, D. E. Bright. **Chihuahua**: 24 km N Chihuahua, 29-VIII-53, *Prunus*, S. L. Wood; Maguarichic, 13-VII-60, peach, S. L. Wood. **Durango**: Durango, X-55, durazno, E. Jiminez. **Jalisco**: Guadalajara. **Hidalgo**: 8 km W Tulancingo, 11-VI-67, wild cherry, S. L. Wood. **Michoacán**: 19 km E Carapan, 18-VI-65, *Prunus*, S. L. Wood. **Nuevo León**: Cerro Potosí, 2-V-71, D. E. Bright.

HOSTS.— *Prunus persica*, *P. virginiana*, *P.* sp.

BIOLOGY.— Apparently the habits are as in *liminaris*. This rather aggressive species was found in peach and wild cherry at every Mexican locality where an effort was made to locate it. Although commercial orchards were not examined, it probably will be at least as important economically as *liminaris* is in the eastern United States.

NOTES.— The above treatment was based on the four paratypes in my collection and on 236 additional specimens. Specimens from the area north of Durango tend to be slightly

smaller and more finely sculptured than those from further south.

### 9. *Phloeotribus simplex* Wood

*Phloeotribus simplex* Wood, 1967, Great Basin Nat. 27:95 (Holotype, female, Fort Clayton, Canal Zone, Panama; Wood Coll.)

DIAGNOSIS.— This species is not clearly related to any species known to me, but evidently it is more nearly allied to *squamatus* Wood than to other Central American species.

FEMALE.— Length 1.3–1.5 mm, 2.1 times as long as wide; color brown.

Frons convex, with a transverse callus at level of antennal insertion; surface coarsely reticulate, with rather coarse, deep, moderately abundant punctures; vestiture fine, hairlike, inconspicuous. Segment 1 of antennal club about twice as wide as long.

Pronotum 0.9 times as long as wide; widest one-fourth length from base, sides feebly arcuate on basal half, rather strongly constricted just behind broadly rounded anterior margin; surface unarmed, reticulate, punctures small, deep, separated by distances one to three times diameter of a puncture; vestiture consisting of short, fine, and longer, coarse, hairlike setae.

Elytra 1.3 times as long as wide, 1.7 times as long as pronotum; scutellar notch very shallow; basal margins armed by a single row of 9 rather high crenulations, submarginal crenulations absent; striae not impressed, punctures deep, coarse; interstriae as wide as striae, almost flat and smooth, with median rows of small setiferous granules. Declivity steep, convex, rather narrow; striae and interstriae narrower than on disc. Vestiture consisting of rows of fine, recumbent, strial hair, and longer, erect, uniseriate rows of interstrial bristles, each bristle somewhat flattened at its apex and spaced in rows and between rows by distances about equal to length of a bristle.

DISTRIBUTION.— Panama.

PANAMA: Fort Clayton, Canal Zone, 22-XII-63, 30 m, woody vine, S. L. Wood; Barro Colorado Island, Canal Zone, 27-XII-63, 60 m, woody vine, S. L. Wood.

HOST.— A large woody vine (liana).

BIOLOGY.— Little could be determined concerning the habits from the partly decomposed host except that the brood penetrated deeply into the tissues. Whether the parental or larval mines had or had not been formed initially in the cambium could not be determined. The host was 5–10 cm in diameter.

NOTES.— The above treatment was based on the type series of 13 female specimens.

### 10. *Phloeotribus squamatus* Wood

*Phloeotribus squamatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):7 (Holotype, male; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This unique species is distinguished from other representatives of this genus by the small size, by the unarmed pronotum, by the short, uniseriate, squamose, interstrial vestiture, and by the shallowly impressed male frons.

MALE.— Length 1.2–1.3 mm, 2.1 times as long as wide; color black, with white squamose vestiture.

Frons shallowly concave from upper level of eyes to epistoma, lateral margins not acutely elevated or armed; epistomal margin weakly elevated, and with a median tubercle; surface coarsely reticulate; vestiture inconspicuous, mostly confined to marginal areas. Antennal club small, compact; segment 1 about 1.5 times as wide as long.

Pronotum 0.8 times as long as wide; widest just behind middle, sides moderately arcuate, moderately constricted just behind rather narrowly rounded anterior margin; surface rather coarsely reticulate, including punctures, with close, coarse, shallow punctures; vestiture consisting of suberect, short, stout, almost scalelike bristles, most of them about three times as long as wide.

Elytra 1.4 times as long as wide, 1.9 times as long as pronotum; scutellar notch rather shallow; basal margins armed by 9 coarse, rather high crenulations, submarginal crenulations not evident; striae weakly impressed, punctures large, rather deep; interstriae about half as wide as striae, almost restricted to a narrow row of closely set, subvulcanate, squamiferous punctures. Declivity rather steep, convex; striae somewhat narrower and deeper than on disc. Vestiture consisting of uniseriate rows of erect scales, each scale less than twice as long as wide; separated from

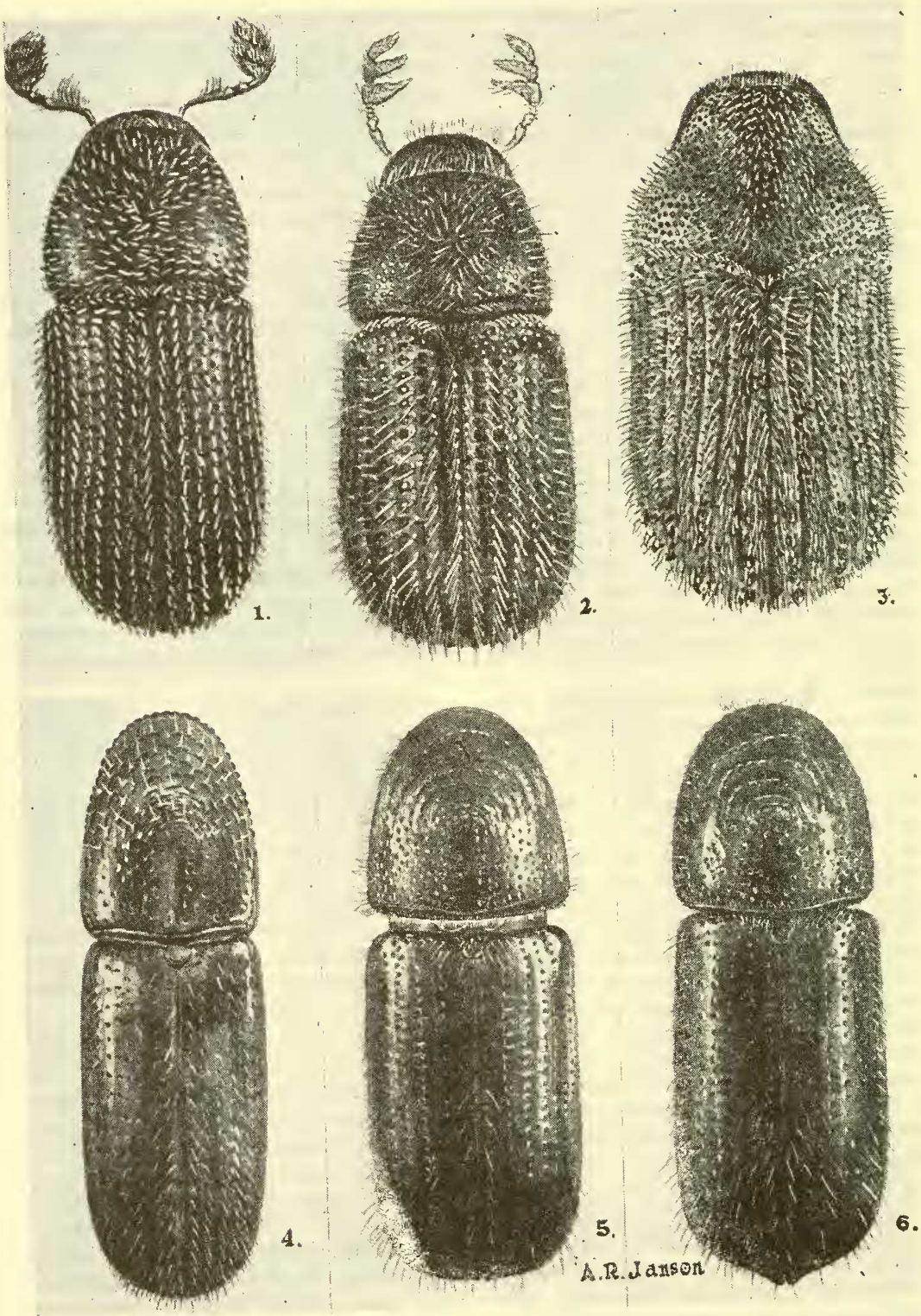



Fig. 90. Scolytidae spp..: 1, *Phloeotribus dentifrons*; 2, *Phloeotribus liminaris*; 3, *Phloeosinus dentatus*; 4, *Pseudopityophthorus asperulus*; 5, *Pityophthorus lautus*; 6, *Pityophthorus scriptor*. (Blackman 1921:11.)

adjacent scales in same row by distances equal to less than the width of a scale, and between rows by distances equal to almost twice length of a scale.

FEMALE.— Similar to male except frons convex, median epistomal tubercle absent; vestiture of pronotum and elytra very slightly more slender.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 8-VII-63, 1300 m, dying tree, S. L. Wood.

BIOLOGY.— The only two known specimens were just entering the bark of a limb of the unidentified host tree.

NOTES.— The above treatment was based on the male holotype and the female allotype. Specimens in a series taken from *Inga* at Colonia Tovar, Aragua, Venezuela, are 1.3–1.7 mm in length, but appear to be of this species.

### 11. *Phloeotribus lecontei* Schedl

*Phloeotribus puberulus* LeConte, 1879, nec Chapuis 1869, U.S. Dept. Interior, Geol. Geograph. Surv. Bull. 5(3):519 (Holotype, male; La Veta Pass, Colorado; Mus. Comp. Zool.)

*Phloeotribus lecontei* Schedl, 1962, Beitr. Ent. 12:487 (replacement name)

DIAGNOSIS.— This species is very closely related to *piceae* Swaine, but it is distinguished by the depressed, often flattened declivital interstriae 2 on the lower half, with the tubercles reduced, by the somewhat smaller strial punctures, and by the coarser vestiture. The European *spinulosus* Rey is a closely related, more finely sculptured species.

MALE.— Length 1.6–2.4 mm, 2.2 times as long as wide; color very dark brown.

Frons deeply, rather narrowly concave from upper level of eyes to epistoma, lateral margins at level of antennal insertion bearing a pair of rather large, pointed tubercles; surface rather smooth, punctures fine, sparse, a few isolated granules above; epistomal margin extended on median third into a moderately large premandibular lobe; vestiture rather sparse, coarse, moderately long, uniformly distributed. Segment 1 of antennal club twice as wide as long.

Pronotum 0.84 times as long as wide; widest very slightly behind middle, sides rather strongly arcuate, moderately constricted just before rather narrowly rounded anterior margin; surface very minutely granulate, punctures moderately large, rather close, often obscure, some punctures on anterior half with their anterior margins very finely granulate; vestiture of coarse, moderately long bristles.

Elytra 1.5 times as long as wide, 2.0 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind, several serrations interrupt posterior profile; scutellar notch rather narrow, moderately shallow; basal margins each armed by 10 coarse crenulations and three submarginal ones near scutellum; striae very weakly impressed, punctures moderately coarse, deep; interstriae as wide as striae, weakly convex, minutely granulose, punctures very finely granulate. Declivity convex, moderately steep; striae very slightly more deeply impressed; interstriae 1, 3, and 9 moderately elevated, 3 and 9 join apically and continue to 1 before apex, 2 narrowed and usually flattened on lower half; all interstriae uniseriately tuberculate except lower half of 2, serrations on 1, 3, 9, and costal margin near apex, larger. Vestiture consisting of very fine, short, strial hair and uniseriate rows of erect, interstriae bristles, each bristle as long as distance between rows, more closely spaced within each row; a supplemental row of bristles on declivital interstriae 1.

FEMALE.— Similar to male except frons convex, with a slight median impression on upper half; elytral tubercles often slightly larger.

DISTRIBUTION.— British Columbia and Alberta to Arizona and New Mexico.

CANADA: **Alberta**: Banff. **British Columbia**: Kootenay Pass near Creston. USA: **Arizona**: Alpine, Chiricahua Mts., Graham Mts., Santa Catalina Mts. **California**: Arcata. **Colorado**: Del Norte, Fort Collins, Fort Garland, Indian Creek, New Castle, Poudre Canyon, Rabbit Ears Pass. **Idaho**: Franklin Co. **Montana**: Glacier N. P. **New Mexico**: Capitan, Cloudcroft, Sacramento Mts., Sandia Mts., Santa Fe Ski Basin. **Oregon**: Dixie Pass, Gold Lake. **Utah**: Alta, Ashley N. F., Bryce Canyon N. M., Logan Canyon, Parowan Canyon, Settlement Creek in Tooele Co., Wolf Creek Pass.

HOSTS.— *Abies lasiocarpa*, *Picea englemannii*, *P. pungens*, *Pseudotsuga menziesii*.

BIOLOGY.— This monogamous species evidently prefers shaded out branches of large living trees, although it occasionally occurs in branches of fallen trees or slash. The male

constructs the entrance tunnel and bases of the biramous egg galleries; the female cuts the remainder of the two egg galleries. The tunnels most commonly cut obliquely across the grain of the wood, though they vary from transverse to almost longitudinal. The winter is passed mostly as young adults or almost fully grown larvae; some of the adults are in the brood galleries, others in what appeared to be special hibernation or maturation tunnels, and others in newly formed parental galleries. Adults and larvae of almost all sizes can be found at any time during the year. Evidently two generations are produced each year at lower elevations. The species is not aggressive and, consequently, is of minor economic importance.

NOTES.— The above treatment was based on my male homotype from Rabbit Ears Pass, Colorado, and 215 additional specimens. This species is rather variable within a series. For this reason geographical variations were difficult to detect. The most distinct variation was the almost completely transverse parental galleries of the Graham Mountain, Arizona, series.

### 12. *Phloeotribus piceae* Swaine
Fig. 89

*Phloeotribus piceae* Swaine, 1911, Canadian Ent. 43:220 (Lectotype, female; Ste. Anne de Bellvue, Quebec; Canadian Nat. Coll., designated by Bright, 1967, Canadian Ent. 99:677)

DIAGNOSIS.— This species is very closely related to *lecontei* Schedl, but it is distinguished by the more coarsely, deeply impressed strial punctures, by the equally convex, serrate declivital interstriae 1 to 3, and by the finer vestiture.

MALE.— Length 2.0–2.5 mm, 2.2 times as long as wide; color dark brown.

Frons as in *lecontei*. Pronotum as in *lecontei* except surface more nearly shining, punctures evidently averaging slightly smaller.

Elytra as in *lecontei* except strial punctures larger, deep, interstriae smoother; declivital interstriae 1 to 3 equally convex and serrate, denticles on 2 continued to its apex, all declivital tubercles coarser than in *lecontei*; vestiture much finer, interstrial setae of eastern specimens almost as fine as those on striae.

FEMALE.— Similar to male except frons planoconvex, with a transverse callus at level of antennal insertion; elytral tubercles very slightly larger.

DISTRIBUTION.— Yukon Territory to Quebec and Maine.

ALASKA: Hope, 1978, pheromone trap, R. A. Werner. CANADA: **Manitoba**: Riding Mts. **Northwest Territories**: Aklivak, Yellowknife. **Ontario**: Sudbury. **Quebec**: Gaspé Co., Isle Perrot, Ste. Anne de Bellvue. **Yukon Territory**: Fortymile. USA: **Maine**: Brunswick, Camp Caribou, Orono. **Minnesota**: Duluth. **New York**: Cranberry Lake.

HOST.— *Picea glauca*.

BIOLOGY.— Evidently similar to *lecontei*.

NOTES.— The above treatment was based on the lectotype, on 8 paratypes, and on 70 other specimens.

### 13. *Phloeotribus frontalis* (Olivier)
Fig. 89

*Scolytus frontalis* Olivier, 1795, Entomologie, Coleopt. 4(78):13 (Amerique septentrionale; presumably in Paris Mus. but not located)

*Bostrichus frontalis*: Fabricius, 1801, Systema Eleutheratorium 1:389.

*Phloeotribus frontalis*: Zimmerman, 1868, Trans. Amer. Ent. Soc. 2:149.

*Phloeophthorus granicollis* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:149 (Lectotype, male; Carolina boreale, specimen labeled "Am. Bor"; U.S. Nat. Mus., present designation); Eichhoff, 1896, Proc. U.S. Nat. Mus. 18:608. *Synonymy*

*Phloeophthorus moriperda* Hopkins, 1905 (preprint), Proc. Ent. Soc. Washington 7:77 (Lectotype, female; Irapuato, Guanajuato, Mexico; U.S. Nat. Mus., 7515, designated by Wood, 1971, Great Basin Nat. 31:151) *Synonymy*

DIAGNOSIS.— As indicated in the above key, this species is rather closely related to *destructor* Wood, but it is distinguished by having declivital interstriae 1 to 4 tuberculate, by the less closely, more finely punctured pronotum with minute points densely marked in the interspaces, and by the different host and distribution.

MALE.— Length 1.7–2.4 mm, 2.1 times as long as wide; color dark brown.

Frons broadly, shallowly concave from epistoma to upper level of eyes, center subfoveately impressed, lateral margins armed by a pair of coarse, pointed tubercles at level of antennal insertion; surface finely rugulose, with a few very fine granules on upper half of sides and above eyes, several, fine, obscure punctures below; vestiture of fine, inconspicuous hair. Segment 1 of antennal club 1.6 times as wide as long.

Pronotum 0.86 times as long as wide; widest just behind middle, very slightly arcuate, rather abruptly rounded just anterior to middle, rather narrowly rounded in front; surface densely marked by fine puncturelike points in interspaces between small, moderately abundant punctures, fine, rounded granules scattered over almost entire surface, perhaps one-third as abundant as punctures; vestiture of stout bristles, moderately abundant, rather short.

Elytra 1.3 times as long as wide, 1.7 times as long as pronotum; scutellar notch rather shallow, broad; basal margins each armed by 12–13 coarse, overlapping crenulations; striae slightly impressed, punctures rather coarse deep; interstriae slightly narrower than striae, rather weakly convex, punctures replaced by uniseriate rows of coarse, narrow crenulations. Declivity rather steep, convex; striae narrower and slightly deeper than on disc; all interstriae uniseriately tuberculate, tubercles small on 1, increasing in size laterally until very coarse on 9, 9 slightly elevated, joining costal margin, elevation and tubercles continuing to apex without interruption. Vestiture consisting of uniseriate rows of pointed bristles, each about equal in length to distance between rows.

FEMALE.— Similar to male except frons convex to narrow, transverse impression just above epistomal margin, a median fovea near center, granules not evident.

DISTRIBUTION.— Kansas and Texas to Pennsylvania and South Carolina.

USA: Alabama, District of Columbia, Georgia, Illinois, Indiana, Iowa, Kansas, Louisiana, Maryland, Michigan, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia. MEXICO: Guanajuato: Irapuato. Hopk. US1326 (introduced but not established).

HOSTS.— *Celtis occidentalis*, *Morus alba*, *M. rubra*.

BIOLOGY.— Young adults emerge from the brood tree in the fall and construct maturation feeding hibernation tunnels in living host trees, primarily in the outer bark but extending to the outer area of phloem tissue. In some areas considerable damage results from this injury. In the spring the beetles emerge from hibernation and attack unthrifty, injured, or cut trees in any area from the stump to the branches. The monogamous beetles construct transverse, biramous parental galleries that engrave both the wood and inner bark surfaces; the male initiates the attack and constructs the entrance tunnel. According to Blackman (1922:54), the two combined egg galleries of a biramous system varied from 3 to 5 cm in length; the number of egg niches varied from 30 to 90. The larval mines parallel the grain of the wood, engraving both the wood and phloem tissues. Evidently there are two generations each year. Although red mulberry appears to be the preferred host, it is not uncommon in hackberry.

NOTES.— The above treatment was based on my series from Lawrenceville, Illinois; in all 429 specimens were examined. One male syntype of *granicollis* was sent by Eichhoff to the U.S. National Museum. That specimen is here designated as the lectotype of *granicollis* Eichhoff and is consistent with what I treat here as *frontalis*, although I have not seen Olivier's type. A search for Olivier's type was unsuccessful, but it probably is in the Paris Museum. The male and female syntypes of *Phloeophthorus moriperda* were also compared directly to my material. Although the size of these syntypes is at the lower limits for this species, the other characters fall well within the range of its variability. It is quite apparent that the species was introduced into the mulberry (*Morus alba*) plantation at Irapuato, but my search gave no indication that it survived there. Cibrián (pers. comm.) apparently found it there at a later date. Because Hopkins did not designate a holotype for his species, I here designate his "female type" as the lectotype of *Phloeophthorus moriperda*.

### 14. *Phloeotribus destructor* Wood

*Phloeotribus destructor* Wood, 1969 Great Basin Nat. 29:123 (Holotype, male; Morelia, Michoacán, Mexico; Wood. Coll.)

DIAGNOSIS.— This species is distinguished from *frontalis* (Olivier) by the absence of tubercles on declivital interstriae 1 to 4, by the much more coarsely punctured pronotum, with the interspaces devoid of fine impressed points, and by the different host and distribution.

MALE.— Length 1.8–2.4 mm, 2.1 times as long as wide; color dark brown.

Frons shallowly, broadly concave from epistomal margin almost to level of upper

margin of eyes; lateral margins armed by a pair of moderately large, pointed tubercles at level of antennal insertion; surface shining, subreticulate below, almost rugulose above, marginal areas above tubercles with rather abundant, small, rounded granules; vestiture of rather abundant, coarse, short hair. Segment 1 of antennal club 2.6 times as wide as long.

Pronotum 0.81 times as long as wide; widest at base, sides rather weakly, arcuately converging to a feeble constriction just behind anterior margin, rather narrowly rounded in front; surface coarsely, very closely, rather shallowly punctured, a few granules and fine asperities in anterolateral areas, interspaces between punctures less than half as wide as diameter of a puncture, devoid of impressed points; vestiture of rather fine, moderately abundant, short hair.

Elytra 1.4 times as long as wide, 1.9 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; scutellar notch rather shallow, obtuse; basal margins each armed by 12–14 coarse, overlapping crenulations; striae moderately impressed, punctures deep, rather fine on basal fourth, becoming coarser toward declivity; interstriae as wide as striae, closely crenulate, crenulations confused, each about half as wide as an interstriae, low except at base and much larger at base of declivity. Declivity convex, moderately steep; striae narrowly impressed, punctures rather small; interstriae 1 to 8 equally convex, armed at base by crenulations that increase in size laterally, interstriae on declivital face not at all granulate, uniseriately, finely punctured, except 9 joining costal margin, its elevation and course tubercles continuing to apex. Vestiture of slender, interstrial bristles of uniform length, slightly confused on most of disc, becoming uniseriate toward and on declivity, on declivity each equal in length to distance between rows.

FEMALE.— Similar to male except frons convex, a narrow, transverse impression immediately above epistoma, lateral tubercles absent.

DISTRIBUTION.— Michoacán.

MEXICO: Michoacán: 19 km E Carapan, 18-VI-65, wild cherry, No. 76, S. L. Wood; Morelia; 14-VI-65, peach, No. 57, S. L. Wood.

HOSTS.— *Prunus persica*, *P.* sp.

BIOLOGY.— This species was misidentified in the field as *pruni*, with which the Carapan series was intermixed; evidently their habits are very similar. The Morelia series was taken from an apparently healthy peach tree. Although some of the new attacks could very well have been for maturation feeding, at least one new, biramous gallery contained eggs. It is a potential horticultural pest species.

NOTES.— The above treatment was based on the type series of 19 specimens.

### 15. *Phloeotribus dentifrons* (Blackman)

Fig. 90

*Phthorophloeus dentifrons* Blackman, 1921, Mississippi Agric. Expt. Sta. Tech. Bull. 10:3 (Holotype, female; Agricultural College or Starkville, Mississippi; U.S. Nat. Mus., 56929)

DIAGNOSIS.— This species is distinguished from *texanus* Schaeffer by the presence of granules on all declivital interstriae, by the less strongly impressed striae with smaller punctures, by the smaller granules on the discal interstriae, and by slightly smaller average size.

MALE.— Length 1.2–1.6 mm, 2.2 times as long as wide; color dark brown.

Frons deeply concave from epistoma to upper level of eyes, lateral margins armed by a pair of rather large, pointed tubercles, margin subacute immediately above tubercles; surface reticulate, a few granules on upper margins; vestiture of sparse, fine, inconspicuous hair. Segment 1 of antennal club 2.5 times as wide as long.

Pronotum 0.85 times as long as wide; widest at base, sides weakly arcuate, converging slightly anteriorly, rather broadly rounded in front; surface subreticulate, punctures of moderate size and depth, usually not clearly defined, anterolateral area armed by about 15 asperities of varying sizes on each side; vestiture of moderately abundant, rather short, very stout setae.

Elytra 1.4 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; scutellar notch shallow, obtuse; basal margins each armed by 9 to 11 coarse crenulations; striae feebly if at all impressed, punctures rather small, deep;

interstriae as wide as striae, almost smooth, punctures replaced by rather small, rounded, uniseriate granules. Declivity convex, rather steep; striae distinctly impressed, punctures smaller, less distinct; interstriae weakly convex, granules very slightly larger on interstriae 1 to 9. Vestiture consisting of very fine, short, strial hair, and uniseriate, interstrial rows of suberect, very stout, almost scalelike bristles; each bristle equal in length to two-thirds of distance between rows.

FEMALE.— Similar to male except frons convex, unarmed, a very weak, transverse impression immediately above epistoma.

DISTRIBUTION.— North Dakota and Pennsylvania to Texas and Florida.

USA: District of Columbia, Florida, Illinois, Kansas, Louisiana, Maryland, Michigan, New Jersey, New Mexico, North Carolina, North Dakota, Pennsylvania, South Carolina, Texas, West Virginia.

HOSTS.— *Celtis occidentalis*, *Celtis* sp., *Condalis obtusifolia*.

BIOLOGY.— The beetles attack weakened or injured limbs and branches of the host tree. They pass the winter as young adults in the brood tunnels. In the spring they emerge to attack a new host. Their method of attack and gallery patterns resemble *frontalis*. There are two generations each year.

NOTES.— The above treatment was based on the holotype and on 539 other specimens.

### 16. *Phloeotribus texanus* Schaeffer

*Phloeotribus texanus* Schaeffer, 1908, J. New York Ent. Soc. 16:222 (Lectotype, male; Esparza Ranch, Brownsville, Texas; U.S. Nat. Mus., 42488, present designation)

DIAGNOSIS.— This species is distinguished from *dentifrons* (Blackman) by the odd-numbered, alternate, declivital interstriae being armed by pointed tubercles, the even-numbered interstriae being unarmed, by the more distinctly impressed discal striae, with the coarse punctures wider than the interstriae, by the wider, discal, interstrial granules, by the larger average size, and by the restricted distribution.

MALE.— Length 1.5–1.9 mm, 2.0 times as long as wide; color dark brown.

Frons as in *dentifrons* except excavation extending slightly above eyes. Antennal scape bearing a tuft of long, yellow hair; segment 1 of club 3.0 times as wide as long.

Pronotum 0.87 times as long as wide; widest a third of length from base, sides rather strongly arcuate, slightly constricted just behind anterior margin, narrowly rounded in front; surface reticulate, punctures moderately coarse, deep, slightly more than anterior half armed by granules and small asperities; vestiture of moderately abundant, short, very stout bristles.

Elytra 1.2 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; scutellar notch shallow, obtuse; basal margins each armed by eight coarse crenulations; striae distinctly impressed, punctures coarse, deep; interstriae slightly narrower than striae except at base, almost smooth, with uniseriate rather coarse, rounded granules. Declivity convex, rather steep; striae impressed, punctures much smaller than on disc; interstriae convex, all uniseriately granulate, those on 3, 5, 7, and 9 and sometimes 1 and 8 much larger and sharply pointed. Vestiture of uniseriate rows of suberect, very stout, interstrial bristles, each bristle about equal in length to distance between rows.

FEMALE.— Similar to male except frons convex, a slight transverse impression just above epistoma, a median fovea at center; scape without tuft of hair.

DISTRIBUTION.— Nuevo León and Texas to South Carolina and Florida.

USA: **Florida**: Biscayne, Lake Worth, Mariana. **Louisiana**: Creole, Killona. **South Carolina**: Charleston. **Texas**: Brownsville, Columbus, Devils River, Hidalgo Co., Southmost. MEXICO: **Nuevo León**: 24 km NW Montemorelos, 26-IV-69, D. E. Bright. DOUBTFUL ORIGIN: Intercepted at Mexican border in shelled corn, lot 36-22399, 16-V-36. A specimen labeled Barro Colorado Isl., C. Z., Panama, VI 1942, Fomes sp., No. 4981, J. Zetek, at the U.S. National Museum, almost certainly is mislabeled.

HOSTS.— *Celtis laevigata*, *Condalia obtusifolia*.

BIOLOGY.— Evidently the habits are similar to *dentifrons*, with which it was intermixed in one series.

NOTES.— The above treatment was based on 2 syntypes and on 563 additional specimens. Because Schaeffer did not designate a type for his species, I here designate the male syntype in the U.S. National Museum as the lectotype of *texanus* Schaeffer.

### 17. *Phloeotribus scabricollis* (Hopkins)

*Phloeophthorus scabricollis* Hopkins, 1916, *in* Blatchley and Leng, Rhynchophora or Weevils of North Eastern America, p. 656 (Holotype, male; Hessville, Indiana; U.S. Nat. Mus., 7485)

DIAGNOSIS.— This unique species is distinguished from other representatives of the genus by the deep, narrow striae, by the very short, abundant, confused elytral hair, by the distinctive pronotum, by the absence of frontal tubercles in the male, and by the host.

MALE.— Length 2.0–2.3 mm, 2.0 times as long as wide; body color dark brown.

Frons shallowly concave, lateral margins subacutely elevated on lower two-thirds, but devoid of tubercles at level of antennal insertion; surface minutely rugose-reticulate, with a few minute punctures; vestiture hairlike, inconspicuous. Segment 1 of antennal club 4.0 times as wide as long.

Pronotum 0.83 times as long as wide; widest at base, sides weakly arcuate, converging very slightly, broadly rounded in front; surface closely, sharply punctured, interspaces about equal in width to one-half diameter of a puncture, becoming granulate to finely asperate anteriorly and laterally, three coarse asperities at anterolateral margin; vestiture rather short, abundant, hairlike.

Elytra 1.3 times as long as wide, 1.9 times as long as pronotum; sides almost straight and parallel on slightly more than basal half, broadly rounded behind; scutellar notch shallow, obtuse; basal margins each armed by 15 coarse crenulations; striae narrowly, rather strongly impressed, punctures rather small, deep; interstriae about one and one-half times as wide as striae, tubercles close, confused, larger ones in somewhat irregular, uniseriate rows. Declivity convex, moderately steep; striae about as on disc; interstriae equally convex, 3, 5, 7, and 9 each bearing a uniseriate row of fine, pointed tubercles, tubercles evidently larger laterally. Vestiture consisting of uniformly short, abundant, confused, hairlike bristles on disc and declivity, each bristle equal in length to little more than half width of an interstriae.

FEMALE.— Similar to male except frons convex; asperities of pronotum slightly larger and more widely distributed; all declivital interstriae bearing at least a few minute tubercles.

DISTRIBUTION.— Illinois to Ohio.

USA: Illinois: Lyons, 20-VIII-12, G. M. Greene; Lisle, DuPage Co., 8-VII-70, *Ptelea trifoliata*, J. Appleby. Indiana: Hessville, 14-VII, W. S. Blatchley; Indiana Dunes St. Pk. Ohio: Georgesville, 10-IX-98, boring in axils of leaves of *Staphylea trifolia*.

HOSTS.— *Ptelea trifoliata*, *Staphylea trifolia*.

BIOLOGY.— Specimens were taken from small, unthrifty branches. The egg galleries were transverse.

NOTES.— The above treatment is based on the holotype and on 19 other specimens.

### 18. *Phloeotribus scabratus* Blandford

*Phloeotribus scabratus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):164 (Lectotype, male; Volcán de Chiriquí; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— The above key places this species near *scabricollis* Hopkins, although they are not closely related. Among Central American species it is unique in having the pronotal sculpture coarse and in having the elytral vestiture scalelike and confused on the disc but in uniseriate rows on the declivity.

MALE.— Length 2.5 mm, about 1.8 times as long as wide; color dark brown.

Frons broadly concave from epistoma to upper level of eyes; lateral margins moderately elevated, unarmed; details of surface sculpture largely obscured by debris, evidently rugose-reticulate, ornamented by a few coarse bristles. Antennal scape bearing a small tuft of long, dark hair; segment 1 of club at least five times as wide as long.

Pronotum 0.76 times as long as wide; widest on basal third, sides moderately arcuate, not converging on basal half, distinctly constricted before rather narrowly rounded anterior margin; surface shining, irregularly, very closely, rather coarsely punctured, anterior or lateral margins of punctures weakly to subasperately elevated, interspaces marked by minute points; anterolateral areas rather finely asperate, a low, completely marginal row across anterior margin; vestiture of stout, semirecumbent bristles of moderate length.

Elytra 1.1 times as long as wide, 1.6 times as long as pronotum; basal margins each armed by 14 crenulations; scutellar notch rather broad, shallow; sides almost straight and parallel on slightly more than basal half, broadly rounded behind; striae rather

strongly impressed, punctures rather coarse, deep; interstriae wider than striae, with numerous, short, confused, acute, setiferous crenulations. Declivity convex, rather steep; interstriae equally convex, 1 very slightly higher, each uniseriately tuberculate, except largely confused on 1. Vestiture of suberect scales, each scale rather short, about four to six times as long as wide, very slightly shorter and stouter on declivity.

DISTRIBUTION.— Panama.

PANAMA: Volcán de Chiriquí, Chiriquí, 4000–6000 ft, G. C. Champion.

NOTES.— This species was described from two male syntypes. The first of these specimens has been considered to be the type; it is here designated as the lectotype of *scabratus* Blandford.

### 19. *Phloeotribus opimus* Wood

*Phloeotribus opimus* Wood, 1969, Brigham Young University Sci. Bull., Biol. Ser. 10(2):7 (Holotype, male; Zomorano, Morazán, Honduras; Wood Coll.)

DIAGNOSIS.— This species is allied to *demessus* Blandford, but it may be distinguished by the smooth, shining, discal interstriae, except for the granules, by the almost straight basal margin of the pronotum, and by the slightly smaller average size.

MALE.— Length 1.4–1.9 mm, 1.8 times as long as wide; color very dark brown, with light vestiture.

Frons deeply excavated from upper level of eyes to epistoma, deepest near center, lateral margins acute from middle to antennal bases, surface rather coarsely reticulate; vestiture largely confined to marginal areas.

Antennal scape long, ornamented by a tuft of long yellowish hair. Segment 1 of antennal club three times as wide as long.

Pronotum 0.8 times as long as wide; widest one-third length from base, sides rather strongly arcuate, anterior constriction weak, rather broadly rounded in front; surface coarsely, deeply punctured, spaces between punctures almost smooth, subshining, less than half width of a puncture, with a small rounded, setiferous granule on anterior margin of each puncture; vestiture consisting of short, stout, whitish bristles.

Elytra 1.1 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal two-thirds, broadly rounded behind; scutellar notch shallow, obtuse; single row of 9–11 crenulations on each elytral base high, coarse; striae slightly impressed, punctures coarse, deep; interstriae convex, narrower than striae, armed by a row of small setiferous tubercles. Declivity steep, convex; striae somewhat narrower and deeper; interstriae 9 weakly elevated, more coarsely serrate. Vestiture consisting of uniseriate rows of suberect flattened bristles, each bristle separated within a row by distances equal to its own length, and from those in adjacent rows by one and one-half times its own length.

FEMALE.— Similar to male except frons convex, lateral margins rounded; antennal scape without tuft of hair.

DISTRIBUTION.— Jalisco to Costa Rica.

MEXICO: Jalisco: 33 km N Juchitlan, 3-VII-65, *Ficus*, 1300 m, S. L. Wood. GUATEMALA: Palín, Esquintla, 19-V-64, *Ficus*, 300 m, S. L. Wood. HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 558, *Ficus*, No. 506, *Celtis iguanae*, No. 507, *Serjania triquetra*, S. L. Wood. COSTA RICA: Lower Río Tempisque, Guanacaste, 25-III-64, 15 m, No. 501, *Ficus*, S. L. Wood.

HOSTS.— *Ficus* spp., less commonly (accidentally?) in *Celtis iguanae* and *Serjania triquetra*.

BIOLOGY.— The twigs and small branches of living fig trees are most commonly selected, although this species will attack broken branches. They tend to select those branches that have started to die near their terminal ends and rear their broods at the margin of the vigorous living tissues. In attacks of this type only one or two monogamous pairs of beetles were found in each branchlet. Presumably several overlapping generations are produced each year.

NOTES.— The above treatment was based on the type series of 103 specimens.

### 20. *Phloeotribus demessus* Blandford

*Phloeotribus demessus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):165 (Lectotype, female; Toxpam or Tuxpan, Mexico; British Mus. Nat. Hist., present designation)

*Phloeotribus tuberculatus* Eggers, 1951, Ent Blätt. 45–46:147 (Holotype, female; Turrialba, Cartago, Costa Rica, U.S. Nat. Mus., 69631); Wood, 1973, Great Basin Nat. 33:181. *Synonymy*

*Phloeotribus eggersi* Schedl, 1962, Beitr. Ent. 12:487. Replacement name

DIAGNOSIS.— This species is allied to *opimus* Wood, but it may be distinguished by the presence of numerous impressed points toward the base of the discal interstriae, these points becoming granulate posteriorly; by the posteriorly extended posteromedian area of the pronotum; and by the larger average size.

MALE.— Length 1.6–2.3 mm, 1.8 times as long as wide; color very dark brown.

Frons shallowly concave from epistoma almost to upper level of eyes, lateral margins at level of antennal insertions moderately elevated but unarmed; surface strongly reticulate, punctures small, moderately abundant, obscure; vestiture of rather abundant bristles of moderate length. Antennal scape ornamented by a small tuft of hair; segment 1 of club about five times as wide as long.

Pronotum 0.87 times as long as wide; widest a third of length from base, sides rather strongly arcuate, very slightly constricted just before narrowly rounded anterior margin; basal margin obtusely produced posteriorly in median area; surface subshining, punctures deep, coarse and moderately large intermixed, with interspaces rather densely marked by very small, deep punctures; vestiture sparse, of short, very stout bristles.

Elytra 1.1 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal half, broadly rounded behind; scutellar notch very broad; basal margins each armed by 15 broadly overlapping, rather low crenulations, a less definite submarginal row also indicated; striae rather strongly impressed at least toward declivity, punctures rather large, deep; interstriae slightly wider than striae, uniseriately, closely crenulate, crenulations more than half as wide as an interstriae, intervening spaces marked by rather abundant, deep, fine punctures. Declivity convex, steep; striae and interstriae slightly narrower than on disc, crenulations narrower, more pointed, often slightly higher. Vestiture consisting of uniseriate rows of suberect, flattened, almost scalelike, interstrial bristles of equal length on disc and declivity; each bristle about equal in length to two-thirds distance between rows, spaced within rows by less than length of a bristle.

FEMALE.— Similar to male except frons convex, punctures much larger, very shallow; tuft of hair on scape almost entirely absent.

DISTRIBUTION.— Veracruz to Panama.

MEXICO: Veracruz: Jicaltepec, Toxpam (or Tuxpan), Sallé. COSTA RICA: Turrialba, Cartago, 9-III-64, 700 m, No. 439, unidentified tree; Río Damitas, Dota Mountains, San José, 18-II-64, 250 m, No. 432, stump; Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 84, log. PANAMA: Barro Colorado Island, Canal Zone, 27-XII-63, 70 m. No. 346, tree branch, all by S. L. Wood.

BIOLOGY.— This species made typical biramous, transverse parental galleries; larval mines paralleled the grain of the wood.

NOTES.— The five syntypes of *demessus* and 58 other specimens were used in preparing the above treatment. Because this species was based on a syntypic series of five specimens, the second specimen, a female from Mexico labeled and previously considered to be the type, is here designated as the lectotype of *demessus* Blandford. The holotype of *tuberculatus* was also examined.

### 21. *Phloeotribus armatus* Blandford

*Phloeotribus armatus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):166 (Holotype, male; Volcán de Chiriquí, Panama; British Mus. Nat. Hist.)

*Phloeotribus mixtecus* Bright, 1972, Canadian Ent. 104:1494 (Holotype, female; 26 miles S Juchatengo, Oaxaca, Mexico; Canadian Nat. Coll., 12609); Wood, 1973, Great Basin Nat. 33:181. *Synonymy*

DIAGNOSIS.— This species is distinguished from *setulosus* Eichhoff by the slightly elevated, dentate, declivital interstriae 1 and 3, 2 and 4 being unarmed except at base, and by the distribution.

MALE.— Length 1.9–2.4 mm, 1.8 times as long as wide; color very dark reddish brown.

Head and pronotum as in *setulosus*, except base of pronotum almost straight.

Elytra 1.2 times as long as wide, 1.6 times as long as pronotum; outline as in *setulosus*, scutellar notch not as deep, more obtuse, basal armature similar; striae strongly impressed, punctures coarse, deep, partly confluent; interstriae as wide as striae, uniseriately crenulate, each crenulation almost as wide as interstriae and evidently coarser than in *setulosus*, general surface with numerous impressed points. Declivity steep, convex; striae and interstriae slightly narrower than on disc; interstriae 1, 3, 5, and 7 slightly more strongly

convex and tuberculate, two or three of tubercles on 3, 5, and 7 larger than others, 2, 4, and 6 unarmed except at extreme base; interstriae 9 very strongly, narrowly elevated, much stronger than *setulosus*, and coarsely serrate, continuing to apex. Vestiture largely abraded on disc; consisting of uniseriate interstrial rows of erect bristles of equal length throughout, each bristle equal in length to distance between rows, somewhat similarly spaced within each row; bristles absent on even-numbered declivital interstriae on at least lower half.

FEMALE.— Similar to male except frons as in female *setulosus*.

DISTRIBUTION.— Oaxaca to Colombia.

MEXICO: Oaxaca: 115 miles or 184 km S Oaxaca, 27-30-V-71, D. E. Bright. GUATEMALA: San Miguel Duenas, 29-V-66, J. M. Campbell. HONDURAS: 1940, W. von Hagen. PANAMA: Fort Clayton, Canal Zone, 22-XII-63, 50 m, No. 325, log, S. L. Wood; Cerro Punta, Chiriquí, 18–24-VII-61, J. M. Campbell; Darien, 6–11-VII-61; Limón Bay, Canal Zone, 30-XII-63, 5 m, No. 353, tree limb.

BIOLOGY.— The biramous parental galleries evidently are diagonal and engrave the wood rather deeply. The true character of the galleries was not clear.

NOTES.— The above treatment was based on the type of *armatus* and on 149 other specimens.

### 22. *Phloeotribus biguttatus* Blandford

*Phloeotribus biguttatus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):169 (Holotype, male; Bugaba, Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *setulosus* Eichhoff by the broad, short pronotum having the asperities restricted to the anterior fourth, with the anterior margin very coarsely serrate; by the smaller discal, interstrial tubercles; and by the less strongly elevated declivital interstriae 9.

MALE.— Length 2.0–2.5 mm, 1.73 times as long as wide; dark brown, slightly reddish posteriorly.

Frons and antenna as in *setulosus* except frontal impression extending very slightly above upper level of eyes, and epistomal carina less strongly procurved.

Pronotum 0.75 times as long as wide; widest at extreme base, sides convergently arcuate from base to rather narrowly rounded anterior margin; anterior margin armed by two very course, close median teeth, two pairs of submarginal teeth of decreasing size lateral to these; surface as in *setulosus*, with numerous minute points and moderately large, shallow punctures, punctures distinctly smaller than in *setulosus*; asperities small, less than a dozen, restricted to anterior fourth on median area; vestiture consisting of a few bristles near anterior margin.

Elytra 1.1 times as long as wide, 1.5 times as long as pronotum; as in *setulosus* except discal interstrial crenulations smaller, appearing more widely spaced, and declivital interstriae 9 lower, about two-thirds as strongly elevated.

FEMALE.— Similar to male except frons convex, scape without tuft of hair; anterior margin of pronotum with serrations reduced, usually absent in median area.

DISTRIBUTION.— Panama to Colombia and Venezuela.

PANAMA: Chiriquí: Bugaba, G. C. Champion. OTHER COUNTRIES: Colombia, Venezuela.

HOST.— *Brosimum* sp.

BIOLOGY.— Specimens were taken from transverse galleries in broken limbs.

NOTES.— The above treatment was based on the male holotype and on 86 other specimens. Three specimens from Panama in the British Museum were assigned to this species but were not mentioned by Blandford.

### 23. *Phloeotribus subovatus* Blandford

*Phloeotribus subovatus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):167 (Lectotype, male; El Reposo, Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished from *setulosus* Eichhoff by characters mentioned in the above key, by the stouter body, by the narrower interstrial tubercles, and by the stouter interstrial setae.

MALE.— Length 2.0–2.5 mm, 1.7 times as long as wide; color almost black.

Frons as in *setulosus* except narrower and more pubescent; epistomal transverse carina straight, very strongly elevated, about one-fourth as wide as epistoma, carina about half as high as wide. Antenna as in *setulosus*.

Pronotum similar to *setulosus* except asperities averaging larger, those on anterolateral margin more consistently present; discal area reticulate, punctures usually not as deep.

Elytra with striae impressed, punctures rather small; interstriae twice as wide as striae, most crenulations half as wide as an interstriae, spaced as in *setulosus* but averaging smaller; interstrial setae slightly shorter and stouter than in *setulosus*. Declivity similar to *setulosus* except interstriae three times as wide as striae, 9 moderately elevated and serrate to striae 3.

FEMALE.— Similar to male except sexual differences as in *setulosus*.

DISTRIBUTION.— Guatemala to Venezuela. GUATEMALA: El Reposo, 800 ft, Champion. BRITISH HONDURAS: Blancaneaux. VENEZUELA: 20 km SW El Vigía, Merida, 21-XI-69, 50 m, No. 147, tree limb, S. L. Wood.

BIOLOGY.— Specimens were taken from biramous, transverse tunnels in a large limb. The inner bark of the host had a distinct yellow color.

NOTES.— From Blandford's syntypic series of 12 specimens from El Reposo, Guatemala, I here designate a male on a double mount (with a female) as the lectotype of *subovatus*. The above treatment was based on Blandford's material and on 127 other specimens from Venezuela.

### 24. *Phloeotribus setulosus* Eichhoff

Fig. 16

*Phloeotribus setulosus* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:149 (Lectotype, male; Colombia, not Carolina as published; Brussels Mus.)

*Phloeotribus rudis* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:149 (Syntypes? male; Brazil; lost with Hamburg Mus.); Wood, 1974, Great Basin Nat. 34:286. *Synonymy*

*Phloeotribus dubius* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:150 (Holotype?; male; Colombia; Berlin Mus.); Wood, 1977, Great Basin Nat. 37:209. *Synonymy*

*Phloeotribus asperatus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):166 (Holotype, male, Panajachel, Guatemala; British Mus. Nat. Hist.); Wood, 1973, Great Basin Nat. 33:182. *Synonymy*

*Phloeotribus sodalis* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6): 168 (Lectotype, male; Cerro Zunil, Guatemala; British Mus. Nat. Hist., designated by Wood, 1974, Great Basin Nat. 34:286). *Synonymy*

*Phloeotribus spinipennis* Eggers, 1931, Ent. Blätt. 26:168 (Holotype, male; Colombia, Moritz; Berlin Mus.); Wood, 1977, Great Basin Nat. 37:209. *Synonymy*

*Phloeotribus bolivianus* Eggers, 1933, Trav. Lab. d'Ent. Mus. Nat. d'Hist. Nat. Paris, Mem. 1:5 (Holotype, male; Cochabamba, Bolivia; U.S. Nat. Mus., 60862); Wood, 1974, Great Basin Nat. 34:286. *Synonymy*

DIAGNOSIS.— This species is distinguished from *armatus* Blandford by the equally convex, equally tuberculate declivital interstriae 1 to 8 and by the somewhat less strongly elevated declivital interstriae 9.

MALE.— Length 1.9–2.4 mm, 1.8 times as long as wide; color very dark reddish brown.

Frons somewhat irregularly concave from epistoma almost to upper level of eyes, lateral margins moderately elevated at level of antennal bases, unarmed by tubercles, a slight callus in median area at this level except for narrow, impressed, median line, epistomal margin elevated on median half as a procurved, transverse carina, a premandibular lobe developed below this elevation; surface reticulate, very finely punctured; vestiture sparse, of fine, inconspicuous hair. Antennal scape bearing a conspicuous tuft of long, yellow hair; segment 1 of club more than seven times as wide as long.

Pronotum 0.82 times as long as wide; posterior margin slightly extended posteriorly in median area, widest a third of length from base, sides strongly arcuate to feeble constriction just before rather narrowly rounded anterior margin; surface rather coarsely but not closely asperate on anterior half, coarsely, irregularly punctured behind, also extending into asperate area, width of interspaces averaging less than half as wide as punctures, rather densely marked by deep, impressed points, vestiture consisting of a few stout bristles in marginal areas.

Elytra 1.1 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal half, rather broadly rounded behind; scutellar notch shallow, obtuse; basal margins each armed by 11 overlapping, basally fused crenulations; striae rather strongly impressed, punctures coarse, deep; interstriae convex, as wide as striae, uniseriately crenulate, each crenulation at least half as wide as interstriae, general surface shining and marked by numerous impressed points. Declivity steep, convex; striae and interstriae slightly narrower than on disc, interstriae 1 to 8 uniseriately, rather finely tuberculate, 1 feebly elevated, 9 rather strongly elevated and serrate to apex, joining costal margin just before apex. Vestiture usually abraded on disc, consisting of uniseriate, interstrial rows of rather stout bristles of equal length

throughout, each bristle equal in length to about three-fourths of distance between rows, somewhat similarly spaced within each row.

FEMALE.— Similar to male except frons slightly convex, with a rather large, median callus at level of antennal insertion, a weak, transverse impression just above the weakly elevated epistomal margin, punctures larger, shallow.

DISTRIBUTION.— Veracruz to Peru and Brazil.

MEXICO: Chiapas: Simohovel. Veracruz: Lago Catemaco, Tampico. GUATEMALA: Cerro Zunil, Panajachel, Rodeo. HONDURAS: Zamorano. COSTA RICA: Dominical, Moravia, Playón, Puerto Viejo, Río Damitas in the Dota Mts., Río Tempisque, San Isidro de Coronado, San José. PANAMA: Boquette, Bugaba, La Chorrera. OTHER COUNTRIES: Brazil, Colombia, Peru, Venezuela.

HOSTS.— *Brosimum* sp., *Cedrela mexicana*, *Celtis iguanae*, *Croton gossypiifolius*, *Ficus* sp., and at least two additional tree species.

BIOLOGY.— This common species occurred most frequently in limbs and branches larger than 2 cm in diameter, but it also attacked logs and stumps. The gallery system was typically transversely biramous with the larval mines following the grain of the wood. Several overlapping generations appeared to occur each year in Costa Rica.

NOTES.— The above treatment was based on the male holotype of *asperatus* and the male lectotypes of *setulosus* and *sodalis*, and on 458 additional specimens. The surface sculpture of the pronotum and the elytral disc varies slightly within series. This fact, coupled with the paucity of specimens, has led to the redescription of this species. At least part of Blandford's *armatus* also belongs to this species. Because *sodalis* was based on a syntypic series, the first specimen, a male from Cerro Zunil previously labeled and considered to be the type, is here designated as the lectotype of *sodalis* Blandford.

Two specimens of *rudis* in the Chapuis Collection that were identified by Eichhoff are of this species. These specimens could be cotypes.

### 25. *Phloeotribus maurus* Wood

*Phloeotribus maurus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):6 (Holotype, male; Rincón de Osa, Guanacaste, Costa Rica; Wood Coll.)

DIAGNOSIS.— Within the Central American fauna this species is allied to *furvus* Wood, although it is not closely related; it may be distinguished by the uniseriately crenulate interstriae, by the uniseriate, interstrial bristles, and apparently by the smaller average size.

MALE.— Length 2.4–3.1 mm, 1.7 times as long as wide; color very dark brown to black.

Frons similar to but much narrower than in *furvus*; sculpture similar; vestiture above antennal bases much coarser than in *furvus*. Scape bearing a rather large, dense tuft of dark hair.

Pronotum outline as in *furvus*; surface less uniformly, more deeply punctured, some punctures toward base much larger than in *furvus*; anterolateral asperities about twice as large as in *furvus*, vestiture at lateral margins coarser and longer.

Elytra 1.03 times as long as wide, 1.2 times as long as pronotum; sides weakly arcuate from base to declivity, somewhat narrowly rounded behind; scutellar notch abrupt, broad, very deep, matching extension of pronotum; basal margins armed by 12 or more low, overlapping crenulations; striae strongly impressed, punctures clearly indicated; interstriae distinctly less than twice as wide as striae, punctures subcrenulate on 2 and 3 to declivity, less distinctly so on 4 to 6, crenulations uniseriate except somewhat biseriate at base of 2, some of them as wide as an interstriae; interstriae narrower and more convex toward declivity. Declivity convex, moderately steep; interstriae narrower than on disc, each with a median, subserrate row of low tubercles. Vestiture consisting of a row of short, suberect bristles on each interstriae; each bristle not longer than a third distance between rows; largely abraded on basal half; some fine hair also on sutural interstriae.

FEMALE.— Similar to male except frons convex, foveate just above level of antennal insertion; tuft of hair on scape absent.

DISTRIBUTION.— Veracruz to Costa Rica.

MEXICO: Veracruz: Lago Catemaco, 1–3-V-69, D. E. Bright. COSTA RICA: Rincón de Osa, Puntarenas, 11-VII-66, 30 m, No. 63, *Ficus*, S. L. Wood.

HOST.— *Ficus* sp.

BIOLOGY.— The type series was taken from irregularly diagonal to almost longitudinal, biramous tunnels that rather deeply engraved the wood. The beetles were just beginning their galleries and very few eggs had been deposited.

NOTES.— The above treatment was based on the type series of 32 specimens.

### 26. *Phloeotribus pilula* Erichson

Fig. 91

*Phloeotribus pilula* Erichson, 1847, Archiv Naturgesch. 13(1): 138 (Lectotype, male; Peru; Zool. Mus. Berlin, designated by Wood, 1973, Great Basin Nat. 33:181)

*Phloeotribus obliquus* Chapuis, 1869, Synopsis des Scolytides, p. 45 (Syntypes; Mexique, Nouvelle-Grenada; Brussels Mus.); Wood, 1973, Great Basin Nat. 33:181. *Synonymy*

*Phloeotribus obesus* Kirsch, 1875, Deutsche Ent. Zeitschr. 19:283 (Holotype, sex? Peru; Dresden Mus.); Eggers, 1929. Wiener Ent. Zeit. 46:52. *Synonymy*

*Phloeotribus manni* Blackman, 1943, Proc. U.S. Nat. Mus. 94:385 (Holotype, female, Río Madeira, Brazil; U.S. Nat. Mus.); Wood, 1973, Great Basin Nat. 33:181. *Synonymy*

*Phloeotribus australis* Schedl, 1953, Mem. Queensland Mus. 13:80 (Holotype, male; Queensland, Australia; Schedl Coll.); Wood, 1977, Great Basin Nat. 37: 209. *Synonymy*

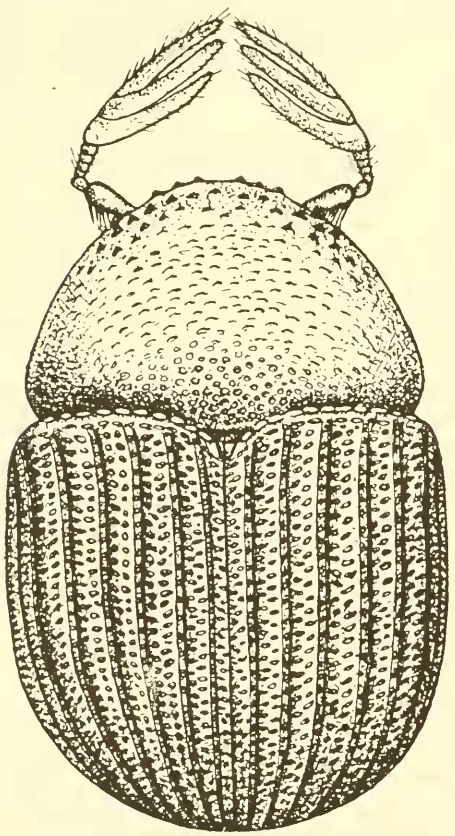


Fig. 91. *Phloeotribus pilula*, male. (After Schedl 1953:80.)

DIAGNOSIS.— This species is distinguished from *furvus* Wood by the rugose-reticulate pronotal and elytral surfaces, by the uniseriate setae on discal interstriae 3–10, and by the finer interstrial tubercles on the declivity.

MALE.— Length 2.6–3.3 mm, 1.6 times as long as wide; color almost black.

As in *furvus* except as noted in above diagnosis.

FEMALE.— Similar to male except sexual differences as in *furvus*.

DISTRIBUTION.— Chiapas to Peru and Brazil.

MEXICO: Chiapas: Palenque Ruins, 9-V-69, D. E. Bright. OTHER COUNTRIES: Brazil, Colombia, Peru, Venezuela.

HOST.— *Brosimum* sp.

BIOLOGY.— Transverse, biramous galleries are made in the bole, limbs, and larger branches. It is a very common and widely distributed species.

NOTES.— The above treatment was based on the lectotype of *pilula*, on the holotypes of *manni* and *australis*, on a syntype of *obliquus*, and on 108 other specimens.

### 27. *Phloeotribus furvus* Wood

*Phloeotribus sulcifrons*: Blandford, 1897 (nec. Chapuis, 1869), Biol. Centr. Amer., Coleopt. 4(6):165

*Phloeotribus furvus* Wood, 1969, Great Basin Nat. 29:124 (Holotype, male; Turrialba, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is allied to *maurus* Wood, but it is not closely related; it may be distinguished by the much more numerous, three-ranked discal, interstrial crenulations, by the confused, minute, interstrial setae, and, apparently, by the larger than average size.

MALE.— Length 2.8–3.3 mm, 1.6 times as long as wide; color black.

Frons broadly, shallowly, subconcavely impressed from epistoma to upper level of eyes, lateral margins weakly elevated, except more strongly raised at level of antennal insertions, unarmed, a low, transverse callus at level of antennal insertions; surface strongly reticulate, with rather close, shallow punctures of moderately small size. Antennal scape with a small tuft of rather short hair; segment 1 of club more than eight times as wide as long.

Pronotum 0.80 times as long as wide; basal margin obtusely extended posteriorly with

median fourth more acutely extended; widest just in front of posterolateral angles, rather strongly, arcuately convergent, weakly constricted just before rather narrowly rounded anterior margin; surface very densely, rather coarsely punctured, becoming somewhat granulate on anterior third; anterolateral angles with two or three coarse asperities, a row of small asperities extending along anterior margin to opposite side; vestiture of minute, dark setae at least in lateral areas.

Elytra 1.03 times as long as wide, 1.4 times as long as pronotum; sides weakly arcuate to base of declivity, rather broadly rounded behind; scutellar notch abrupt, deep, broad; basal margins armed by 19 low, overlapping crenulations; striae abruptly, narrowly deeply impressed, punctures small, deep; interstriae twice as wide as striae, dense crenulations narrow, rather high, often obscurely three-ranked, general surface evidently minutely punctured. Declivity convex, steep; interstriae as on disc but slightly narrower, median tubercles larger, others largely absent, 9 moderately elevated from middle of declivity anteriorly. Vestiture of minute, abundant, confused hairlike bristles, each about equal in length to one-third width of an interstriae.

FEMALE.— Similar to male except frons convex, with an indistinct central fovea, punctures larger, very shallow, antennal scape not ornamented by hair; interstriae 9 less strongly elevated.

DISTRIBUTION.— Guatemala to Panama.

GUATEMALA: Las Mercedes, Quezaltenango, G. C. Champion. COSTA RICA: Turrialba, Cartago, 9-III-64, 700 m, No. 459, unidentified trees, S. L. Wood; San Isidro del General, 5-XII-63, 1000 m, No. 286, in flight, S. L. Wood. PANAMA: Bugaba, Chiriquí, G. C. Champion.

BIOLOGY.— This monogamous species constructed irregularly diagonal, biramous tunnels in a limb about 15 cm in diameter at Turrialba.

NOTES.— The above treatment was based largely on the type series; all of Blandford's specimens were also studied. In all 131 specimens were examined.

## Tribe PHLOEOSININI

Phloeosinides Nüsslin, 1912, Zeitschr. Forst- und Landwirtsch. 1912:273 (Type-genus: *Phloeosinus* Chapuis, 1869)

Anatomical features.— The frons is usually sexually dimorphic, with the male frons impressed, the female flat to convex, the eye varied from entire to emarginate to completely divided (some Indo-Australian *Phloeosinus*), the antennal funicle is 5- to 7-segmented, the club is flattened, slightly to strongly asymmetrical and with or without sutures, the pronotum is unarmed, the third tarsal segments are stout and bilobed (except slender in *Chramesus*), the scutellum is visible, and the metanotum is fused to the postnotum.

Biological features.— All American species are monogamous (a few Indo-Australian *Phloeosinus* are polygamous); all except *Dendrosinus* and a few *Chramesus* are phloeophagous. Parental tunnels are monoramous with a conspicuous turning niche or nuptial chamber; some *Dendrosinus* tunnels are biramous (inconsistent). In the xylophagous *Dendrosinus* and *Chramesus* tunnels, fungal alteration of the wood is obvious, although symbionts have not been reported. Eggs are deposited in niches. Larval mines tend to follow a definite course and rarely cross one another.

Taxonomy.— This tribe consists of a diverse assemblage of distantly related genera that appear to be relics of a former much larger group. Allied genera are largely worldwide in distribution, with a slight concentration in Africa. *Cladoctonus* occurs in both Africa and South America, *Dendrosinus* is mostly in South America, *Carphotoreus* is known only from Central America, but allied genera are in Africa, and *Phloeosinus* is largely restricted to the northern hemisphere. *Chramesus* occurs only in America, but allied genera occur in Africa; future investigation may require the transfer of this genus to the Hypoborini. The North and Central American genera in this tribe are quite easily recognized; the genera might be recognized with greater difficulty in other parts of the world.

### Genus *DENDROSINUS* Chapuis

*Dendrosinus* Chapuis, 1869, Synopsis des Scolytides, p. 28 (Type-species: *Hylesinus globosus* Eichhoff, monobasic)

Diagnosis.— This small, distinctive, neotropical genus is not closely allied to any other genus in North or Central America.

Description.— Length 3.3–4.3 mm, 1.5–1.6 times as long as wide. Frons flattened or weakly convex, variously ornamented by hair; male frons a little more strongly impressed than female. Eye elongate-oval, entire (broadly emarginate in one South American species). Antennal scape short, not reaching posterior margin of eye; funicle 7-segmented; club almost symmetrical, flattened, three procurved sutures on basal half. Pronotum unarmed (conspicuous anterolateral teeth occur in *vittifrons* Blandford; they are rudimentary in *transversalis* Blandford), punctate; grooved behind for reception of elytral bases. Scutellum small, rounded; appearing posteriorly displaced. Crenulations on elytral bases in a single row, not well developed; striae very narrow, deeply impressed; declivity convex, gradual, unarmed; abdomen ascending posteriorly to meet elytra. Coxae very widely separated; prothoracic precoxal ridge not well developed, but present. Third tarsal segments bilobed.

Distribution.— Eight neotropical species occur from Florida to Argentina.

Biology.— The two species treated here attack woody plants about 3–10 cm in diameter, where they construct transverse, biramous, parental galleries that extend well into the wood. The larvae are also xylophagous. In *globosus* (Eichhoff) the eggs are

placed in definite, randomly placed niches on all walls of the egg gallery. The larval mines are rather long and wander aimlessly through the wood.

Key to the Species of *Dendrosinus*

1. Antennal club slender, conspicuously longer than wide; frons shining, glabrous except ornamented by long hair on lateral margins and on epistomal area; pronotum rather coarsely, deeply punctured; elytral interstriae with small, confused granules; Florida to Puerto Rico; 3.5–4.3 mm ..... 1. ***bourreriae*** Schwarz

— Antennal club broad, much wider than long; frons closely, uniformly covered by short, golden pubescence; pronotum and elytral interstriae minutely granulate, punctures and tubercles not evident; Veracruz to Costa Rica; 3.3–4.0 mm ..... 2. ***transversalis*** **Blandford**

### 1. *Dendrosinus bourreriae* Schwarz

Figs. 92, 93

*Dendrosinus bourreriae* Schwarz, 1920, Proc. Ent. Soc. Washington 22:225 (Holotype, sex?; Marathon, Key Vaca, Florida; U.S. Nat. Mus.)

*Dendrosinus lima* Eggers, 1930, Ent. Blätt. 26:166 (Holotype, sex?; Puerto Rico; Berlin Zool. Mus.); Eggers, 1934, Ent. Nachrbl. 8:27. *Synonymy*

DIAGNOSIS.— This species is easily distinguished by characters summarized in the above key.

FEMALE.— Length 3.5–4.3 mm, 1.6 times as long as wide; color black.

Frons broadly flattened from just above slightly elevated epistoma to vertex; a narrow epistomal lobe present; surface smooth, polished, shining on middle half, rather coarsely, closely punctured on upper fourth, on lower fourth, and on lateral margins; vestiture hairlike, moderately short, yellow on epistomal area and lower half of sides, upper lateral areas bearing a single row of about 20 dark, long hairs lying against frons, curling to median line, then ventrad, ending at base of lower setae of its origin. Eye entire.

Pronotum 0.84 times as long as wide; widest at posterolateral angles at middle of total length, sides strongly, arcuately converging to broadly rounded anterior margin; posteromedian area angulately extended behind, posterolateral margins grooved for reception of elytral bases; anterolateral areas unarmed; surface dull, with close, rather coarse, shallow punctures; vestiture of fine, very short, rather abundant, dark hair.

Elytra 1.2 times as long as wide, 1.7 times as long as pronotum; widest on basal third, arcuately converging toward narrowly rounded, emarginate posterior margin, apex of abdomen usually filling elytral notch; elytral bases extended anteriorly, very strongly so at humeral angles, scutellar notch appearing very strongly displaced posteriorly; crenulations on anterior margins rather small, distinct; striae narrowly, abruptly, rather deeply impressed, punctures fine, rather obscure; interstriae three to four times as wide as striae, almost flat, dull, armed by numerous narrow, rather small, confused, subcrenulate tubercles, each about a fifth as wide as interstriae, becoming rather coarsely crenulate toward base. Declivity convex, gradual, short, abdomen rising to meet elytra; interstriae narrower than on disc. Vestiture consisting of small recumbent, black hair, one hair arising from each granule; each hair equal in length to about half width of an interstriae.

MALE.— Similar to female except lower frons very feebly impressed.

DISTRIBUTION.— The Florida Keys to Puerto Rico and Jamaica.

USA: **Florida**: Key Largo, 13-V-39, D. J. and J. N. Knull; Marathon, Key Vaca, 7-III-19, *Bourreria havanensis*, H. S. Barber and E. A. Schwarz, and 29-VI-51, *Eugenia buxifolia, Torrubia longifolia*, S. L. Wood. PUERTO RICO: "Puerto Rico." JAMAICA: Duncans, 15-VIII-66, H. F. Howden and E. C. Becker.

HOSTS.— *Bourreria havanensis, Eugenia buxifolia, Torrubia longifolia.*

BIOLOGY.— Specimens were taken at the type locality by Hubbard and Schwarz and by myself from host material 5–15 cm in diameter mostly from slash piled for burning adjacent to a recently cleared plot of ground. One apparently healthy tree was attacked. Adult tunnels were mostly biramous, although one branch was usually much longer.

The tunnels were cut into the wood. Egg niches were not seen in new tunnels. Schwarz, in the original description, reported seeing a few eggs loose in frass in the egg gallery. He also reported that the xylophagous larvae follow the grain of the wood for about 8 cm before they emerge.

NOTES.— The above treatment was based on my female homotype and on 22 other specimens. The holotype of *bourreriae* and the cotype of *lima* were examined.

### 2. *Dendrosinus transversalis* Blandford

*Dendrosinus transversalis* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):156 (Lectotype, female; San Andrés Tuxtla, Veracruz, Mexico; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is easily distinguished by characters summarized in the above key.

FEMALE.— Length 3.3–4.0 mm, 1.5 times as long as wide; color black, with legs, antennae, and frontal pubescence reddish.

Frons broadly planoconcave from vertex to a narrow, weak, transverse impression immediately above weakly elevated epistomal margin; epistomal lobe narrow; surface dull, finely, closely punctured in impressed area, minutely granulate at sides and above; vestiture short, suberect, abundant to just above upper level of eyes, golden to reddish. Eye entire. Antennal club wider than long, sutures subangulately procurved, 3 reaching middle.

Pronotum 0.84 times as long as wide; outline as in *bourreriae* except feebly emarginate in front; anterolateral angles usually with a small cluster of minute, rudimentary asperities (not always present); surface dull, not clearly punctured or reticulate; vestiture short, semirecumbent, black, moderately abundant, hairlike.

Elytra 1.15 times as long as wide, 1.7 times as long as pronotum; widest one-third from base, sides arcuate from base, rather broadly rounded behind; crenulations on basal margins small, narrow, extended as in *bourreriae*, scutellar notch also similar; strial grooves narrowly impressed, punctures obsolete; interstriae about three times as wide as striae, 1 on right side twice as wide as 1 on left side, surface dull, not clearly marked by punctures, bases of 1–5 submarginally crenulate. Declivity convex, gradual, as on disc; abdomen ascending to meet elytra. Vestiture as in *bourreriae*.

MALE.— Similar to female except frons very slightly more strongly impressed.

DISTRIBUTION.— Veracruz to Costa Rica.

MEXICO: Veracruz: San Andrés Tuxtla, Sallé. COSTA RICA: Guapiles, Limón, 22-VII-66, 100 m , No. 108, woody vine, S. L. Wood.

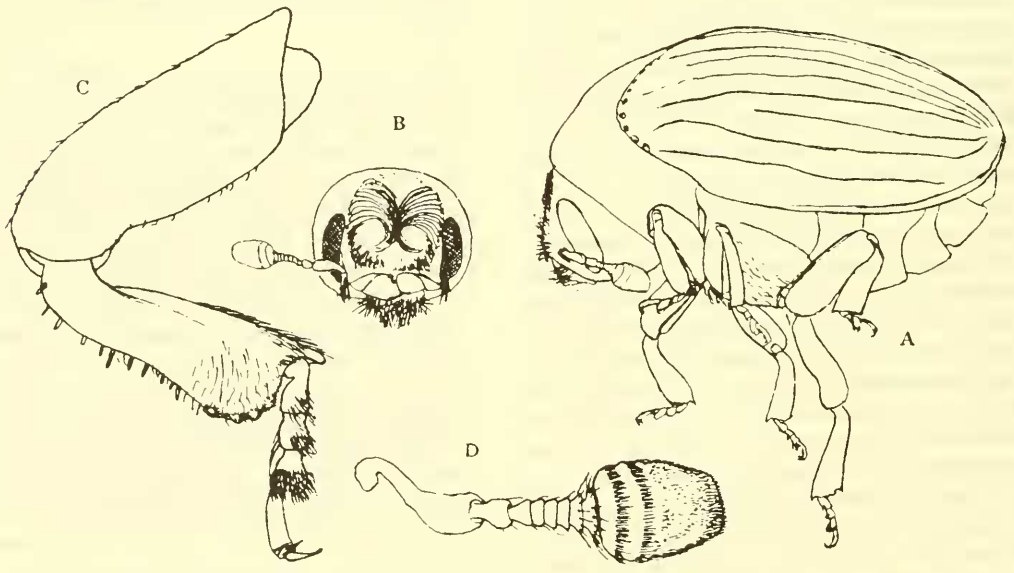



Fig. 92. *Dendrosinus bourreriae*: A, adult; B, head; C, proleg; D, antenna. (After Schwarz 1920:225.)

HOST.— A woody vine (liana).

BIOLOGY.— The parental tunnels were biramous, about as described for *bourreriae*. Eggs and larvae were not found in the new galleries. The host was a cut woody vine 8 cm in diameter. Superficially it was very similar in growth habit and habitat to *Celtis iguanae*; it had spines on lateral twigs almost identical to that plant, but the leaf was very different. The beetles constructed small maturation feeding tunnels in branches less than 2 cm in diameter of the same host.

NOTES.— This species was named from two syntypes, both of which were examined. One of them, a female, was selected and is here designated as the lectotype of the species. The above treatment was prepared from the lectotype and a series of 61 Costa Rican specimens.

## GENUS *CARPHOTOREUS* WOOD

*Carphotoreus* Wood, 1973, Great Basin Nat. 33:171 (Type-species: *Chaetophloeus alni* Bright, original designation)

DIAGNOSIS.— This genus superficially resembles certain *Chaetophloeus* species, but it is distinguished by the 6-segmented antennal funicle, by the more widely distributed crenulations on the basal margins of the elytra, by the absence of submarginal crenulations on the elytral bases, by the visible scutellum, by the different arrangement and form of pronotal asperities, and by other characters.

DESCRIPTION.— Length 1.5–1.6 mm, 2.14 times as long as wide.

Frons dimorphic, moderately concave in male, flattened or convex in female; eye elongate-oval, entire; scape moderately long, funicle 6-segmented, club flattened, almost symmetrical, three nonseptate sutures indicated. Pronotum wider than long, anterolateral areas with a few asperities. Scutellum small, visible. Elytra suturally emarginate at base, a row of marginal crenulations at base, submarginal crenulations entirely absent; striate; declivity simple. Anterior coxae moderately separated. Third tarsal segments slender.

DISTRIBUTION.— Oaxaca; only one species is known.

NOTES.— The position of this genus is uncertain. It could be placed near *Carphobius* Blackman except that the eye is not emarginate and the anterolateral areas of the pronotum are asperate. Within the American Hylesinini it is probably nearest *Phloeosinus* Chapuis, although the antennal funicle and vestiture suggest that the relationship is remote.

### *Carphotoreus alni* (Bright)

*Chaetophloeus alni* Bright, 1972, Canadian Ent. 104:1492 (Holotype, female; 42 km or 26 miles S Juchatengo, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species superficially resembles certain *Chaetophloeus* species, but it is distinguished by the sutural emargination at the base of the elytra, by the visible scutellum, by the absence of submarginal crenulations at the bases of the elytra, and by other characters.

MALE.— Length 1.5–1.6 mm, 2.14 times as long as wide; color black, vestiture pale.

Frons moderately, rather broadly concave from epistoma to upper level of eyes; surface slightly rugose-reticulate, punctures sparse, minute, rather obscure; vestiture of rather short, coarse, uniformly distributed setae. Eye elongate-oval, three times as long as wide, entire; finely faceted. Antennal scape rather short, extending slightly beyond middle of eye; funicle 6-segmented, distinctly longer than scape, club elongate-oval, almost symmetrical, strongly flattened, three sutures indicated, suture 1 evidently partly septate.

Pronotum 0.80 times as long as wide; widest at base, sides arcuately converging to moderately rounded anterior margin; surface most finely rugose-reticulate, punctures fine, moderately abundant, except anterolateral areas armed by several small, rather high, rounded granules. Vestiture rather short, moderately abundant, of stout and rather fine bristles; plural areas with some bifid hairs.

Elytra 1.5 times as long as wide, 2.0 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; basal margins suturally emarginate, each armed by a row of 10 crenulations to interstriae 7, submarginal crenulations entirely absent; striae slightly impressed, punctures moderately deep, rather coarse; interstriae distinctly wider than striae, distinctly convex, each bearing a

row of small, closely set granules. Declivity steep, convex; sculpture as on disc. Vestiture in ground cover of short, rather slender, subplumose setae, and interstrial rows of erect bristles; each bristle stout, each one-half to two-thirds as long as distance between rows or between bristles within a row.

FEMALE.— Similar to male except frons broadly convex, subfoveate at center; some pronotal asperities much larger.

DISTRIBUTION.— Oaxaca.

MEXICO: **Oaxaca**: 85 km or 53 miles S Valle Nacional, 24-V-71, 3300 m, *Alnus*, D. E. Bright; Highway 131, 184 km or 115 miles S Oaxaca, 27–30-V-71, 2000 m, *Alnus*, D. E. Bright.

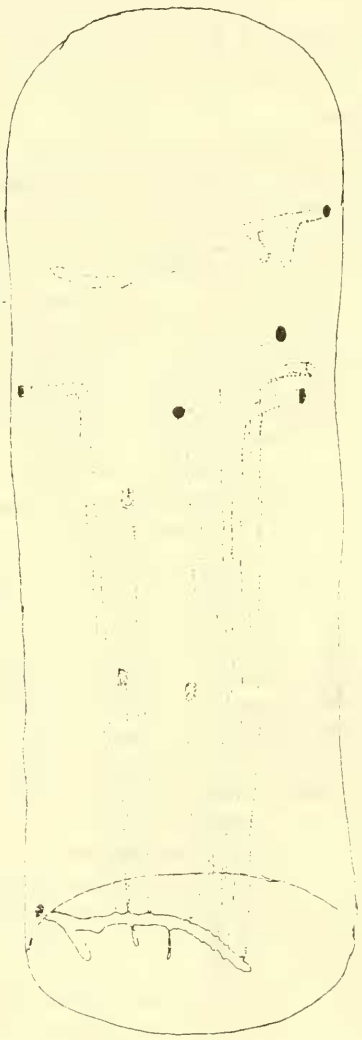


Fig. 93. *Dendrosinus bourreriae*: gallery system. (After Schwarz 1920:223.)

NOTES.— The above treatment was based on the type series.

## GENUS *CLADOCTONUS* STROHMEYER

*Cladoctonus* Strohmeyer, 1911, Ent. Blätt. 7:17 (Type-species: *Cladoctonus affinis* Strohmeyer, monobasic)

*Hoplites* Eggers, 1923 (nec. Dejean, 1833, etc.), Meded. Roy. Mus. Nat. Hist. Leiden 7:141 (Type-species: *Hoplites banosus* Eggers, monobasic)

*Hoplitontus* Wood, 1961, Great Basin Nat. 21:2 (replacement name for *Hoplites* Eggers); Schedl, 1963, Ent. Abh. Ber. Tierk. Dresden 28:264. *Synonymy*

*Hoplitophthorus* Wood, 1961, Great Basin Nat. 21:2 (Type-species: *Hoplitophthorus sentosus* Wood, monobasic); Wood, 1961, Great Basin Nat. 21:105 (corrected spelling); Schedl, 1963, Ent. Abh. Ber. Tierk. Dresden 28:264. *Synonymy*

Species in this genus are known from Cuba, Jamaica, Guadeloupe, Colombia, Bolivia, and Brazil, but at the present time they are not known from North or Central America. Eleven species have been described, six from the neotropics, one from the Philippine Islands, and four from Africa. Two of the African species breed in *Acacia* trees; one American species was taken from *Citrus*, and another from *Pseudoolmedia* sp. The one species observed was phloeophagous and monogamous. The genus almost certainly will be found in Central America.

## GENUS *PHLOEOSINUS* CHAPUIS

*Olonthogaster* Motschulsky, 1866, Bull. Soc. Imp. Nat. Moscou 39:401 (Type-species: *Olonthogaster nitidicollis* Motschulsky, designated by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:126, suppressed, Internat. Comm. Zool. Nomencl. 1981:67)

*Phloeosinus* Chapuis, 1869, Synopsis des Scolytides, p. 37 (Type-species: *Hylesinus thujae* Perris, designated by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:126)

*Holonthogaster* Geminer & Harold, 1872, Cat. Coleopt. 9:2676. *Replacement name*

*Phloeosinites* Hagedorn, 1907, Schr. Physik. Oekon, Ges. Konigsberg 47:119 (Type-species: *Phloeosinites rehi* Hagedorn, designated by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:126)

*Hyledius* Sampson, 1921, Ann. Nat. Hist. 7:35 (Type-species: *Hyledius asper* Sampson, monobasic); Schedl, 1958, Tijd. Ent. 101:152. *Synonymy*

*Phloeosinopsis* Schedl, 1936, J. Fed. Malay St. Mus. 18:23 (Type-species: *Phloeosinopsis armatus* Schedl = *Phloeosinus spinifer* Schedl, monobasic); Browne, 1963, Ent. Bericht. 23:53. *Synonymy*

DIAGNOSIS.— Among genera in the western hemisphere *Phloeosinus* is allied to *Cladoctonus* Strohmeyer, from which it is easily

distinguished by the 5-segmented antennal funicle and by the oblique sutures of the antennal club. The male frons is impressed, the pronotum is unarmed, the asymmetrical antennal club is rather strongly compressed, the eye is emarginate, and declivital interstriae 3 is armed in both genera.

DESCRIPTION.— Length 1.5–4.1 mm, 1.8–2.1 times as long as wide; sexes usually dimorphic, male frons variously impressed, female flat or convex, male elytral declivity usually more coarsely armed. Eye elongate, moderately to very strongly emarginate; finely granulate; widely separated. Antennal scape elongate, unadorned; funicle 5-segmented; club moderately asymmetrical, compressed, marked by three oblique, aseptate sutures. Pronotum usually wider than long, unarmed, surface punctate. Scutellum moderately large, distinct. Elytral bases armed by a row of marginal crenulations; striate; declivity convex, moderately steep, one or more interstriae armed by minute to very coarse teeth. Vestiture hairlike, except scalelike on elytral declivity in some species.

DISTRIBUTION.— North America to Panama, Europe and Asia to North Africa and Australia; 27 species and two subspecies occur in North and Central America, 35 species have been named from the eastern hemisphere.

BIOLOGY.— These monogamous, phloeophagous species construct simple, longitudinal, parental galleries that usually engrave the wood rather deeply. The male normally constructs the entrance tunnel and nuptial chamber; the female forms the egg gallery. The egg niches are usually rather large and conspicuous. Larval mines tend to wander in the general direction away from the parental mine. With few exceptions among American species, host plants belong to the Taxodioideae and the Cupressineae. The habits of some Indomalayan-Indonesian species differ drastically from American forms.

NOTES.— Except for catalogs, the name *Olonthogaster* disappeared from the literature from 1866 to 1968, when the type was examined and associated with *Phloeosinus* (Wood 1969:119). In the interest of preserving a well-known, established name, an appeal to the International Commission on Zoological Nomenclature was made to conserve the name *Phloeosinus*.

## Key to the Species of *Phloeosinus*

1. Declivital interstriae 2 broad, armed by several tubercles in female, usually by one or two tubercles near apex in male ..... 2
— Declivital interstriae 2 broad or narrow, entirely unarmed in both sexes ..... 8

2(1). Declivital interstriae equally convex, except 2 in male often feebly impressed; interstriae 2 in male normally bearing several tubercles, tubercles subequal in size on all interstriae; anterior margin of mesosternum precipitous, subvertical, intercoxal piece protuberant, often conical; anterolateral margins of punctures of pronotum minutely asperate; Alaska to Quebec and Michigan; *Picea glauca* or *Pinus*; 1.8–2.5 mm ..... 1. ***pini*** **Swaine**
— Declivital interstriae 1 and 3 more strongly elevated and with larger tubercles than 2, 2 on male never with more than two tubercles near apex; anterior slope of mesosternum gradual to rather abrupt, never protuberant; lateral punctures on pronotum almost never asperate; in *Cupressineae* ..... 3

3(2). Declivital interstriae 4 in male armed by several tubercles near its apex, tubercles on 1 and 3 subequal in size and not laterally compressed; in *Taxodium* ..... 4
— Declivital interstriae 4 unarmed, tubercles on 1 larger and often much less numerous than on 3 and rather strongly, laterally compressed; in *Juniperus* ..... 5

4(3). Interstriae about four times as wide as striae, interstrial tubercles on disc finer and more strongly confused; declivital scales more slender and not extending anterior to base of declivity; male frons weakly impressed; Virginia to Texas and Florida; 1.9–3.0 mm ..... 2. ***taxodii taxodii*** **Blackman**

– Interstriae little more than twice as wide as striae, interstrial tubercles slightly larger and less strongly confused; declivital scales usually extending to middle of disc; male frons flattened, not impressed; Durango to Puebla; 2.0–2.6 mm .... 3. ***taxodii taxodiicolens*** **Wood**

5(3). Interstriae on disc about twice as wide as striae; male interstriae 1 on declivity armed by three or four small teeth, 3 by six to nine teeth; vestiture very sparse; Durango and Hidalgo to Oaxaca; 2.4–3.2 mm ..... 4. ***deleoni*** **Blackman**

– Interstriae two to four times as wide as striae; male interstriae 1 armed by eight or more teeth, 3 by ten or more teeth; vestiture rather abundant ..... 6

6(5). Male declivital interstriae 1 and 3 weakly elevated, their serrations comparatively small, more slender; interspaces between pronotal punctures smooth, shining; interstrial tubercles on disc generally narrower, more numerous, higher; vestiture generally more abundant, declivital scales when present on interstriae 2 four times as long as wide; Nebraska and E Texas to Ontario, New Hampshire, and Georgia; 1.9–2.8 mm ..... 5. ***dentatus*** (Say)

– Male declivital interstriae 1 and 3 rather strongly elevated, their serrations large, very stout; interstrial tubercles on disc generally more broadly crenulate, not as pointed, less numerous; vestiture generally less abundant, declivital scales on interstriae 2 less than twice as long as wide ..... 7

7(6). Smaller; interspaces on pronotum marked by rather numerous points and/or minute lines; submarginal crenulations at elytral bases smaller, less abundant, marginal ones usually smaller, teeth on male declivital interstriae 1 less strongly compressed, their anterior profiles usually evenly arcuate from base to apex; Chiapas; 1.8–2.5 mm ..... 6. ***palearis*** **Wood**

– Larger; interspaces on pronotum at most marked by rather sparse points; submarginal crenulations at elytral bases rather coarse, more numerous, marginal ones usually larger; teeth on male interstriae 1 strongly compressed, their anterior profiles angulate, distal portion almost straight; Washington and Idaho to Durango and Texas; 2.0–3.7 mm ..... 7. ***serratus*** **(LeConte)**

8(1). Larger species, 2.5–4.3 mm; interstriae 1 on male declivity unarmed or armed only at base of declivity, if armed in female tubercles often much smaller than on 3 or else striae as wide or wider than interstriae ..... 9

– Smaller species, 1.6–3.7 mm; declivital interstriae 1 armed to apex in both sexes, teeth not smaller than those of 3 in females ..... 13

9(8). Discal interstriae less than twice as wide as striae; male interstriae 1 armed at base of declivity, 1 in female with teeth equal in size to those on 3 ..... 10

– Discal interstriae more than twice as wide as striae; male interstriae 1 unarmed throughout, if armed in female then tubercles much smaller than those on 3 ..... 12

10(9). Discal striae impressed, shallow punctures longitudinally elongate and subconfluent; interstriae convex; Alaska to California; *Cupressus*, etc.; 2.5–3.6 mm .... 8. ***cupressi*** **Hopkins**

– Discal striae not impressed, deep punctures circular or transversely oval, not at all confluent, summit of partitions between punctures in a row almost as high as interstriae; larger species, 3.0–4.6 mm ..... 11

11(10). Punctures of discal striae averaging slightly smaller, surface of interstriae more irregular; pronotal punctures slightly larger; SE Arizona to Puebla, Edo. Mexico, and El Salvador; *Cupressus*; 3.0–4.1 mm ..... 9. ***baumanni*** **Hopkins**

– Punctures of discal striae averaging slightly larger, surface of interstriae less irregular; male interstriae 9 more acutely elevated; pronotal punctures slightly smaller; California; *Cupressus*; 3.0–4.6 mm ..... 10. ***variolatus*** **Bruck**

12(9). Male frons shallowly, rather broadly impressed, median carina indistinct in both sexes; discal interstriae generally smooth, sculpture irregular with sparse, transverse lines; declivital punctures generally fine, shallow, obscure; female declivital interstriae 1 usually unarmed or with sparse, minute tubercles; Alaska to California; *Cupressus, Sequoia, Thuja*; 3.0–4.3 mm ..... 11. ***sequoiae*** **Hopkins**

– Male frons rather narrowly, deeply concave, median carina rather well developed in both sexes; discal interstriae generally closely subcrenulate, with numerous small tubercles; declivital punctures usually larger and deeper; female declivital interstriae 1 armed by regularly placed teeth of small to moderately large size; California and Arizona to Durango; *Cupressus*; 2.8–4.0 mm ..... 12. ***cristatus*** **(LeConte)**

13(8). Declivital teeth on interstriae 1 of male conspicuously less numerous than those on 3 and very strongly, laterally compressed, longitudinal axis at base of some teeth more than twice as great as their transverse axis; male vestiture hairlike, female with hair and scales; usually larger, 2.2–3.8 mm ..... 14

– Male declivital teeth on interstriae 1 almost as numerous as those on 3, only slightly if at all compressed; usually smaller, 1.6–3.4 mm ..... 15

14(13). Pronotum and frons very slightly more coarsely, more sparsely punctured; upper half of frons usually devoid of granules; British Columbia and Alberta to Washington; *Juniperus*; 2.4–2.8 mm ..... 13. ***scopulorum scopulorum*** **Swaine**

– Pronotum and frons more finely, more closely punctured; upper half of frons with a few granules, lower half more closely granulate; S Idaho to Texas; *Juniperus*; 2.2–3.7 mm ..... 14. ***scopulorum neomexicanus*** **Blackman**

15(13). Vestiture on elytral declivity often sparse, hairlike in male, either hairlike or scalelike in female; declivital interstriae 2 at least as wide as 1 or 3 (narrowed in occasional males of *punctatus*) ..... 16

– Declivital vestiture at least partly scalelike in both sexes (almost hairlike in male *hoferi*); left declivital interstriae 2 narrower than 1 or 3 on lower half (except some *arizonicus*) ..... 20

16(15). Declivital vestiture hairlike in male, at least partly scalelike in female (commonly abraded in both sexes); male interstriae 1 almost always with fewer teeth than on 3; interstriae variable, almost smooth and punctate (southern) to rather coarsely rugose-tuberculate; S Alaska and N Idaho to California and W Nevada; 1.9–3.4 mm ..... 15. ***punctatus*** **LeConte**

– Declivital vestiture hairlike in both sexes; declivital teeth on interstriae 1 and 3 about equal in number (sometimes reduced on 1 in *fulgens*) ..... 17

17(16). Declivital interstriae 1 and 3 very weakly elevated, their minute tubercles reduced in number to about two to six; elytra subglabrous, bright shining, usually reddish brown, discal interstriae not at all granulate; S Oregon to California; *Libocedrus decurrens*; 1.8–2.2 mm ..... 16. ***vandykei*** **Swaine**

– Declivital interstriae 1 and 3 more strongly elevated, their tubercle more numerous and larger; larger species, 2.0–3.4 mm ..... 18

18(17). Declivital interstriae densely punctured, surface irregular but subcrenulate or tuberculate only toward declivity; pronotal punctures very close; declivital tubercles smaller and less abundant; subglabrous; S Oregon to California; *Libocedrus decurrens*; 2.0–2.7 mm ..... 17. ***fulgens*** **Swaine**

– Discal interstriae tuberculate to base, few punctures visible; pronotal punctures not as densely placed; declivital interstrial tubercles larger and more numerous; elytral vestiture longer and more abundant ..... 19

19(18). Elytral vestiture very fine, rather sparse; male frontal excavation deeper, larger; devoid of a carina in both sexes; SW Wyoming to Arizona and New Mexico; *Juniperus*; 2.3–3.3 mm ..... 18. ***furnissi*** **Blackman**

– Elytral vestiture moderately coarse, abundant; male frontal excavation less extensive, not as deep; a conspicuous carina on lower half of frons in both sexes; Ontario and Minnesota to New Brunswick and New York; *Thuja occidentalis*; 2.0–2.9 mm ..... 19. ***canadensis*** **Swaine**

20(15). Male frons shallowly (rather deep in *hoppingi*), rather narrowly excavated, excavation ending well below upper level of eyes, with an acutely elevated, well developed, longitudinal, median carina extending from epistomal margin at least two-thirds of distance to upper level of eyes; declivital interstriae 5 each usually bearing six or more teeth in both sexes ..... 21

– Male frons deeply, broadly excavated, impression extending to or above upper level of eyes, usually devoid of a median carina, less commonly with a rudiment on lower third; female frontal carina partly reduced (except *keeni*); declivital interstriae 5 each usually armed by four or fewer teeth ..... 25

21(20). Male frons moderately to strongly concave; male declivital teeth coarse; stout, conspicuously larger than those on 5 or 7 or those of female; British Columbia to California; *Libocedrus, Juniperus, Cupressus*, etc.; 1.7–2.2 mm ..... 20. ***hoppingi*** **Swaine**

– Male frons feebly to shallowly, transversely impressed; male declivital teeth on interstrial 1 and 3 not larger than those on 5 and 7 or those of female ..... 22

22(21). Declivital interstriae 2 glabrous in both sexes, smooth except for nonsetiferous, minute points; declivital striae 1 and 2 usually each wider than interstriae 2 ..... 23

– Declivital interstriae 2 bearing numerous scalelike setae, scales arising from confused punctures; declivital striae 1 and 2 each distinctly narrower than interstriae 2 ..... 24

23(22). Declivital striae 1 and 2 with punctures coarsely, deeply impressed; discal strial punctures larger, more sharply impressed; Napa to Colusa counties, California; *Cupressus sargentii*; 1.7–2.4 mm ..... 21. ***setosus*** **Bruck**

– Declivital striae 1 and 2 with punctures shallowly, rather indefinitely impressed; discal strial punctures somewhat smaller, less clearly impressed; Arizona; *Cupressus arizonica*; 1.8–2.3 mm ..... 22. ***arizonicus*** **Blackman**

24(22). Discal interstriae little if any wider than striae; longest erect bristles on declivital interstriae hairlike; Oregon to California; *Libocedrus decurrens*, etc.; 1.6–2.0 mm ..... 23. ***antennatus*** **Swaine**

– Discal interstriae twice as wide as striae; longest, erect bristles on discal interstriae, flattened, scalelike; Hidalgo to Guatemala; *Cupressus*; 1.7–2.3 mm ..... 24. ***tacubayae*** **Hopkins**

25(20). Declivital interstriae 1 and 3 rather weakly elevated, each armed by three to five teeth, striae 4–7 weakly if at all impressed ..... 26

– Declivital interstriae 1 and 3 rather strongly elevated, each armed by eight or more teeth in both sexes, striae 4–7 more strongly impressed posteriorly ..... 28

26(25). Vestiture on elytral declivity primarily hairlike in both sexes, scales six or more times as long as wide; male carina short, restricted to epistomal area; male declivital teeth small, little if any longer than their basal width; California; *Cupressus sargentii*; 1.5–2.1 mm ..... 25. ***swainei*** **Bruck**

— Vestiture on elytra primarily scalelike, most scales stout, less than four times as long as wide ..... 27

27(26). Male frontal carina reduced to an epistomal tubercle; male declivital teeth on interstriae 1 and 3 unusually long and slender, some two or more times longer than their basal width; Arizona and New Mexico to Chihuahua; *Cupressus arizonica, Juniperus deppeana*; 1.6–2.0 mm ..... 26. ***spinosus*** **Blackman**

— Male frontal carina weak, extending from epistomal margin to deepest point of concavity; male declivital teeth on interstriae 1 and 3 smaller, little if any longer than basal width; S California; *Cupressus*; 1.5–2.0 mm ..... 27. ***frontalis*** **Bruck**

28(25). Male frons bearing a short median carina on lower half of lower slope of frontal impression; declivital tubercles on interstriae 1 and 3 smaller, each interval usually bearing 12 or more; scalelike setae on declivity more abundant; British Columbia and Washington to N Idaho; *Chamaecyparis nootkatensis*; 2.1–2.8 mm ..... 28. ***keeni*** **Blackman**

— Male frons devoid of median carina except for a small, marginal, epistomal tooth; declivital tubercles on interstriae 1 and 3 larger, each interval usually bearing 9 or fewer; S British Columbia and North Dakota to Arizona and W Texas; *Juniperus*; 1.7–2.4 mm ..... 29. ***hoferi*** **Blackman**

### 1. *Phloeosinus pini* Swaine
Fig. 94

*Phloeosinus pini* Swaine, 1915, Canadian Ent. 47:362 (Lectotype, female; Riding Mountains, Manitoba, Canada; Canadian Nat. Coll., designated by Bright, 1967, Canadian Ent. 99:677)

*Phloeosinus piceae* Swaine, 1934, Canadian Ent. 66:205 (Holotype, female; Berry Mountain Brook, Cascapedia River, Gaspé Co., Quebec, Canada; Canadian Nat. Coll.); Wood, 1957, Canadian Ent. 89:400. *Synonymy*

*Phloeosinus alaskanus* Blackman, 1942, Proc. U.S. Nat. Mus. 92:409 (Holotype, male; Eagle, Alaska; U.S. Nat. Mus., 55396); Wood, 1971, Great Basin Nat. 31:149. *Synonymy*

DIAGNOSIS.— This appears to be a unique, primitive species that lacks sexual dimorphism except for the impressed male frons; all declivital interstriae are about equally convex and equally, finely tuberculate in both sexes.

MALE.— Length 1.8–2.5 mm, 1.9 times as long as wide; color dark brown.

Frons concave, variably concavity extending from just below upper level of eyes to level of antennal insertion, occupying less than half to more than two-thirds of frontal area, a rather weakly elevated median carina usually present on lower slope in most specimens; surface shining, occasional irregular areas of feeble reticulation sometimes present, with rather fine, moderately abundant punctures intermixed with equally abundant rounded granules; vestiture hairlike, inconspicuous.

Pronotum 0.78 times as long as wide; widest on basal third, sides strongly arcuate on basal two-thirds to very strong constriction just behind rather broadly rounded anterior margins, surface somewhat irregular, shining, often with irregular patches of feeble reticulation, punctures rather large, deep, moderately abundant, some on basal half occasionally granulate; vestiture hairlike, rather short, moderately abundant.

Elytra 1.3 times as long as wide, 2.0 times as long as pronotum; sides almost straight and parallel on basal half, rather broadly rounded behind; basal margins each armed by 10 crenulations; striae narrowly, rather strongly impressed, punctures rather indistinctly impressed; interstriae about twice as wide as striae, moderately convex, punctures replaced by an indefinite, staggered row of rather coarse, subcrenulate tubercles on each interstriae. Declivity convex, steep; striae less strongly impressed than on disc; interstriae with close, confused, fine punctures; each equally armed by a uniseriate row of about eight pointed tubercles, those on 2 sometimes partly reduced in size and number, 1 weakly elevated toward suture. Vestiture hairlike on disc, changing toward declivity to moderately abundant, subsquamose, short, ground cover and interstrial rows of slender bristles, each bristle slightly shorter than distance between rows.

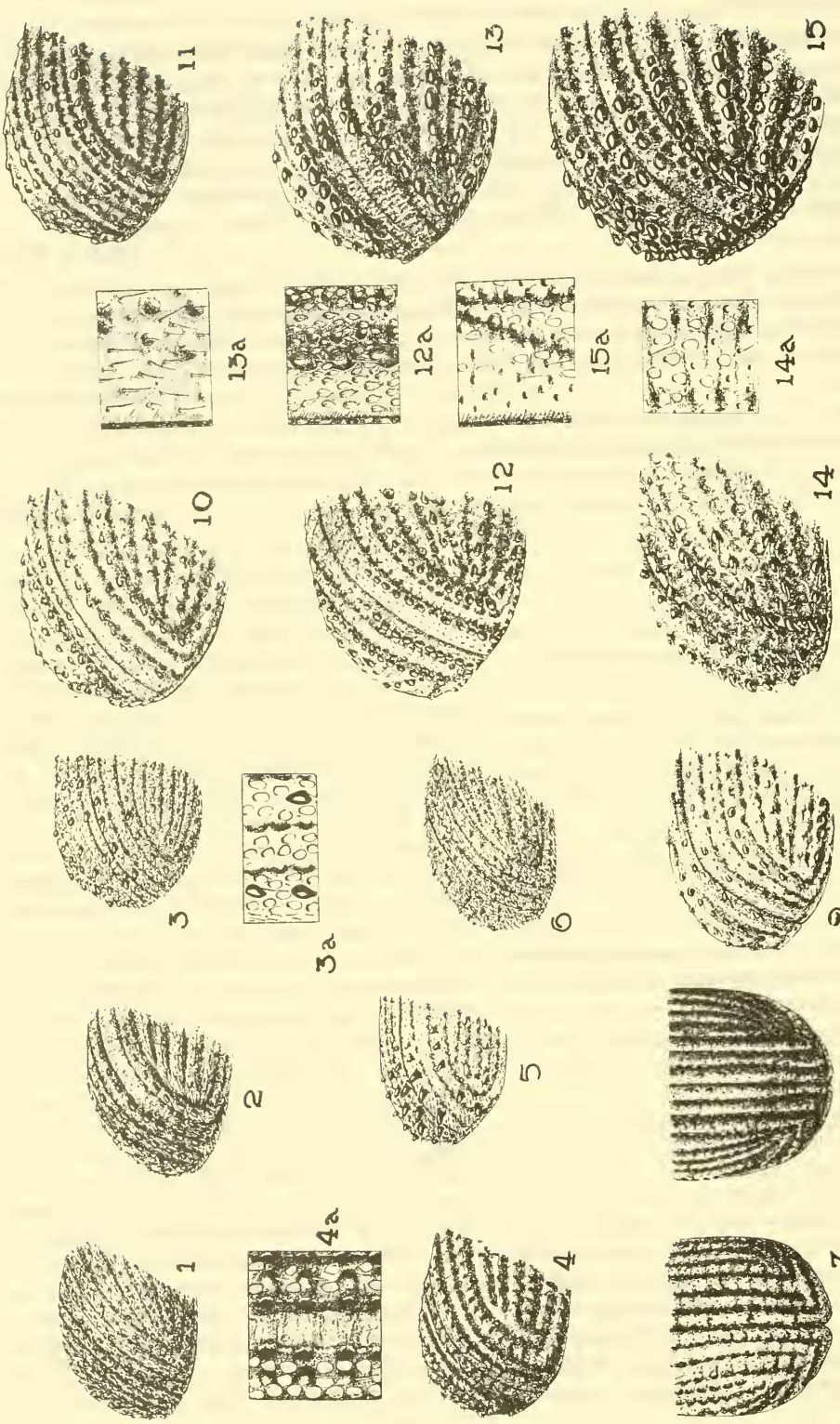



Fig. 94. *Phloeosinus* spp., elytral declivity: 1, *pini*, male; 2, *hoferi*, male; 3, *frontalis*, male, 3a, same, interstriae 1–3; 4, *arizonicus*, male, 4a, same, interstriae 1–3; 5, *spinosus*, male; 6, *spinosus*, female; 7–8, *fulgens*, male; 9, 11, *punctatus*, male; 10, *punctatus*, female; 12, *cupressi*, female, 12a, same, interstriae 1–2; 13, *cupressi*, male, 13a, same, interstriae 1–2; 14, *variolatus*, female, 14a, same, interstriae 2; 15, *variolatus*, male, 15a, same, interstriae 1–2. (After Blackman 1942: pls. 38–39.)

FEMALE.— Similar to male except frons convex, carina more consistently present.

DISTRIBUTION.— Alaska to Quebec and Michigan.

ALASKA: Eagle, Hopk. U.S. 1170c, *Picea glauca*, W. N. Osgood. CANADA: **Manitoba**: Grassy River, 27-VII-72, *P. glauca*, D. E. Bright; Riding Mountains, *Pinus banksiana*, J. M. Swaine. **Northwest Territories**: Aklavik, 27-IV, 10-V, 18-VI-31, Nos. 206, 222, 234, O. Bryant. **Quebec**: Gaspé Co., 2-VIII-31, 16-VIII-34, *Picea glauca*, E. B. Watson. USA: **Michigan**: Grande Island, Hopk. U.S. 3775 and 3755a.

HOSTS.— *Picea glauca, Pinus banksiana.*

BIOLOGY.— Specimens have been reared from spruce branches and from a broken top of Jack pine.

NOTES.— The above treatment was based on my male homotype from Gaspé Co. that was compared to the types of both *pini* and *piceae* and a female bearing identical data; these types previously had been compared directly to one another. The type series of *alaskanus* was examined in addition to 84 other specimens.

### 2. *Phloeosinus taxodii taxodii* Blackman

Fig. 95

*Phloeosinus taxodii* Blackman, 1922, Mississippi Agric. Expt. Sta. Tech. Bull. 11:61 (Holotype, female; Columbia, Mississippi; U.S. Nat. Mus., 55410)

DIAGNOSIS.— This species is distinguished from *dentatus* (Say) by the presence of several small teeth at the base of declivity on interstriae 4, by the larger, less numerous granules on the declivital interstriae, and by the slightly narrower, weakly convex, declivital interstriae 2.

MALE.— Length 1.9–3.0 mm, 1.9 times as long as wide; color dark brown.

Frons weakly convex, a slight transverse impression just above upper level of antennal insertion; surface shining, punctured above and laterally, most punctures replaced by rather large, rounded granules in central area; a moderately well-developed, acute, median carina extending from upper level of eyes to epistomal margin; vestiture hairlike, inconspicuous.

Pronotum 0.81 times as long as wide; widest at base, sides convergently arcuate, a moderate constriction just before broadly rounded anterior margin; surface shining, punctures close, deep, interspaces about half as wide as diameters of punctures; vestiture hairlike, short, rather abundant.

Elytra 1.3 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on slightly more than basal half, rather broadly rounded behind; each basal margin armed by 10–11 crenulations; striae narrowly impressed, small punctures obscurely impressed; interstriae three to four times as wide as striae, surface shining, with narrow, confused, transverse crenulations. Declivity convex, rather steep; interstriae 1 and 3 moderately elevated and armed by coarse teeth, those on 1 slightly larger and less numerous, eight teeth on 1, 10 or 11 on 3, 2 weakly convex and armed by two or three small granules at base and one just before apical margin, 4–9 each with five or more smaller teeth. Vestiture hairlike, part of ground vestiture on declivity stout, almost scalelike.

FEMALE.— Similar to male except frontal impression less pronounced, carina often absent; discal interstrial crenulations slightly higher; declivital teeth on elytra smaller, more slender, slightly more numerous, equally abundant on interstriae 2; ground vestiture on elytra partly scalelike, each scale about two or three times as long as wide.

DISTRIBUTION.— Texas and Virginia to Florida.

USA: **Florida**: Apalchea, Jacksonville, La Bell, Mariana, Monroe Station, Oneco. **Georgia**: Sea Island. **Louisiana**: Frenier, New Orleans, Patterson. **Mississippi**: Columbus, Holly Springs. **North Carolina**: Boardman, Wilmington. **South Carolina**: Lumber, New Landing. **Virginia**: Cape Henry, Franklin, Portsmouth.

HOST.— *Taxodium distichum.*

BIOLOGY.— This species breeds in the limbs and bole of the host species. The gallery system is essentially as described for the genus.

NOTES.— The above descriptions were based on the holotype and on 109 other specimens.

### 3. *Phloeosinus taxodii taxodiicolens* Wood

*Phloeosinus taxodiicolens* Wood, 1956, Canadian Ent. 88:250 (Holotype, male; Tamazunchale, San Luis Potosi, Mexico; Snow Ent. Coll., Univ. Kansas)

DIAGNOSIS.— As in *t. taxodii* except discal striae distinctly wider; discal interstrial crenulations lower, wider, less numerous; ground vestiture in male more nearly scalelike, extending to near middle of disc in both sexes; declivital teeth usually slightly smaller.

MALE.— Length 2.0–2.6 mm, 1.8 times as long as wide; color dark brown.

Distinguished from the northern race by characters mentioned above.

DISTRIBUTION.— Durango to Puebla.

MEXICO: **Durango**: 20 km N Rodeo, 22-VI-53, 1400 m, *Taxodium*, S. L. Wood. **San Luis Potosí**: Tamazunchale, 21-VI-53, 800 m, *Taxodium*, S. L. Wood. **Puebla**: Matamoros, 14-VI-67, *Taxodium*, S. L. Wood.

HOST.— *Taxodium mucronatum*.

BIOLOGY.— Essentially as in *t. taxodii*.

NOTES.— The above treatment was based on the type series of 76 specimens and on 5 other specimens. It was treated as a distinct species until a series from Durango was found to exhibit characters intermediate between those usually seen in series from the United States and from Mexico.

### 4. *Phloeosinus deleoni* Blackman

*Phloeosinus deleoni* Blackman, 1942, Proc. U.S. Nat. Mus. 92:454 (Holotype, male; Jacala, Hidalgo, Mexico; U.S. Nat. Mus., 55411)

DIAGNOSIS.— This unique species is allied to the following three species as indicated by the armature of declivital interstriae 2 and the sculpture of the male frons; however, it is not closely related to any of them. The sculpture is much finer and the elytral tubercles are reduced in size and number, particularly in the male, and the declivity begins at the middle of the elytra.

MALE.— Length 2.4–3.2 mm, 1.9 times as long as wide; dark brown, elytra usually of lighter color.

Frons broadly, transversely impressed on middle third, convex above, gradually ascending to epistomal margin below; a weak, median carina extending from upper level of eyes to epistomal margin; surface shining, closely, rather coarsely punctured, a few punctures very feebly granulate; vestiture fine, hairlike, rather abundant but noticeable only near epistoma.

Pronotum 0.86 times as long as wide; outline and sculpture essentially as in *taxodii*.

Elytra 1.24 times as long as wide, 1.56 times as long as pronotum; sides almost straight and parallel on basal half, then slightly, arcuately convergent and rather broadly rounded behind; basal margins each armed by 12 crenulations; striae narrowly, moderately impressed, punctures rather fine, deep; interstriae twice as wide as striae, shining, punctures usually with their anterior margins higher, about a fourth of them finely crenulate on 1 to 3 and on bases of other interstriae. Declivity convex, gradual, beginning at middle of elytra; interstriae 1 and particularly 3 weakly elevated, 1 armed by three or four pointed teeth, 3 by seven to nine teeth, middle ones pointed, 5 to 9 each with three to five shorter, blunt teeth; 2 as wide as 1 or 3, armed by one small tubercle near apex in about half of males (tubercle on left elytron most commonly missing). Vestiture short, fine on disc, becoming stout toward declivity, almost scalelike on lower half, each scale three to six times as long as wide (some more slender setae also intermixed with scales).

FEMALE.— Similar to male except frons more nearly convex; discal crenulations on interstriae larger and more abundant; declivital teeth slightly smaller, interstriae 1, 2, and 3 each with eight or nine pointed teeth of about equal size.

DISTRIBUTION.— Durango and Hidalgo to Oaxaca.

MEXICO: **Durango**: 17 km W El Salto, 11-VII-64, *Juniperus*, E. E. Lindquist. **Hidalgo**: Jacala, 18-I-38, No. 662, *Juniperus flaccida*, D. DeLeon; 30 km N Zimapan, 11-VII-67, No. 192, *Juniperus*, S. L. Wood; State of Hidalgo (near Jacala), VI-53, *Juniperus*, S. L. Wood. **Jalisco**: Guadalajara, 22-IV-77, Hopk. 60595, M. M. Furniss. **Michoacán**: Km 118 Toluca-Morelia. **Oaxaca**: 120 km S Oaxaca, 11-V-71, 2000 m, *Cupressus*, D. E. Bright.

HOST.— *Juniperus flaccida*, *J.* sp., *Cupressus* sp.

BIOLOGY.— This species breeds in the bole and larger branches. The gallery patterns were essentially as described above for the genus.

NOTES.— The above descriptions were based on the holotype, allotype, and 3 paratypes and on 94 other specimens.

### 5. *Phloeosinus dentatus* (Say)

Fig. 95

*Hylurgus dentatus* Say, 1826, J. Acad. Sci. Philadelphia 5:258 (Syntypes?; presumably Milton, Massachusetts; type evidently lost)

*Dendroctonus* (?) *graniger* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:147 (Lectotype, male; Texas, labeled "Am. Bor."; U.S. Nat. Mus., present designation); Eichhoff, 1895, Proc. U.S. Nat. Mus. 18:608. *Synonymy*

*Dendroctonus* (?) *haagi* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:148 (Lectotype, female; Amerique Boreale, U.S. Nat. Mus., present designation); Blackman 1942, Proc. U.S. Nat. Mus. 92:452. *Synonymy*

*Phloeosinus enixus* Blackman, 1921, Mississippi Agric. Expt. Sta. Tech. Bull. 10:5 (Syntypes; Nachez, Mississippi; U.S. Nat. Mus.); Blackman, 1942, Proc. U.S. Nat. Mus. 92:452. *Synonymy*

DIAGNOSIS.— This species is very closely related to *taxodii* Blackman, from which it is distinguished with some difficulty by the absence (usually) of teeth on interstriae 4 at the declivital base, by the smaller, more numerous discal interstrial crenulations, by the wider, flat, declivital interstriae 2 of the male, and by the finer, more slender declivital setae in both sexes.

MALE.— Length 1.8–2.8 mm, 2.0 times as long as wide; color dark brown, pronotum commonly darker than elytra.

Head and pronotum as described above for *taxodii*.

Elytra 1.2 times as long as wide, 1.6 times as long as pronotum; outline and crenulations on basal margins as in *taxodii*; striae narrowly impressed, punctures small, impressed, somewhat obscure; interstriae three to four times as wide as striae, surface shining, almost smooth except armed by rather abundant setiferous, subcrenulate tubercles, smaller and evidently more numerous than in *taxodii*. Declivity as in *taxodii* except interstriae 2 flatter and slightly wider, two teeth nearest middle (usually second and third from apex) normally slightly larger, and interstriae 4 unarmed. Vestiture hairlike; ground vestiture near apex stout in some specimens.

FEMALE.— As in male except frons more convex; elytra more slender, 1.3 times as long as wide; discal tubercles on interstriae slightly higher; declivital tubercles smaller, more slender, usually slightly more numerous, interstriae 2 usually also armed; declivital vestiture mostly hairlike above, a few slender scales present on lower half, each scale usually four or more times as long as wide.

DISTRIBUTION.— Nebraska, Ontario, and New Hampshire to Texas and Georgia.

CANADA: **Ontario**: E Ontario. USA: **Alabama**: Mobile. **Arkansas**: "Ark.," Lyme, Rowayton. **District of Columbia**: Washington. **Georgia**: Thomasville. **Illinois**: Lyons. **Iowa**: Mt. Carmel, Shenandoah. **Kansas**: Douglas Co., Fowler, Lawrence, Osborne Co., Salina. **Kentucky**: Lexington. **Maryland**: Bladensburg, Glen Echo, Piney Point, Plummers Island. **Massachusetts**: Lawrence, Walpole in Norfolk Co. **Minnesota**: Monticello. **Mississippi**: Agricultural College, Columbus, Gulfport, Natchez, Ripley, Wallerville. **Nebraska**: St. Paul. **New Hampshire**: Webster. **New Jersey**: Anglesea, Bamber, New Milford. **New York**: Huntington on Long Island, Ithaca, New York, Peekskill, Syracuse, West Point. **North Carolina**: Durham, Elizabeth, Tryon. **Ohio**: Cleveland, Gypsum. **Pennsylvania**: Hummelstown, York Co. **South Carolina**: Greenville, Yorkville. **South Dakota**: Ft. Pierce, Wessington Springs. **Tennessee**: "Tenn." **Texas**: Austin, Bostrop, Dallas, Houston, La Grange. **Virginia**: Ft. Monroe, Falls Church, Fredericksburg, Mt. Vernon, Onville, Pennington Gap, Richmond, Rosslyn, Virginia Beach. **West Virginia**: Bayard, Kanawha Station, Wood Co.

HOSTS.— *Chamaecyparis thyoides*, *Juniperus virginiana*, *Thuja occidentalis*.

BIOLOGY.— Both limbs and bole of the host are attacked. The gallery system is as described above for the genus.

NOTES.— The above descriptions were based on a male and a female from Long Island, New York (Melville and Wayandanch, respectively), that agree with LeConte's representatives of this species. The type evidently is lost. In addition, 552 other specimens were examined. Two male syntypes of *graniger* are in the U.S. National Museum; the first is here designated as the lectotype of *graniger* Eichhoff. One female syntype of *haagi* is also in the U.S. National Museum; it is here designated as the lectotype of *haagi* Eichhoff. All other syntypes of these two Eichhoff species presumably were destroyed with the Hamburg Museum.

### 6. *Phloeosinus palearis* Wood

*Phloeosinus palearis* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):2 (Holotype, male; Chiapa de Corzo, Chiapas, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *serratus* (LeConte) by the smaller size, by the numerous minute points and/or fine lines in the interspaces between punctures on the pronotal disc, by the less numerous, smaller submarginal crenulations at the elytral bases, and by the less strongly compressed teeth on the male elytral declivity, the anterior profile of each tooth usually evenly arcuate (abruptly angled in *serratus*).

MALE.— Length 1.9–2.5 mm, 1.95 times as long as wide; color very dark brown.

Frons feebly convex, almost flat, lower fourth gradually ascending to epistomal margin; lower half marked by a fine, low, median

carina; surface smooth, with rather fine, deep, close punctures, some subgranulate in area mesad from upper half of eye; vestiture fine, moderately long, rather abundant. Vestiture on antennal club short, more abundant than in allied species.

Pronotum 0.82 times as long as wide; widest near base, sides strongly, convergently arcuate to moderate constriction just before broadly rounded anterior margin; surface smooth, with some minute points and lines in interspaces between moderately large deep punctures; width of interspaces one-fourth to equal in width to diameter of a puncture. Vestiture fine, rather short, moderately abundant.

Elytra 1.2 times as long as wide, 1.6 times as long as pronotum; basal margins armed by 12 crenulations on interstriae 2–9; striae narrowly impressed, small punctures somewhat obscurely indicated; interstriae about three times as wide as striae, feebly convex, surface smooth but irregular, punctures moderately coarse, close, confused, their anterior margins usually elevated, some rather coarsely crenulate at base. Declivity convex, rather steep; striae less strongly impressed; interstriae 1 and 3 moderately, 5, 7, 8, and 9 less strongly elevated, these and 6 armed by rather coarse teeth, those on 3 and particularly on 1 larger, 2 bearing two teeth near apex, 2 and 4 flat, finely punctured; interstriae 1 bearing eight teeth, each only slightly compressed and usually with anterior profile evenly arcuate, 3 bearing 13 teeth with none of them compressed. Vestiture scanty, but stout, some setae almost scalelike.

FEMALE.— Similar to male except frons more strongly convex and more extensively granulate; pronotal lines and points much more abundant; a few elytral crenulations extend almost to declivity; declivital teeth smaller with interstriae 2 and 4 armed by at least a few small teeth; declivital vestiture largely of scales, each only slightly longer than wide.

DISTRIBUTION.— Chiapas.

MEXICO: Chiapas: 17 km E Chiapa de Corzo, 17-VI-64, 2300 m, No. 710, *Juniperus*, S. L. Wood; 40 km SE Teopisca, 18-V-69, *Juniperus*, D. E. Bright.

HOST.— *Juniperus* sp.

BIOLOGY.— The type series was taken from a broken branch less than 4 cm in diameter. The parental galleries were as described for the genus.

NOTES.— The above description was based on the type series of 16 specimens, and on 4 other specimens.

### 7. *Phloeosinus serratus* (LeConte)

Fig. 95

*Hylesinus serratus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:170 (Holotype, male; Middle States; Mus. Comp. Zool.)

*Phloeosinus utahensis* Swaine, 1915, Canadian Ent. 47:363 (Lectotype, female; Stockton, Utah; Canadian Nat. Coll., designated by Bright, 1967, Canadian Ent. 99:677); Wood, 1971, Great Basin Nat. 31:150. *Synonymy*

*Phloeosinus rugosus* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):9 (Lectotype, female; Scaffold Meadow, Sequoia N. F., California, Canadian Nat. Coll., 9259, designated by Bright, 1967, Canadian Ent. 99:677); Wood, 1974, Great Basin Nat. 34:286. *Synonymy*

*Phloeosinus juniperi* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Bull. 14(1):10 (Lectotype, female; Scaffold Meadow, Tulare Co., California; Canadian Nat. Coll., designated by Bright, 1967, Canadian Ent. 99:677); Wood 1971, Great Basin Nat. 31:150. *Synonymy*

*Phloeosinus aciculatus* Bruck, 1931, Pan-Pacific Ent. 7:127 (Holotype, male; Chiricahua Mountains, Cochise Co., Arizona; California Acad. Sci.); Wood, 1971, Great Basin Nat. 31:150. *Synonymy*

*Phloeosinus neotropicus* Schedl, 1939, Proc. Roy. Ent. Soc. London 8(1):12 (Holotype, female; Jamaica; British Mus. Nat. Hist.); Wood, 1978, Great Basin Nat. 38:387. *Synonymy*

DIAGNOSIS.— This species is allied to *palearis* Wood, but is easily distinguished by characters included in the above key. It varies geographically as noted below.

MALE.— Length 2.0–3.7 mm, 2.0 times as long as wide; body very dark brown, elytra often reddish brown.

Frons convex above, flattened toward center, transversely impressed just above level of antennal insertion, ascending toward epistomal margin; surface shining, with rather abundant, isolated, rounded granules, their size smaller below; vestiture hairlike, fine, rather abundant.

Pronotum 0.81 times as long as wide; essentially as described for *taxodii*.

Elytra 1.2 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on slightly more than basal half, rather broadly rounded behind; basal margins each armed by 10–11 crenulations; striae

narrowly impressed, punctures obscurely indicated; interstriae more than twice as wide as striae, shining, punctures rather coarse, confused, their anterior margins weakly to strongly elevated, a few forming small, narrow crenulations (number and height of crenulations greater in specimens from extreme southern part of distribution). Declivity convex, rather steep; interstriae 1 and 3 moderately elevated and coarsely serrate, teeth larger and laterally compressed near middle on 1, 1 bearing 7 to 11 teeth, 3 bearing 11 to 16 teeth (higher numbers more common in southeastern part of range), 5 and 7 armed by about five to six teeth, 6, 8, and 9 usually bearing a few small tubercles, 2 and 4 unarmed and punctured, 2 impressed. Vestiture consisting of hair on disc; ground cover on declivity subscalelike, with median rows of short, interstrial hair.

FEMALE.— Similar to male except frons convex, a small, subfoveate impression at center; discal interstrial crenulations larger, wider, more numerous; declivital interstriae 1 and 3 less strongly elevated, teeth much smaller, all interstriae armed but 2 with fewer smaller teeth; declivital scales more abundant, stouter, mostly about twice as long as wide.

DISTRIBUTION.— Washington and Idaho to Hidalgo and Texas, Jamaica.

USA: **Arizona**: Carr Canyon in Huachuca Mts., Chiricahua Mts., Dragoon Mts. in Cochise Co., Ft. Apache, Grand Canyon, Greer, Lakeside, Paradise, Prescott N. F., Santa Rita Mts., Sycamore Springs, Williams. **California**: Alturas, Angora Lake, Buck Creek near Warner in Modoc Co., Fallen Leaf Lake, Grass Lake in Siskiyou Co., Hackamore, Hat Creek, Likely in Modoc Co., Madeline, Scaffold Meadow in Tulare Co., Sequoia N. F., Willow Ranch in Modoc Co., Yosemite N. P. **Idaho**: Centerville. **New Mexico**: Capitan Mts., Manzano, Santa Catalina Mts., Santa Fe, Stevens. **Oregon**: Beatty, Hood River, Klamath Falls, Ochoca N. F., Prineville, Redmond. **Texas**: **Dallas, Davis Mts., Jeff Davis Co.** **Utah**: Beaver, Oak Creek Canyon in Millard Co., Stockton. MEXICO: **Chihuahua**: Creel, La Magdalena. **Durango**: 16 and 48 km in W Durango, El Salto, La Zarca. **Hidalgo**: Chico N. P. **Tlaxcala**: Capulapan. JAMAICA: Chinchona.

HOSTS.— *Juniperus deppeana, J. monosperma, J. occidentalis, J. osterosperma, J. scopulorum.*

BIOLOGY.— The bole and larger limbs are attacked by this species. The gallery system is about as described for the genus.

NOTES.— The above descriptions were prepared largely from a male and a female from La Zarca, Durango. The type of *serratus* was examined and, although it has the large number of teeth more commonly characteristic of the southeastern part of the range, the size and other features suggest it came from California or Oregon. The second specimen in the type series is not of this species. In addition to these two specimens the types of *utahensis, juniperi, rugosus,* and *aciculatus,* and 431 other representatives of this species were examined. The *rugosus* of Blackman (1942) is actually *punctatus* LeConte.

Blackman (1942) divided this species into four allopatric units. While certain specimens from each area do fit his morphological definitions of species rather well, he does not indicate the variability within series or the overlap in these variations between series. Although most of the northern California and Oregon specimens are rather clearly different from the La Zarca, Durango, series, they are not nearly as distinct from the El Salto, Durango, series. There appear to be slight clinal differences from northwest to southeast increasing the number of declivital teeth on male interstriae 1 and 3 and in the size and number of discal interstrial crenulations (not really measurable). With the limited material at hand, in view of the broad availability of potential hosts over the entire distribution, it appears that only one species should be recognized. When sufficient material is available for study, it may be necessary to reduce *palearis* Wood to subspecific rank; however, at the present time such action is not justified.

### 8. *Phloeosinus cupressi* Hopkins
Figs. 94, 96

*Phloeosinus cupressi* Hopkins, 1903, U.S. Bur. For. Bull. 38:35 (Holotype, male; Golden Gate Park, San Francisco, California; U.S. Nat. Mus., 55406)

*Phloeosinus nitidus* Swaine, 1924, Canadian Ent. 56:145 (Holotype, male; Santiam Nat. For., Oregon; Canadian Nat. Coll., 730); Wood, 1971, Great Basin Nat. 31:148. *Synonymy*

*Phloeosinus blackwelderi* Blackman, 1943, Proc. U.S. Nat. Mus. 94:397 (Holotype, male; Circito, Canal Zone, Panama; U.S. Nat. Mus., 56576); Wood, 1971, Great Basin Nat. 31:148. *Synonymy*

DIAGNOSIS.— This species is rather closely related to *baumanni* Hopkins and *variolatus* Bruck, but it differs from both by the smaller

size, by the more narrowly, more strongly impressed discal striae, by the somewhat more coarsely sculptured discal interstriae, and by the reduced male frontal carina.

MALE.— Length 2.5–3.6 mm, 1.9 times as long as wide; color dark brown to black with elytra lighter, usually dark reddish brown.

Frons concave on median half from upper level of eyes almost to epistomal margin; surface smooth and shining, with a few moderately large, isolated granules on margins of concavity on slightly more than upper half, with moderately abundant, rather large punctures at sides and above except in area of granules; a moderately large, median tubercle just above epistomal margin; vestiture hairlike, fine, rather short, moderately abundant.

Pronotum 0.85 times as long as wide; as in *taxodii* except interspaces between punctures marked by moderately abundant, fine points.

Elytra 1.3 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind, with declivital tubercles interrupting outline; basal margins each armed by 12 crenulations; striae narrowly, moderately impressed to base, punctures obscurely impressed; interstriae at least twice as wide as striae, punctures mostly obscurely impressed, those on 1 to 3 and sometimes 4 crenulate on their anterior margins, varying from low to rather coarse, crenulations on those from northern parts of range tending to be slightly larger. Declivity steep, convex; interstriae 2 narrowed and obsolete by upper fourth, 2 armed by 2 to 4 coarse teeth at upper margin, 3 slightly elevated and armed by a row of 8 to 12 coarse, rather blunt, closely set teeth, 5, 7, and 9 usually with about 3 to 5 smaller teeth, 1 below armed area smooth, with sparse, setiferous punctures. Vestiture hairlike, rather short, mostly in rows, not abundant; fine on disc, stout on declivity.

FEMALE.— Similar to male except frons convex, with a median fovea near center, a fine, median carina from fovea to epistoma, surface closely, coarsely granulate; interstrial crenulations higher and evidently slightly more abundant; declivital interstriae 1 and 3 equally serrate to apex, all teeth smaller, 2 continued to apex, only slightly narrower than 1 or 3; declivital vestiture consisting of abundant scales, each scale less than twice as long as wide.

DISTRIBUTION.— Alaska to California. Also introduced into Panama, New Zealand, and Australia.

ALASKA: Juneau and Petersburg. CANADA: **British Columbia**: Mt. Benson in Vancouver Island, Vancouver. USA: **California**: Aptos, Berkeley, Callistoga, Carmel, Cooks Springs in Colusa Co., Costa Mesa, Cypress Ridge near Fairfax in Marin Co., Del Monte, Easton, Ft. Bragg, Los Gatos, Mojave, Montara, Monterey, Mt. St. Helena, Napa Co., Oakland, Pacific Grove, Palo Alto, Paraiso Springs, Pasadena, Redlands, Salinas, San Francisco, San Mateo. **Oregon**: Klamath Falls. **Washington**: Fairfax, Mt. Rainier, Ogseagle Pass. OTHER COUNTRIES: **Australia**: Northarodge, New South Wales, 4-V-47, *Cupressus torulosa*, P. H. Taylor. **New Zealand**: St. Heliers, Auckland, 29-VIII-43, D. Spillar. **Panama**: Ciricito, Canal Zone, 4-IV-30, R. E. Blackwelder.

HOSTS.— *Chamaecyparis nootkatensis*, *Cupressus macrocarpa*, *C. sargentii*, *Sequoia sempervirens*, *Thuja plicata*.

BIOLOGY.— The bole and limbs are selected for breeding; maturation feeding tunnels may also be constructed in tiny living twigs by young adults. When populations are high this species is said to attack and kill healthy trees (Blackman 1942:398). The gallery system appears to be as described for the genus.

NOTES.— The above descriptions were based on the holotypes of *cupressi*, *nitidus*, and *blackwelderi* and on 521 other specimens.

Blackman (1942) divided this taxon into two allopatric species defined by differences in host, by supposedly smoother lateral interstriae, and by sinuate striae in the northern race. I find the discal interstriae of the northern race tend to be more coarsely, closely crenulate in specimens from Washington but finer in those from Alaska; the other characters vary about equally within series from both areas. None of the supposed differences, except host, appear sufficiently constant to be recognized in more than half the available material; therefore, until biological or other supporting evidence becomes available for separation, I must recognize only one species.

### 9. *Phloeosinus baumanni* Hopkins

*Phloeosinus baumanni* Hopkins, 1905, preprint of Proc. Ent. Soc. Washington 7:79 (Holotype, male; Tacubaya, Distrito Federal, Mexico; U.S. Nat. Mus., 7517a)

DIAGNOSIS.— This species is closely related to *variolatus* Bruck, but it is distinguished

with difficulty by characters summarized in the above key.

MALE.— Length 3.0–4.1 mm, 1.9 times as long as wide; color dark brown to black, elytra usually dark reddish brown.

Frons rather weakly, subconcavely impressed in central area; lower two-thirds bearing a fine, median carina; surface rather coarsely punctured, with a few coarse, isolated granules at sides above; vestiture fine, hairlike, more conspicuous along epistoma.

Pronotum 0.90 times as long as wide, otherwise as in *cupressi*.

Elytra 1.3 times as long as wide, 1.5 times as long as pronotum; outline and basal margins as in *cupressi*; striae slightly impressed toward declivity only, punctures very coarse and deep, decreasing in size toward base; interstriae usually narrower than striae on posterior half, equal to or slightly wider than striae on anterior half, surface smooth and shining, undulating but not crenulate, punctures rather fine, their anterior margins usually slightly elevated. Declivity steep, convex; armature as in *cupressi* except interstriae 2 only slightly narrowed and continuing to apex. Vestiture as in *cupressi* except some scales present on interstriae 1 and 3.

FEMALE.— Similar to male except frons convex, foveate at center, a median carina extending from fovea to epistoma; interstriae 2 and 3 with a few fine crenulations on disc; declivital interstriae 1 and 3 equally armed to apex, teeth slightly smaller, 4, 6, and 8 usually with fine teeth; declivital vestiture largely scalelike, each scale about twice as long as wide.

DISTRIBUTION.— SE Arizona to El Salvador.

USA: **Arizona**: Rucker Canyon, Chiricahua Mts., 21-VII-68, *Cupressus arizonicus*, D. E. Bright. MEXICO: **Distrito Federal**: Chapingo, 11-IX-49, *C. benthami*, J. P. Perry; Mexico City, 16-V-49, *C. benthami*, J. P. Perry; Tacubaya, Hopkins U.S. 1146. **Hidalgo**: 32 km E Tulancingo, 10-VII-67, 2300 m, *C. benthami*, S. L. Wood. **Puebla**: Iztaccihuatl-Popocatepetl N. P., 9-V-72, 3000 m, *Cupressus*, D. E. Bright. Unknown state: San Juan, 25-I-36, *Cupressus*, D. DeLeon. EL SALVADOR: San Andres, 1979, *C. lusitanica*.

HOSTS.— *Cupressus arizonicus* and *C. benthami*.

BIOLOGY.— This species bred in the bole larger than 25 in diameter in the two trees observed. Both evidently were primary attacks on healthy trees. The tunnels were essentially as described for the genus.

NOTES.— The above descriptions were based on the holotype and on 137 other specimens.

This species is very closely related to *variolatus*; some female specimens are extremely difficult to distinguish.

### 10. *Phloeosinus variolatus* Bruck
Figs. 94, 96

*Phloeosinus variolatus* Bruck, 1931, Pan-Pacific Ent. 7:126 (Mount Saint Helena, Napa Co., California; California Acad. Sci.)

DIAGNOSIS.— This species is so very closely related to *baumanni* Hopkins that occasional females are distinguished with great difficulty. The characters summarized in the above key will serve to distinguish these species.

MALE.— Length 2.6–4.6 mm, 2.0 times as long as wide; color very dark brown to black, elytra usually lighter.

Frons and pronotum as in *baumanni* except pronotal punctures slightly larger and closer. Pronotum 0.83 times as long as wide.

Elytra 1.2 times as long as wide, 1.5 times as long as pronotum; outline and basal crenulations as in *baumanni*; striae feebly impressed, punctures very coarse, deep, decreasing in size slightly toward base; interstriae distinctly narrower than striae on posterior half of disc, about equal in width on basal third, surface smooth, punctures fine, not at all crenulate, undulations feeble. Declivity essentially as in *baumanni* except interstriae 2 narrower, almost obsolete below. Vestiture as in *baumanni* except scales apparently more numerous and more widely distributed.

FEMALE.— Similar to male except frons convex, more coarsely granulate, foveate at center with median carina extending from fovea to epistoma; interstriae 2 to 4 undulating, with an occasional weak crenulation; declivity as in female *baumanni*, interstriae 2 not constricted.

DISTRIBUTION.— Central California.

USA: **California**: Cedar Ridge in Alameda Co., 22-III-51, *Cupressus sargentii*; Cooks Springs, *C. sargentii*; Livermore, 16428, *C. sargentii*, F. H. Herbert; Middletown, 2-IV-50, *C. sargentii*; Mt. St. Helena, 20-X-23, *C. sargentii*.

HOST.— *Cupressus sargentii.*

BIOLOGY.— Except for the host relationship nothing has been recorded. The lower end of the gallery includes a unique J-shaped hook (Bright 1973:135).

NOTES.— The above description was prepared from 81 specimens that included 37 paratypes.

### 11. *Phloeosinus sequoiae* Hopkins
Fig. 95

*Phloeosinus sequoiae* Hopkins, 1903, U.S. Bur. For. Bull. 38:33 (Holotype, female; Sonoma Co., California; U.S. Nat. Mus., 55408)

*Phloeosinus squamosus* Blackman, 1942 (nec. Schedl 1942), Proc. U.S. Nat. Mus. 92:448 (Holotype, male; Naselle, Washington; U.S. Nat. Mus., 55409) Wood, 1957, Canadian Ent. 89:400. *Synonymy*

*Phloeosinus blackmani* Schedl, 1950, Occ. Pap. Bishop Mus. 20:36 (Replacement for *squamosus* Blackman); Wood, 1957, Canadian Ent. 89:400. *Synonymy*

DIAGNOSIS.— This species is rather closely related to *cristatus* (LeConte), from which it is easily distinguished by characters summarized in the above key.

MALE.— Length 3.0–4.3 mm, 2.0 times as long as wide; color very dark brown to black, elytra usually lighter, reddish brown.

Frons transversely, subconcavely impressed in central area; median carina indicated only by a feebly raised line in deepest part of impressed area; surface shining, punctures coarse, close laterally, sparse elsewhere; vestiture hairlike, fine, inconspicuous.

Pronotum 0.89 times as long as wide; sides on basal third almost straight and parallel, then arcuately rounded to moderate constriction just behind broadly rounded anterior margin; surface smooth, shining, punctures close, deep, usually separated by distances equal to about half diameter of a puncture, some interspaces on posterior half marked by minute points; part of median line near center impunctate; vestiture hairlike, fine, short, inconspicuous.

Elytra 1.4 times as long as wide, 1.6 times as long as pronotum; outline and basal margins as in *cupressi*; striae narrowly impressed, punctures obscure, weakly impressed; interstriae three times as wide as striae, shining, punctures fine, confused, usually with anterior margins at least slightly elevated, commonly with transverse lines (much deeper and more numerous in specimens from northern part of distribution). Declivity steep, convex; striae not impressed, punctures moderately deep, distinct; interstriae 1 and 2 rather narrow, entirely unarmed, 3 elevated and armed by 8 to 12 very coarse, blunt, often laterally compressed (below) teeth (some small teeth often intermixed), 4 unarmed, 5 to 9 usually bearing three to five smaller teeth. Vestiture minute, delicate, usually abraded; sparse, hairlike on disc, declivity with minute, declicate, scales, each about twice as long as wide; specimens from northern part of range more commonly retain vestiture.

FEMALE.— Similar to male except frontal impression greatly reduced, carina higher, reaching epistoma; interstrial punctures minutely (southern) to moderately (northern) crenulate on 2 and 3, less commonly crenulate on 1 and 4; declivital teeth slightly smaller; interstriae 1 at least partly armed by a row of fine tubercles.

DISTRIBUTION.— Alaska to California.

ALASKA: Kell Bay, Kuiu Island. CANADA: **British Columbia**: Bear Hill, Blue River, Brower, Genoa Bay near Duncan, Pender Harbor, Sidney, Stanley N. P., Tofino, Vancouver, Victoria. USA: **California**: Alameda Co., Berkeley, Big Sur, Carmel, Del Monte, Duncan Mills, Eureka, Fieldbrook, Gasquet, Guerneyville, Lagunitas in Marin Co., Los Gatos, Marin Co., Mill Valley, Muir Woods, Oakland, Palo Alto, Piercy, San Mateo, Santa Clara, Santa Cruz Beach, Sonoma Co., Sylvania, Taylorville, Woodside. **Oregon**: Brookings, Coquelle, Douglas Co., Elk Lake in Santiam N. F., Marshfield, Oak Ridge. **Washington**: Blaine, Hoquiam, London, Naselle, Seattle.

HOSTS.— *Chamaecyparis lawsoniana, Ch. nootkatensis, Cupressus macrocarpa, Libocedrus decurrens, Sequoia sempervirens, Thuja plicata.*

NOTES.— The above descriptions were based on the holotypes of *sequoiae* and *squamosus* and on 467 other specimens.

Blackman (1942) divided this taxon into two species on the basis of more abundant and larger female declivital scales, and more abundant female punctures on the declivity. Specimens from redwood in northern California have the declivital scales just as abundant and as large as do specimens from northern localities from other hosts. I see no difference in the number of punctures from the two areas, although those on specimens from the northern areas are distinctly larger. It

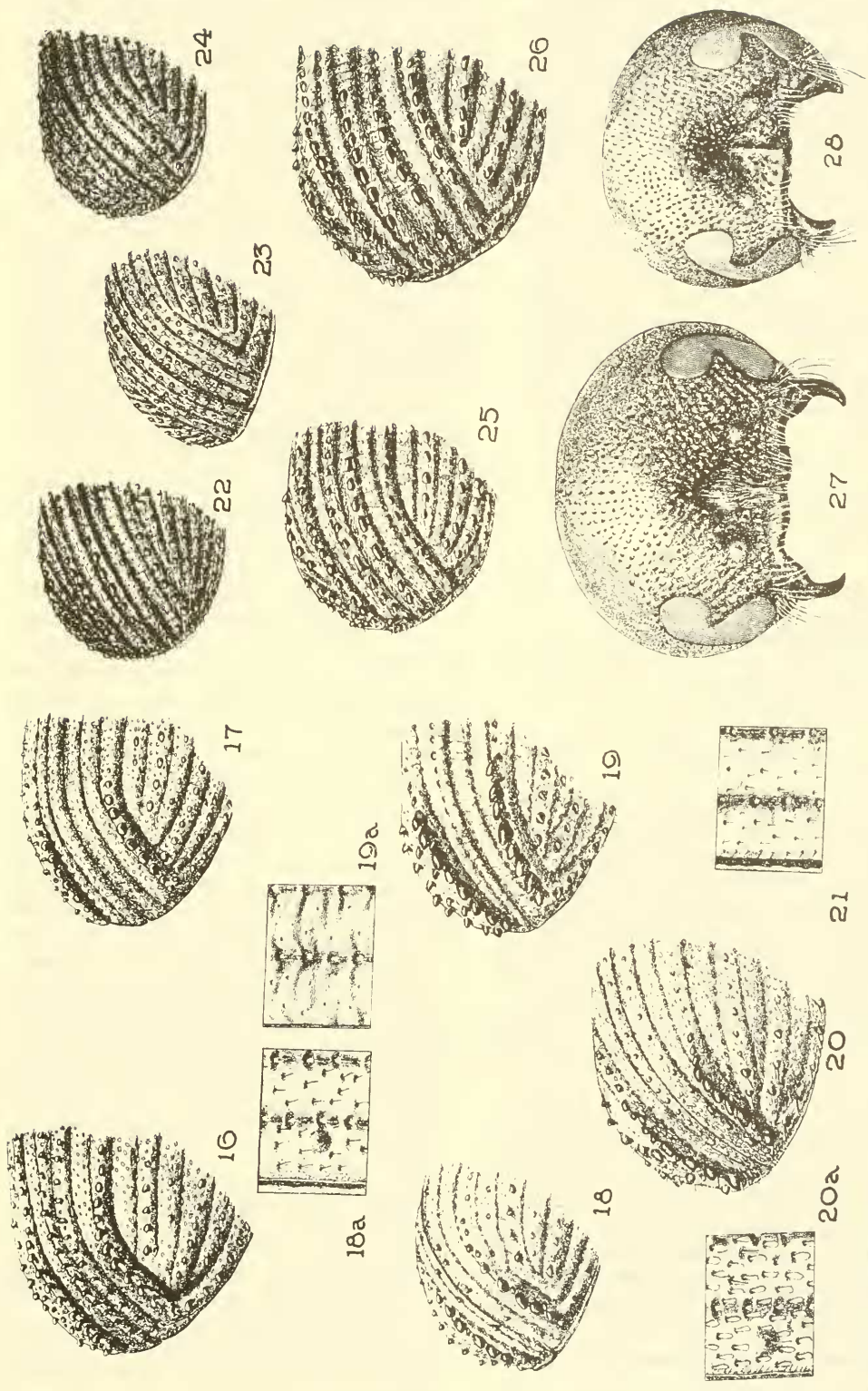



Fig. 95. *Phloeosinus* spp., elytral declivity or head; 16, *cristatus*, female; 17, *cristatus*, male; 18, 20, *sequoiae*, female, 18a, 20a, same, interstriae 1–2; 19, *sequoiae*, male, 19a, 21, same, interstriae 1–2; 22, *taxodii*, male; 23, *taxodii*, female; 24, *dentatus*, male; 25, *serratus*, male; 26, *scopulorum neomexicanus*, male; 27, *furnissi*, female, mandibles omitted; 28, *furnissi*, male, mandibles omitted. (After Blackman 1942; pls. 40–41.)

appears that slight clinal differences do exist in the coarseness of the declivital punctures and vestiture and in the sculpture of the discal interstriae in both sexes; however, based on the material at hand, these changes apparently are not related to the host nor is the transition sufficiently abrupt to permit recognition of geographical races.

### 12. *Phlocosinus cristatus* (LeConte)

Figs. 22C, 95, 96

*Hylesinus cristatus* LeConte, 1868, Trans. American Ent. Soc. 2:169, 170 (California; Carnegie Mus.)

*Phlocosinus chiricahua* Blackman, 1942, Proc. U.S. Nat. Mus. 92:444 (Holotype, male; Chiricahua Nat. Mon., Cochise Co., Arizona; U.S. Nat. Mus., 55400); Wood, 1971, Great Basin Nat. 31:147. *Synonymy*

DIAGNOSIS.— This species is very closely related to *sequoiae* Hopkins, from which it is distinguished by characters summarized in the above key.

MALE.— Length 2.8–4.0 mm, 2.0 times as long as wide; color very dark brown, elytra usually lighter.

Frontal cavity slightly deeper and narrower than *sequoiae*, carina reaching epistoma; lateral and dorsal areas more coarsely granulate.

Pronotum 0.88 times as long as wide; as in *sequoiae*.

Elytra 1.3 times as long as wide, 1.5 times as long as pronotum; outline, basal margins, and striae as in *sequoiae*; interstriae two to three times as wide as striae, punctures transversely, densely subcrenulate (northern) to rather closely rippled to strongly undulate (southern). Declivity as in *sequoiae* except upper margin of interstriae 1 usually armed by two or three small granules, 1 and 2 usually more closely, deeply punctured, scalelike vestiture longer, much more abundant, distributed over entire declivity.

FEMALE.— Similar to female *sequoiae* except frons with rather abundant, isolated granules; interstrial crenulations on disc higher; teeth on declivital interstriae 1 larger and more regularly placed; interstrial punctures on declivity larger and more abundant; scalelike vestiture on declivity larger, more abundant, and more widely distributed, reaching middle of disc in some specimens.

DISTRIBUTION.— California to Arizona and Durango.

USA: **Arizona**: Chiricahua Mts., Douglas, Gila Valley, Globe, Nogales, Oak Creek Canyon, Phoenix, Safford, Santa Catlaina Mts., Sedonia, Thatcher, Tuscon. **California**: Carlotta, Contra Costa, Fresno, Glendale, Kings Co., Lockwood, Los Angeles, Martinez, Newhall, North Hollywood, North Sacramento, Oakland, Oroville, Palo Alto, Paradise Springs, Placerville, Reedley, Rio Linda, Sacramento, San Diego, San Jose, Santa Ana Canyon, Santa Rosa, Sonoma, Vine Hill in Contra Costa Co. MEXICO: **Durango**: Los Altos. **Sonora**: Cucuta.

HOSTS.— *Cupressus arizonica*, *C. forbsei*, *C. macrocarpa*, *Juniperus* sp., *Thuja* sp.

BIOLOGY.— This species attacks the lower bole and evidently the larger limbs of the host tree, where galleries similar to those described for the genus are cut. Primary attacks that killed healthy cypress trees have been attributed to this species. The young adults normally construct maturation feeding tunnels in the pith of small, healthy twigs of living trees before seeking a new host.

NOTES.— The above descriptions are based on the holotype of *chiricahua*, on the series of *cristatus* studied by Hopkins and Blackman, and on 198 other specimens.

Blackman (1942) divided this taxon into two species based on differences in the sculpture of the discal interstriae, on the impression of the sutural striae on the declivity, and on the vestiture. The material at hand was the character of the discal interstriae, the reverse of that reported by Blackman; the second and third characters I am unable to detect. The differences in sculpture of the interstriae are so slight and variable I do not feel separate species or even geographical races can be recognized from the material presently available for study. Until more data are available that will support their separation, I prefer to recognize only one species.

It is noted with interest that material of *sequoiae* from the northern part of its distribution (Oregon to British Columbia) resembles *cristatus* from Arizona much more closely than do specimens of these species from the zone of overlap in their distributions.

### 13. *Phlocosinus scopulorum scopulorum* Swaine

*Phlocosinus scopulorum* Swaine, 1924, Canadian Ent. 56:148 (Holotype, male; Williams Lake, British Columbia; Canadian Nat. Coll.)

DIAGNOSIS.— Superficially this species resembles *serratus* (LeConte), with which it is

easily confused, but it is distinguished by the more deeply impressed male frons, by the more finely sculptured discal interstriae, by the complete absence of tubercles on declivital interstriae 2, and by the smaller declivital teeth.

MALE.— Length 2.4–4.0 mm, 2.0 times as long as wide; color very dark brown to black, elytra reddish brown.

Frons narrowly, shallowly concave on lower two-thirds; median carina represented only by an epistomal tubercle; shining, punctures coarse, rather close laterally, rather sparse in concavity and above, rarely with two or three minute tubercles above; vestiture hairlike, fine, short, inconspicuous.

Pronotum 0.87 times as long as wide; widest near base, sides arcuately convergent to moderate constriction just before broadly rounded anterior margin; surface smooth with rather sparse, minute points, punctures coarse, separated in central area by distances equal to diameter of a puncture; vestiture short, hairlike, inconspicuous.

Elytra 1.3 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind, posterior outline interrupted by declivital teeth; basal margins each armed by 9 or 10 crenulations; striae weakly impressed, punctures moderately large, obscurely impressed; interstriae twice as wide as striae, 2 and 3 with small, isolated, short crenulations, others feebly, more sparsely crenulate. Declivity steep, convex; interstriae 2 impressed, unarmed, finely punctured, 1 and 3 moderately elevated, 1 armed by six, 3 by seven or eight moderately large, recurved, stout teeth, those near middle on 1 strongly compressed laterally, 5, 7, and 9 each bearing two or three smaller teeth. Vestiture consisting of fine and stout hairlike setae intermixed, stout setae predominant on declivity.

FEMALE.— Similar to male except frons convex, marked on lower half by a fine, median carina, surface more closely punctured, bearing rather numerous, fine granules; crenulations on discal interstriae higher; teeth on declivital interstriae smaller, conical, pointed, almost twice as numerous; declivital vestiture scalelike, much more abundant.

DISTRIBUTION.— British Columbia and Alberta to Washington.

CANADA: **Alberta**: Lethbridge, 15-V-30, J. H. Pepper. **British Columbia**: Canyon House, 14-VII-22, *Juniperus scopulorum*, R. Hopping; Creston, 9-V-58, H. Howden; Boswell, 9-V-58, H. Howden; Lumby in Creighton Valley, 30-VIII-32, *Thuja plicata*, R. Hopping; Pavilion Lake, 8-VIII-72, *J. scopulorum*, D. E. Bright; Salmon Arm, 10-V-32, H. B. Leech; Williams Lake, 21-VIII-21, *J. scopulorum*, R. Hopping; Wyndel, 15-V-58, H. Howden. USA: **Washington**: Vantage Bridge, 20-II-35, *J. scopulorum*, J. A. Beal.

HOST.— *Juniperus scopulorum.*

BIOLOGY.— Except for the host association and gallery (Bright 1976:216) nothing has been published.

NOTES.— The above description was prepared from the holotype and 138 other specimens.

### 14. *Phloeosinus scopulorum neomexicanus* Blackman

Fig. 95

*Phlocosinus neomexicanus* Blackman, 1942, Proc. U.S. Nat. Mus. 92:460 (Holotype, male; Vermejo, New Mexico; U.S. Nat. Mus., 55412)

*Phloeosinus texanus* Blackman, 1942, Proc. U.S. Nat. 92:462 (Holotype, male; Montell, Uvalde Co., Texas; U.S. Nat. Mus., 55413); Wood, 1971, Great Basin Nat. 31:149. *Synonymy*

DIAGNOSIS.— This subspecies is probably recognizable only because of the lack of material from Idaho; it is distinguished from *s. scopulorum* Swaine by the more finely, more closely punctured frons and pronotum, by the very slightly, more coarsely sculptured discal interstriae, and by the longer male carina extending from epistoma to fundus of impression.

MALE.— Length 2.2–3.7 mm, 1.93 times as long as wide; color very dark brown to black, elytra reddish brown.

Except as noted in the diagnosis above, I am unable to distinguish these races.

FEMALE.— See *s. scopulorum* above.

DISTRIBUTION.— S Idaho to Texas.

USA: **Arizona**: Chiricahua Mts., Lakeside, Santa Catalina Mts., Santa Rita Mts. **Colorado**: El Paso Co., Ft. Garland, Mesa Verde N. P., Ute Pass. **Idaho**: Franklin. **Montana**: Columbia Falls. **Nevada**: Charleston. **New Mexico**: **Bandelier, Capitan, Vermejo. Texas**: Austin, Dallas, Gillespie, Grundyville, Montell, San Antonio, Sonora. **Utah**: Beaver, Kamas, Logan, Logan Dry Canyon, Oak Creek Canyon, Panguitch, Zion N. P.

HOSTS.— *Cupressus arizonica, Juniperus deppeana, J. monosperma,* and *J. osteosperma.*

BIOLOGY.— This is perhaps the most common *Phloeosinus* in Utah. It attacks cut or injured limbs and bole of the host trees. The gallery system is as described for the genus. The maturation twig-feeding habit has not been observed.

NOTES.— The above treatment was based on the holotype and on 188 other specimens.

The validity of this subspecies is questioned. When more material from Idaho and neighboring areas is available, the slight differences that characterize it are almost certain to intergrade with those of *s. scopulorum*.

### 15. *Phloeosinus punctatus* LeConte
Figs. 94, 96

*Phloeosinus punctatus* LeConte, 1876, Proc. American Philos. Soc. 15:382 (Lectotype, female; Oregon; Mus. Comp. Zool., 978, present designation)

*Phloeosinus rubicundulus* Swaine, 1924, Canadian Ent. 56:144 (Holotype, female; Hossack Meadow, Tulare Co., California; Canadian Nat. Coll., 729); Wood 1971, Great Basin Nat. 31:149. *Synonymy*

*Phloeosinus buckhorni* Blackman, 1942, Proc. U.S. Nat. Mus. 92:432 (Holotype, male; Portland, Oregon; U.S. Nat. Mus., 55403); Wood, 1966, Great Basin Nat. 26:27. *Synonymy*

*Phloeosinus kaniksu* Blackman, 1942, Proc. U.S. Nat. Mus. 92:434 (Holotype, male; Metaline Falls, Washington; U.S. Nat. Mus., 55404); Wood, 1966, Great Basin Nat. 26:27. *Synonymy*

*Phloeosinus rusti* Blackman, 1942, Proc. U.S. Nat. Mus. 92:435 (Holotype, male; Metaline Falls, Washington; U.S. Nat. Mus., 55405); Wood, 1966, Great Basin Nat. 26:27. *Synonymy*

*Phloeosinus chamberlini* Blackman, 1942, Proc. U.S. Nat. Mus. 92:470 (Holotype, male; Alturas, California; U.S. Nat. Mus., 55415); Wood, 1971, Great Basin Nat. 31:149. *Synonymy*

DIAGNOSIS.— This species is distinguished from *s. scopulorum* Swaine by the much wider striae, by the more finely sculptured discal interstriae, by the bright, shining elytral surfaces, and by the much finer, usually abraded elytral vestiture.

MALE.— Length 1.9–3.4 mm, 1.9 times as long as wide; color very dark brown to black, elytra reddish brown.

Frons rather deeply concave on median half from upper level of eyes to epistoma; epistoma armed by a median tubercle, no other remnant of carina visible; surface shining, rather coarsely, closely punctured, with rather abundant, isolated granules to epistoma; vestiture hairlike, fine, inconspicuous.

Pronotum 0.88 times as long as wide; as in *s. scopulorum*.

Elytra 1.3 times as long as wide, 1.6 times as long as pronotum; outline and basal margins as in *s. scopulorum*; striae impressed, punctures large, confluent, obscurely impressed; interstriae about as wide as striae, shining, punctures moderately large, almost uniseriate, most with anterior margin slightly elevated but not at all granulate. Declivity steep, convex; striae much narrower than on disc; interstriae 2 as wide as 1 or 3, unarmed, shining, a few minute, obsolescent punctures usually present, 1 and 3 moderately elevated and armed by about six coarse teeth on 1, by about seven on 3, each tooth recurved, conical, rarely slightly compressed laterally on 1; interstriae 5, 7, and 9 each with one to three smaller teeth; entire surface brightly shining, interstrial punctures reduced in size and number over entire surface. Vestiture usually abraded; when present it consists of sparse, short, fine, hairlike setae on disc, often becoming rather stout on declivity.

FEMALE.— Similar to male except frons convex, a median fovea at center, median carina extending from fovea to epistomal margin, granules somewhat larger; anterior margins of interstrial punctures subcrenulate; declivital teeth slightly smaller and more numerous (about eight on 1, 10 on 3); vestiture on declivity, when present, includes scales at least on interstriae 1 and 3.

DISTRIBUTION.— S Alaska and N Idaho to California and E Nevada.

ALASKA: Hollis, Petersburg. CANADA: **British Columbia**: Blue River, Bowser, Chase, Likely, Lumby in Creighton Valley, Pender Harbor, Princeton, Stanley N. P., Steelhead, Trinity Valley, Vancouver, Vernon. USA: **California**: Alturas, Camp Seely in San Bernardino Co., Carrville, Cascada, Chester, Daulton Meadow, Facht in Lassen Co., Fallen Leaf Lake, Faunskin, Forest Hill in Placer Co., Hat Creek, Hazel Green in Mariposa Co., Hossock Meadow in Tulare Co., Huckleberry Meadow in Fresno Co., Lassen N. P., Mariposa Co., McCloud, Meadow Valley in Plumas Co., Miami R. S. in Madera Co., Mill Creek in Tuolumne Co., Mt. Palomar, Norval Flats in Lassen Co., Pine Crest, Placer Co., Placerville, Pyramid R. S., Sequoia N. P., Shasta Springs, Sierra N. F. in Fresno Co., Siskiyou Co., Sugar Pine, Weed, Yosemite Valley. **Idaho**: Kamiah, Moscow. **Nevada**: Reno. **Oregon**: Brandon, Coos Bay, Corvallis, Florence, Klamath Lake, Lolo Pass in Clackamas Co., Marshfield, Prineville, Redmond, Santiam N. F., Taft, Tolo. **Washington**: Easton, Metaline Falls, Mt. Rainier, Northbend in King Co., Northport, Wind River.

HOSTS.— *Chamaecyparis nootkatensis, Juniperus occidentalis, Libocedrus decurrens, Sequoia gigantea, S. sempervirons, Thuja occidentalis, T. plicata, Tsuga heterophylla.*

BIOLOGY.— This is the most common *Phloeosinus* on the Pacific Coast. It attacks from the bole to the small limbs of its host, usually in cut or injured material, although primary attacks have been attributed to it. The tunnels are essentially as described for the genus.

NOTES.— The above description was based on three syntypes of *punctatus*, on the holotypes of *rubicundulus*, *buckhorni*, *kaniksu*, *rusti*, and *chamberlini*, and on more than 800 other specimens. Blackman's (1942) *rugosus* is this species.

This species is somewhat variable, particularly with respect to the details in sculpture of the male frons and the declivital vestiture. The latter character apparently is related more to beetle activity and moisture factors than to distribution or genetics. As a result, six synonyms have been described by Swaine and Blackman. The types and several paratypes of each of the synonyms were studied and compared to long series from adjacent localities. Because nothing more than minor variations that should be expected in a long series are represented, only one species is recognized here. LeConte's original series of *punctatus* was composite (Blackman 1942). The first of three female syntypes from Oregon is here designated as the lectotype of *punctatus*.

### 16. *Phloeosinus vandykei* Swaine

*Phloeosinus vandykei* Swaine, 1915, Canadian Ent. 47:366 (Lectotype, female; Millwood, Fresno Co., California; Canadian Nat. Coll., designated by Bright, 1967, Canadian Ent. 99:677)

*Phloeosinus russus* Swaine, 1924, Canadian Ent. 56:148 (Holotype, female; San Bernardino Mountains, California; Canadian Nat. Coll.); Blackman, 1942, Proc. U.S. Nat. Mus. 92:425. *Synonymy*

DIAGNOSIS.— Although allied to *punctatus* LeConte and *fulgens* Swaine, this species is not closely related. It is easily distinguished by the bright, shining surfaces, by the fine sculpturing, and by other characters summarized in the above key.

MALE.— Length 1.8–2.2 mm, 2.0 times as long as wide; color dark brown to black, elytra reddish brown.

Frons rather broadly concave from upper level of eyes to epistoma, a moderately large, median tubercle on epistoma but no other evidence of a carina; surface shining, punctures rather coarse, moderately close, most of them very finely granulate; vestiture hairlike, fine, inconspicuous.

Pronotum 0.83 times as long as wide; otherwise as in *punctatus*.

Elytra 1.4 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; basal margins each armed by 10–11 crenulations; striae narrowly impressed, punctures moderately large, obscurely impressed; interstriae about twice as wide as striae, punctures moderately large, uniseriate except somewhat confused on basal two-thirds of 2 and 3, anterior margins of most punctures toward base elevated. Declivity steep, convex; striae not impressed, punctures appearing coarse (partly due to coloration); interstriae smooth, with minute points, 1 and 3 very feebly elevated, 1, 3, 5, 7, and 9 each with about two to six minute tubercles. Vestiture very sparse, when present consisting of a few minute, hairlike bristles.

FEMALE.— Similar to male except frons convex, a carina feebly indicated above tubercle; discal interstriae 1 to 3 finely subcrenulate; declivital tubercles tending to be slightly more numerous.

DISTRIBUTION.— S Oregon to California.

USA: California: Blodgett Forest near Georgetown in El Dorado Co., Camp Seely, Carrville, Castle Craig, Chiquito Basin, Dardanelles in Tuolumne Co., El Dorado Co., Fallen Leaf Lake, Fish Camp in Mariposa Co., Forest Hill, Fresno, General Grant N. P., Grass Valley, Hazel Green, Huckleberry Meadow in Fresno Co., Lake Arrowhead, Lost Lake, Mariposa Co., Miami R. S. in Mariposa Co., Millwood, Mt. Shasta, North Fork, Patterson Mtn. in Fresno Co., Placer Co., Placerville, Sand Flat, Sierra N. F. in Fresno Co., Strawberry in Tuolumne Co., Yosemite N. P. Oregon: Klamath Falls, Pinehurst.

HOST.— *Libocedrus decurrens.*

BIOLOGY.— This species breeds in branches of the host; the gallery system evidently is similar to that described for the genus.

NOTES.— The above description was based on the lectotype of *vandykei*, on the holotype of *russus*, and on 362 other specimens.

### 17. *Phloeosinus fulgens* Swaine
Figs. 94, 96

*Phloeosinus fulgens* Swaine, 1924, Canadian Ent. 56:146 (Holotype, male; Northfork, California; Canadian Nat. Coll.)

*Phloeosinus splendens* Blackman, 1942, Proc. U.S. Nat. Mus. 92:428 (Holotype, male; Pinehurst, Oregon, U.S. Nat. Mus., 55402); Wood, 1971, Great Basin Nat. 31:148. *Synonymy*

DIAGNOSIS.— This species is allied to *vandykei* Swaine, but it is easily distinguished by the larger size, by the coarsely, very closely punctured pronotum, and by the more strongly elevated, alternate declivital interstriae.

MALE.— Length 2.0–2.7 mm, 2.1 times as long as wide; color very dark brown, elytra usually a lighter brown.

Frons rather narrowly concave below upper level of eyes; surface shining, coarsely, closely punctured, a few small granules on dorsolateral margin of concavity; carina represented by a median, submarginal subtuberculate callosity; vestiture consisting of fine, rather abundant, moderately long, inconspicuous hair.

Pronotum 0.88 times as long as wide; as in *scopulorum* except punctures much coarser and closer, interspaces usually less than a fourth as wide as diameter of a puncture; glabrous, except at margins.

Elytra 1.3 times as long as wide, 1.6 times as long as pronotum; outline as in *vandykei*; basal margins each armed by 12–13 crenulations; striae narrowly impressed, punctures obscurely impressed; interstriae two to three times as wide as striae, coarsely, very closely, somewhat irregularly punctured, interspaces between punctures often narrowly rounded but not at all crenulate. Declivity steep, convex; interstriae 1 and 3 slightly elevated, 1 armed by four to six small teeth, 3 by six to nine, 5, 7, 8, and 9 by two or three subtuberculate granules, 2 as wide as 1 or 3, smooth, shining, with a few fine, obscure punctures. Vestiture consisting of minute, confused, interstrial hair on declivity; abraded in most specimens.

FEMALE.— Similar to male except frons convex to feebly impressed, carina fine, long, extending from epistomal margin two-thirds distance to upper level of eyes; many pronotal punctures tend to be subconfluent; tubercles on elytral declivity tend to be smaller, interstriae 1 and 3 less strongly elevated.

DISTRIBUTION.— S Oregon to California.

USA: **California**: El Dorado Co., Giant Forest, Grass Valley, Hackamore, Madera Co., Mill Creek in Tuolumne Co., Northfork, Oakhurst in Madera Co., Paradise Creek in Sequoia N. P., Placerville, Sequoia N. P., Wawona, Willow Ranch in Modoc Co., Yosemite. **Oregon**: Ashland, Wonder.

HOST.— *Libocedrus decurens.*

BIOLOGY.— Chamberlin (1958:91) indicated dying branches in the tops of the living host were selected for attack. The longitudinal egg galleries were up to 4 cm in length and almost entirely in the bark. Larval mines began perpendicular to the parental gallery, but soon turned parallel to the grain of the wood. They engraved the wood rather deeply.

NOTES.— The above descriptions were based on the holotypes of *fulgens* and *splendens* and on 141 other specimens.

### 18. *Phloeosinus furnissi* Blackman
Fig. 95

*Phloeosinus furnissi* Blackman, 1942, Proc. U.S. Nat. Mus. 92:469 (Holotype, male; Flagstaff, Arizona; U.S. Nat. Mus., 55414)

DIAGNOSIS.— The above key indicated the superficial affinities of this species; it is much more likely to be confused with *scopulorum neomexicanus* Blackman. From *s. neomexicanus* it may be distinguished by the finer elytral vestiture in both sexes, by the conical noncompressed teeth on the male elytral declivity, and by the smoother discal interstriae which have finer granules.

MALE.— Length 2.3–3.3 mm, 2.0 times as long as wide; color very dark brown, elytra partly or entirely brown to reddish brown.

Frons transversely impressed on middle half, becoming shallowly concave toward center, surface smooth, shining, rather sparsely, deeply punctured, granulate on dorsolateral margin of concavity; epistomal area ascending toward margin, armed on median line by a fine, somewhat indefinite tubercle; vestiture fine, hairlike, inconspicuous.

Pronotum 0.82 times as long as wide; as in *s. neomexicanus* except punctures tending to be slightly larger and more widely spaced, interspacial impressed points more conspicuous; vestiture fine, hairlike, of moderate length and abundance.




Fig. 96. Gallery systems: 10, *Alniphagus aspericollis*; 11, *Phloeosinus fulgens*; 12, *Phloeosinus punctatus*; 13, *Phloeosinus variolatus*; 14, *Phloeosinus cupressi*; 15, *Phloeosinus cristatus*; 16, *Chaetophloeus heterodoxus*; 17, *Cactopinus desertus*; 18, *Cactopinus rhois*. (After Bright and Stark 1973:135.)

Elytra 1.3 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind, declivital profile interrupted by projecting teeth; basal margins each armed by 10 crenulations; striae narrowly impressed, punctures rather obscurely indicated; interstriae three times as wide as striae, smooth and shining, tuberculate, short crenulations small, rounded, isolated, their width averaging less than one-fourth width of interstriae. Declivity convex, steep; interstriae 1 and 3 moderately elevated, 1 armed by 5 to 9 subconical teeth, 3 by 9 to 11 similar but more nearly conical teeth, 5, 7 and 9 each with 3 to 5 smaller teeth. Vestiture moderately abundant on disc and declivity, mostly hairlike, a few setae on disc laterally compressed, many of those on declivity stout, very narrowly scalelike.

FEMALE.— Similar to male except frons convex, a carina usually not indicated; crenulations on discal interstriae higher and slightly wider; declivital vestiture more abundant, particularly scales, each scale very slender, at least six to eight times as long as wide, scales much more slender, at least six to eight times as long as wide, scales much more slender and much more abundant than in *s. neomexicanus*.

DISTRIBUTION.— SW Wyoming to Arizona and New Mexico.

USA: **Arizona**: Bear Canyon in Santa Catalina Mts., Flagstaff, Jerome. **Colorado**: Mesa Verde N. P. **New Mexico**: Nogal. **Utah**: Beaver, Boulder, Manila, St. George. **Wyoming**: Ft. Bridger.

HOSTS.— *Juniperus deppeana, J. monosperma, J. osteosperma.*

HABITS.— This species attacks the larger limbs and branches of the host tree, where gallery systems similar to those described for the genus are constructed.

NOTES.— The above descriptions were based on the holotype and on 108 other specimens.

### 19. *Phloeosinus canadensis* Swaine

*Phloeosinus canadensis* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):8 (Lectotype, female; St. Anne de Bellevue, Quebec, Canada; Canadian Nat. Coll., designated by Bright, 1967, Canadian Ent. 99:676)

DIAGNOSIS.— This species is rather closely allied to *furnissi* Blackman, from which it is distinguished by characters summarized in the above key.

MALE.— Length 2.0–2.9 mm, 1.9 times as long as wide; color rather dark brown, elytra a lighter brown.

Frons very shallowly concave between upper level of eyes and epistomal margin; surface smooth, shining, rather sparsely, coarsely, deeply punctured, devoid of granules; median carina finely, acutely elevated on lower half; vestiture fine, rather abundant.

Pronotum 0.86 times as long as wide; essentially as in *furnissi* except sides less strongly arcuate, with punctures slightly smaller, closer, and interspacial points largely obsolete or contributing toward obscure reticulation; vestiture fine, rather abundant.

Elytra 1.3 times as long as wide, 1.7 times as long as pronotum; outline as in *furnissi*; basal margins each armed by 11 crenulations; striae and interstriae as in *furnissi* except punctures on posterior slopes of crenulations more conspicuous, crenulations evidently very slightly higher. Declivity as in *furnissi* except teeth on interstriae 1 not at all laterally compressed. Vestiture rather abundant; some setae on disc laterally compressed, some on declivity rather stout.

FEMALE.— Similar to male except frons convex with most punctures in lateral areas finely granulate; crenulations on discal interstriae higher, wider and evidently more numerous; declivital teeth finer; declivital vestiture mostly stout but not actually scalelike.

DISTRIBUTION.— Ontario and New Brunswick to Minnesota and New York.

CANADA: **New Brunswick**: Fredicton, McGraw Brook, Pisquit Brook, Plaster Rock. **Ontario**: Bancroft, Carp, Constance Bay, Frater, Lake of the Woods, MacDiarmid, Toronto. **Quebec**: Chelsea, Ft. Coulonge, Hull, Laniel, St. Anne de Bellevue. USA: **Maine**: Beaver Pond, Brunswick, Meddybemps, Monson, Orono. **Michigan**: Grand Island, Mackinac Island, Marquette. **Minnesota**: Itasca Park. **New Hampshire**: Milford. **New York**: Arton, Clear Lake, Flood Wood, Rensselaer, Schroon, Syracuse. **Ohio**: Columbus.

HOST.— *Thuja occidentalis.*

BIOLOGY.— The tunnels were constructed in bole, limbs, and branches of the host and evidently were similar to those described for the genus.

NOTES.— Swaine designated a female type by a label in his original series of four specimens, but neglected to mention the designation in the original publication of the name.

As indicated above, Bright designated this specimen as lectotype for the species. The above descriptions were based on four lectohomotypes from Frater. In all, 884 specimens were examined.

### 20. *Phloeosinus hoppingi* Swaine

*Phloeosinus hoppingi* Swaine, 1915, Canadian Ent. 47:364 (Lectotype, female; Camp 6, California; Canadian Nat. Coll., designated by Bright, 1967, Canadian Ent. 99:676)

*Phloeosinus woodi* Bright, 1966, Pan-Pacific Ent. 42:296 (Holotype, male; Cypress Camp, near Hat Creek, Shasta Co., California; Wood Coll.); Wood, 1971, Great Basin Nat. 31:149. *Synonymy*

DIAGNOSIS.— This species, at least superficially, resembles *hoferi* Blackman much more closely than it does any species placed near it in the above key. However, the relationship to *hoferi* is not close. It differs from *hoferi* by the long, well-developed frontal carina, by the much more coarsely tuberculate discal interstriae, and by the different declivital vestiture.

MALE.— Length 1.7–2.2 mm, 1.97 times as long as wide; color very dark brown to black, elytra, at least partly, lighter brown.

Frons concave from upper level of eyes to epistoma, deeper on upper half of impression; surface smooth, shining, rather finely, closely punctured; an acutely elevated median carina on lower two-thirds; vestiture fine, hairlike, rather abundant.

Pronotum 0.80 times as long as wide; sides very weakly arcuate and converging slightly on basal half then abruptly rounded to constriction just behind broadly rounded anterior margin; surface shining, coarsely, deeply punctured, fine impressed points moderately abundant; vestiture fine, hairlike, moderately abundant.

Elytra 1.3 times as long as wide, 1.7 times as long as pronotum; outline about as in *furnissi*; basal margins each armed by 10 crenulations; striae impressed, punctures obscurely indicated; interstriae one and one-half to two times as wide as striae, convex, punctures coarse, confused, their anterior margins slightly elevated, some forming low, rounded nodules in uniseriate rows. Declivity steep, convex; interstriae 1 and 3 rather strongly elevated and armed by coarse, stout teeth, those on 1 slightly larger, 1 bearing 10 to 12, 3 bearing 11 to 13, 5, 7, and 9 each bearing 4 or 5 smaller teeth, 2 narrowed apically, narrower than 1 or 3, punctured. Vestiture consisting of rather abundant, fine, and laterally compressed hairlike setae intermixed on disc, becoming predominately scalelike on declivity; each scale on interstriae 2 about three times as long as wide, more slender elsewhere.

FEMALE.— Similar to male except frons convex and more nearly granulate; interstrial granules on disc slightly larger; declivital teeth slightly smaller (much coarser than in most females of this genus); stouter declivital scales more widely distributed.

DISTRIBUTION.— British Columbia to California.

CANADA: **British Columbia**: Canyon House. USA: **California**: Alta Sierra in Kern Co., Bass Lake, Barkhouse in Siskiyou Co., Burney, Fallen Leaf Lake, Fawnskin, Fresno Co., General Grant N. P., Giant Forest, Hat Creek, Lake Eiler in Lassen N. F., Last Chance Creek near Milford, McCloud, Miami R. S., Millwood, Modoc Co., Monterey, Mt. St. Helena, Northfork, Pinecrest, Sequoia N. P., Tahoe City, Viola, Wawona, Yosemite.

HOSTS.— *Cupressus macnabiana, C. macrocarpa, C. sargentii, Juniperus occidentalis, J. scopulorum, Libocedrus decurrens.*

BIOLOGY.— Twigs or branches less than 4 cm in diameter are usually selected for attack. The gallery pattern evidently is similar to that described for the genus.

NOTES.— The above descriptions were based on the lectotype of *hoppingi*, on the type series of *woodi*, and on 275 other specimens.

### 21. *Phloeosinus setosus* Bruck

*Phloeosinus setosus* Bruck, 1933, Canadian Ent. 65:54 (Holotype, male; Mount Saint Helena, Napa Co., California; Ohio State Univ. Coll.)

DIAGNOSIS.— This species is very closely related to *arizonicus* Blackman, but it is distinguished by characters summarized in the above key.

MALE.— Length 1.7–2.4 mm, 1.8 times as long as wide; color very dark brown, elytra lighter brown.

Frons shallowly, subconcavely impressed just below upper level of eyes; an acutely elevated carina extending from deepest point in impression to epistomal margin; surface shining, punctured above upper level of eyes, with moderately abundant, isolated, rather coarse granules below to epistoma; vestiture

consisting of fine, inconspicuous, hairlike setae of moderate length.

Pronotum 0.80 times as long as wide; widest at base, sides arcuately converging to prominent constriction just before broadly rounded anterior margin; surface shining, punctures moderately large, separated in some areas by distances as great as diameter of a puncture, interspaces marked by rather abundant points (one male has some of punctures very finely asperate, probably an abnormality); vestiture of fine, short, moderately abundant hair.

Elytra 1.2 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind, declivital teeth interrupting profile; basal margins each armed by 10 crenulations; striae narrowly impressed, punctures obscurely indicated at margins; interstriae slightly wider than striae, shining, uniseriately armed by a row of narrow, rather high crenulations, a setiferous puncture on posterior slope of each. Declivity convex, steep; striae less strongly impressed and evidently narrower than on disc; interstriae 1 and 3 slightly elevated and armed by a row of small teeth, those on 3 slightly larger, 5 to 9 each armed by one to four small teeth, 2 smooth, marked by fine points, as wide as 1 or 3. Vestiture consisting of fine strial hair and, on disc, uniseriate rows of laterally compressed, semitransparent scales, scales on declivity more abundant, particularly on 1 and 3, 2 glabrous on declivity; each scale on disc one-half to two-thirds as long as distance between rows, about six times as long as wide; each scale on declivity shorter, stouter, rather abundant on 1.

FEMALE.— Similar to male except frons convex, devoid of granules, punctured to epistoma; discal crenulations larger, closer, staggered; declivital striae wider, interstriae 2 slightly narrower than 1 or 3; vestiture slightly longer.

DISTRIBUTION.— Napa and Colusa Counties, California.

USA: California: Cook's Springs in Colusa Co., 26-X-71, *Cupressus sargentii*, H. B. Leech; Mt. St. Helena, 29-III-30, 21, 26-III-31, 15-XI-31, *C. sargentii*, C. R. Bruck, etc.

HOST.— *Cupressus sargentii.*

BIOLOGY.— Reared from branches of the above host.

NOTES.— The above descriptions were based on the holotype, allotype, and 33 paratypes, and on 302 other specimens.

### 22. *Phloeosinus arizonicus* Blackman

Fig. 94

*Phloeosinus arizonicus* Blackman, 1942, Proc. U.S. Nat. Mus. 92:424 (Holotype, male; Santa Catalina Mountains, Arizona; U.S. Nat. Mus., 55401)

DIAGNOSIS.— This species is very closely related to *setosus* Bruck, from which it may be distinguished by characters summarized in the above key.

MALE.— Length 1.8–2.3 mm, 1.88 times as long as wide; color very dark brown, elytra a lighter brown.

Frons and pronotum as in *setosus.*

Elytra as in *setosus* except discal striae less strongly, more narrowly impressed; declivital striae narrowly impressed, individual punctures very obscure.

FEMALE.— Differs from male in same ways as in *setosus*, except declivital striae and interstriae as in male.

DISTRIBUTION.— Arizona.

USA: **Arizona**: Chiricahua Mts., Hopk. U.S. 5555, *Cupressus arizonica*, J. L. Webb; Pine, 11-X-40, Hopk. U.S. 33155A, *C. arizonica*, R. L. Furniss; Rucker Canyon in Chiricahua Mts., 21-VII-68, *C. arizonica*, D. E. Bright; Santa Catalina Mts., 18-IV-08, Hopk. U.S. 7193, and 5-VIII-68, *C. arizonica*, D. E. Bright; Sedonia, 2-VIII-62, *C. arizonica*, S. L. Wood.

HOST.— *Cupressus arizonica.*

BIOLOGY.— Specimens were taken from a 25 cm bole of the host. The tunnels were essentially as described for the genus.

NOTES.— The above treatment was based on the holotype and on 112 other specimens.

This species differs from *setosus* only in the depth and width of the striae and strial punctures, both of which vary, but do not overlap in the series at hand. It will be most surprising if additional material from California localities does not close the apparent gap in characters between these populations even to the extent of eliminating geographical races.

### 23. *Phloeosinus antennatus* Swaine

*Phloeosinus antennatus* Swaine, 1924, Canadian Ent. 56:146 (Holotype, male; Strawberry, California; Canadian Nat. Coll.)

*Phloeosinus pseudotsugae* Chamberlin, 1955, Pan-Pacific Ent. 31:117 (Holotype, male?; Tiller, Oregon; California Acad. Sci.); Wood, 1957, Canadian Ent. 89:400. *Synonymy*

DIAGNOSIS.— This species is allied to *tacubayae* Hopkins and, perhaps, to *hoppingi* Swaine, but it may be distinguished by characters summarized in the above key.

MALE.— Length 1.6–2.0 mm, 1.9 times as long as wide; color very dark brown, elytra lighter brown.

Frons transversely impressed one-third of distance below upper level of eyes then gradually ascending to epistoma, impressed area with a long, median carina of uniformly low height; surface shining, punctate with moderately abundant, rounded, isolated granules above impression; vestiture of moderately abundant, fine, rather short hair.

Pronotum 0.80 times as long as wide, widest at base, sides on basal half feebly arcuate, very slightly converging, then abruptly rounded to constriction just behind broadly rounded anterior margin; punctures rather coarse, close, separated by distances averaging about half diameter of a puncture, interspaces smooth, shining, with a few minute points; vestiture of moderately abundant, fine, short hair.

Elytra 1.3 times as long as wide, 1.8 times as long as pronotum; outline as in *setosus*; basal margins each armed by 10 crenulations; striae impressed, punctures obscurely indicated; interstriae as wide as striae, each bearing an irregular row of rounded granules supplemented by fine punctures, some punctures subgranulate on their anterior margins. Declivity steep, convex, striae shallowly impressed; interstriae 1 and 3 moderately elevated and armed by 9 small teeth on 1, 11 small teeth on 3, with 5, 7, 8, and 9 each bearing about 3 similar teeth, 2 narrower than 1 or 3 and finely punctured. Vestiture of both fine and stout, hairlike setae of equal length on disc; becoming rather densely scalelike on declivity, including interstriae 2, each scale short, not more than twice as long as wide; setae on declivity arising from lower margins of teeth longer and more nearly hairlike.

FEMALE.— Similar to male except frons convex, granules reduced; declivital teeth little, if any, smaller, scales more abundant and slightly longer.

DISTRIBUTION.— Oregon to California.

USA: California: Blodgett Forest near Georgetown in El Dorado Co., Burney, Grass Lake, in Siskiyou Co., Hackamore, Hat Creek, Los Angeles, Mt. Shasta, Pot Springs in Shasta Co., Siskiyou Co., Strawberry, Viola in Shasta Co., Yosemite N. P. Oregon: Corvallis, Klamath Falls, Phoenix, Pinehurst, Wapinita.

HOSTS.— *Libocedrus decurrens*, less commonly from *Cupressus* sp., *Pinus contorta*, and *Pseudotsuga taxifolia*.

BIOLOGY.— This is a common species in small branches of the principal host, where it constructs tunnels similar to those described for the genus. Series were also reared from an ornamental *Cupressus* and from Douglas fir. One pair was taken from ground level at the base of a lodgepole pine 25 cm in diameter, where an egg gallery had been constructed, but eggs were not present; this obviously was an accidental occurrence of the species. It would appear that Chamberlin's collection of this species in Douglas fir was also a local phenomenon.

NOTES.— The above description was based on the holotype and four paratypes of *antennatus*, on four paratypes of *pseudotsugae*, and on 256 other specimens.

### 24. *Phloeosinus tacubayae* Hopkins

*Phloeosinus tacubayae* Hopkins, 1905 (preprint), Proc. Ent. Soc. Washington 7:78 (Holotype, female; Tacubaya, Distrito Federal, Mexico; U.S. Nat. Mus., 7516).

DIAGNOSIS.— This species is allied to *antennatus*, but it is easily distinguished by the distribution and by characters summarized in the above key.

MALE.— Length 1.7–2.3 mm, 1.95 times as long as wide; color very dark brown to black.

Frons shallowly, rather narrowly impressed on lower two-thirds, a sharply elevated, median carina extending from epistomal margin three-fourths distance to upper level of eyes; surface shining, punctures rather small, close, deep, those on upper and dorsolateral margins of impression finely granulate; vestiture fine, moderately abundant, short.

Pronotum 0.81 times as long as wide; widest about a third of length from base, sides arcuately rounded and converging to well-developed constriction just before broadly rounded anterior margin; surface shining, punctures small, deep, close, interspaces averaging less than half as great as diameter of a puncture; vestiture hairlike, stout, short, rather abundant.

Elytra 1.25 times as long as wide, 1.7 times as long as pronotum; outline as in *setosus*; basal margins each armed by 11 crenulations; striae narrowly impressed, punctures very obscurely indicated; interstriae twice as wide as striae, armed by confused, transversely oval, rounded granules, each granule with a setiferous puncture on posterior margin. Declivity steep, convex; striae less strongly impressed; interstriae 1 and 3 moderately elevated, 1 bearing about seven, 3 bearing nine fine teeth, 5, 7, and 9 each with about three similar teeth, 2 unarmed, narrower than 1 or 3, punctured to apex. Vestiture on disc consisting of rather sparse hairlike and slightly less abundant scalelike setae of equal length; declivital setae more abundant, entirely scalelike, each scale about twice as long as wide (more slender on 1) except median row on each interstriae about six times as long as wide, 2 clothed by scales to apex.

FEMALE.— Similar to male except frons planoconvex; interstrial tubercles on disc higher; declivital scales longer, each about three to four times as long as wide.

DISTRIBUTION.— Hidalgo to Guatemala.

MEXICO: **Distrito Federal**: Mexico City, 16-IX-49, *Cupressus benthamii*, J. P. Perry; Tacubaya, Hopk, U.S. 1144, Baumann. **Hidalgo**: 35 km E Tulacingo, 10-VII-67, 2300 m, No. 17, *C. benthamii*, S. L. Wood. **Mexico**: Chapultepec, VII-24, *C. benthamii*. GUATEMALA: Volcán de Agua, 19-V-64, 1000 m, No. 597, *C. lusitanica*, S. L. Wood.

HOSTS.— *Cupressus benthamii*, *C. lusitanica*.

BIOLOGY.— This species was taken from the bole of a host 35 cm in diameter, and again in cut limbs about 5–10 cm in diameter. The tunnels appeared similar to the description given above for the genus.

NOTES.— The above descriptions were prepared from my Tulacingo series. In all, 87 species were examined.

### 25. *Phloeosinus swainei* Bruck

*Phloeosinus minutus* Swaine, 1917 (nec. Blandford, 1894), Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):9 (Lectotype, female; Fairfax, Cypress Ridge, Marin Co., California; Canadian Nat. Coll., 9252 designated by Bright, 1967, Canadian Ent. 99:677)

*Phloeosinus swainei* Bruck, 1933, Canadian Ent. 65:56 (Replacement name)

DIAGNOSIS.— This species is distinguished from *frontalis* Bruck by the smaller punctures on declivital striae 1 and 2 and by the hairlike declivital vestiture in both sexes; scalelike setae are entirely absent.

MALE.— Length 1.5–2.1 mm, 1.8 times as long as wide; color very dark brown to black, elytra slightly lighter.

Frons deeply, broadly concave from epistoma to just above upper level of eyes; carina reduced to an epistomal tubercle; frons shining, sparsely punctured, with small, rounded, isolated granules on upper half of lateral margins of concavity; vestiture fine, hairlike, inconspicuous.

Pronotum 0.80 times as long as wide; widest at base, sides arcuately converging to rather well-developed constriction just behind broadly rounded anterior margin; surface shining, obscurely reticulate, punctures rather coarse, deep, close, separated by distances averaging about one-half diameter of a puncture; vestiture of fine, short, moderately abundant hair.

Elytra 1.2 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; basal margins each armed by 10 crenulations; striae impressed, small punctures individually impressed; interstriae about twice as wide as striae, each bearing a uniseriate row of narrow, moderately high tubercles and more numerous, fine, confused punctures. Declivity convex, steep; striae feebly impressed, punctures rather coarse, deep; interstriae 1 and 3 weakly elevated, 1 armed by four to five teeth, 3 by five to six teeth, all teeth on upper two-thirds, lower ones longer than distance equal to basal width, sharply pointed; interstriae 5, 7, and 8 each with about two small, toothlike granules, 2 unarmed, narrower than 1 or 3; all interstriae with fine, confused punctures. Vestiture consisting of coarse, flattened setae and fine hair of equal length on disc and declivity; flattened, subscalelike setae each tapered on apical half to a point, all at least six times as long as wide.

FEMALE.— Similar to male except frons planoconvex, lower two-thirds marked by an elevated carina, granules more abundant, distributed over entire surface below upper level of eyes; discal interstrial tubercles slightly larger; declivital teeth slightly smaller and

more abundant, extending on 1 and 3 almost to apex; vestiture more abundant.

DISTRIBUTION.— California.

USA: **California**: Alturas Co., 29-V-31, *Juniperus occidentalis*, Wohletz; Carson Ridge, in Marin Co.; Cypress Ridge at Fairfax in Marin Co., 5-IV-14, *Cupressus sargenti*, E. C. Van Dyke; Faunskin in San Bernardino Mts., 9-V-31, *J. occidentalis*; Modoc Co., 8-V-31, R. L. Furniss; Mt. St. Helena, 29-II-31, A. T. McClay; Mt. Tamalpias, 26-V-29, *C. sargentii*, F. P. Keen; Occidental (Sonoma Co.,), *C. sargentii*.

HOST.— *Cupressus sargentii* and *Juniperus occidentalis*.

BIOLOGY.— Except for the host association, nothing has been recorded pertaining to the habits of this species.

NOTES.— The above descriptions are based on one male and three female paratypes and a female topotype from Fairfax, on two females from Mt. St. Helena, and on 56 other specimens. One female "paratype" from Los Angeles, California, XII-14, *Cupressus macrocarpa* in the Canadian National collection, is not of this species.

### 26. *Phloeosinus spinosus* Blackman
Fig. 94

*Phloeosinus spinosus* Blackman, 1942, Proc. U.S. Nat. Mus. 92:417 (Holotype, male; Chiricahua Mountains, "New Mexico"; U.S. Nat. Mus., 55400)

DIAGNOSIS.— This species is very closely related to *swainei* Bruck and *frontalis* Bruck. Typical examples are easily distinguished by characters summarized in the above key and in the following treatment.

MALE.— Length 1.6–2.0 mm, 1.9 times as long as wide; color very dark brown to black, elytra slightly lighter.

Frons and pronotum as in *swainei* except pronotal reticulation rarely visible, usually replaced by minute points.

Elytra 1.2 times as long as wide, 1.6 times as long as pronotum; outline, basal crenulations, and disc as in *swainei*; declivital sculpture and arrangement of teeth as in *swainei* except slender, elongate teeth on interstriae 1 about two to three times larger, those on 3 almost twice as large. Declivital vestiture consisting of abundant, short scales, each scale about twice as long as wide.

FEMALE.— As in female *swainei* except frontal granules largely obsolete; declivital teeth very small; declivital scales abundant, similar to male.

DISTRIBUTION.— Arizona and New Mexico to Chihuahua.

USA: **Arizona**: Cave Creek Canyon in Chiricahua Mts., 4-VIII-60, *Cupressus arizonica*, S. L. Wood; Chiricahua N. M., *C. arizonica*; Pine, 11-X-40, Hopk. U.S. 33135A, *C. arizonica*; Santa Catalina Mts., 5-VIII-68, *C. arizonica*, D. E. Bright; 3 miles E Sedonia, 13-VIII-68, *C. arizonica*, D. E. Bright. **New Mexico**: Ruidoso, 8-X-40, *Juniperus deppeana*, R. L. Furniss. MEXICO: **Chihuahua**: 37 km S Creel, 18-VII-60, *C. arizonica,o* S. L. Wood.

HOSTS.— *Cupressus arizonica*, *Juniperus deppeana*.

BIOLOGY.— Broken or cut limbs about 10 cm in diameter were attacked by this species. The tunnels were essentially as described above for the genus.

NOTES.— The above descriptions were based on the holotype and on 105 other specimens.

The Creel specimens have the male declivital teeth scarcely half as large as the Arizona material; in fact, the difference between them and the male of *frontalis* is slight. It appears that considerably more material from California, Arizona, and northwestern Mexico must be examined before the taxonomic status of *spinosus*, *frontalis*, and *swainei* can be correctly interpreted.

### 27. *Phloeosinus frontalis* Bruck
Fig. 94

*Phloeosinus frontalis* Bruck, 1933, Canadian Ent. 65:55 (Holotype, male; Rialto, California; U.S. Nat. Mus., 53820)

*Phloeosinus granulatus* Bruck, 1936, Southern California Acad. Sci. Bull. 35:33 (Holotype, male; Santa Ana Canyon, Orange Co., California; Ohio State Univ. Coll.); Bright, 1966, Pan Pacific Ent. 42:305. *Synonymy*

DIAGNOSIS.— This species is very closely related to *swainei* Bruck and *spinosus* Blackman, but it may be distinguished, with difficulty, by characters summarized in the above key and in the following treatment.

MALE.— Length 1.5–2.0 mm, about 1.8 times as long as wide; color dark brown to black, elytra slightly lighter.

Frons as in *swainei* except median carina very low, extending from epistoma to deepest point in concavity. Pronotum as in *swainei* except reticulation obscurely visible only on anterior third.

Elytra as in *swainei* except declivital teeth larger, teeth almost equal to most poorly developed males of *spinosus*; declivital scales as

in *spinosus* but mostly more slender, about three to four times as long as wide.

FEMALE.— As in female of *spinosus* except declivital scales tending to be more elongate, similar to those of male.

DISTRIBUTION.— S California.

USA: **California**: Guatay in San Diego Co., 13-IX-65, *Cupressus guadeloupensis*, D. E. Bright; Los Angeles, XII-14, *C. macrocarpa*; Mt. Palomar, 26-VIII-68, *Cupressus*, D. E. Bright; Rialto, 2-V-30, Arizonia cypress, H. E. Burke; San Dimas, I-XII-33, *C. arizonicus*; Santa Ana Canyon in Orange Co., 10-XII-30, *C. forbseii*, C. R. Bruck.

HOST.— *Cupressus forbesii*, *C. guadeloupensis*, and *C. macrocarpa*.

BIOLOGY.— This species was taken from twigs and branches.

NOTES.— The above descriptions were based on the holotypes of *frontalis* and *granulatus*, and on 201 other specimens.

Except for the long male carina this species is almost exactly intermediate between *swainei* and *spinosus*. Because each of these three replace one another geographically in hosts taxonomically very closely related, it is recognized that differences may reflect geographical variations in one variable species. Considerably more material from additional localities must be examined before the correct taxonomic status of these populations can be determined.

### 28. *Phloeosinus keeni* Blackman

*Phloeosinus keeni* Blackman, 1942, Proc. U.S. Nat. Mus. 92:414 (Holotype, male; Mount Rainier National Park, Washington; U.S. Nat. Mus., 55398)

DIAGNOSIS.— This species is rather closely allied to *hoferi* Blackman, from which it is easily distinguished by characters summarized in the above key. Because of its distribution it might be confused with *punctatus* LeConte or allied species; however, the scalelike declivital vestiture and the smaller, more numerous declivital teeth distinguish *keeni*.

MALE.— Length 2.1–2.8 mm, 2.1 times as long as wide; color very dark brown, part or all of elytra usually lighter brown.

Frons rather narrowly convex from epistoma to just above upper level of eyes, a low median carina extending from epistoma about one-half distance to deepest point of concavity; surface shining, rather closely punctured except at center of concavity, dorsolateral margins of concavity bearing a few granules; vestiture hairlike, rather abundant, moderately long.

Pronotum 0.86 times as long as wide; sides almost straight and parallel on basal half, then arcuately converging to prominent constriction just before broadly rounded anterior margin; surface smooth, shining, punctures coarse, deep, close, interspaces marked by minute points, their widths averaging slightly less than half diameter of a puncture; vestiture consisting of fine, short, rather abundant hair.

Elytra 1.2 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds rather broadly rounded behind, profile interrupted by elevated interstriae; basal margins each armed by 11 crenulations; striae narrowly impressed, punctures obscurely indicated; interstriae twice as wide as striae, punctures moderately large, numerous, confused, each with its anterior margins slightly elevated but not at all granulate. Declivity steep, convex; striae less strongly, more narrowly impressed than on disc; interstriae 1 and 3 rather strongly elevated, 1 bearing 11, 3 bearing 13 moderately coarse, low teeth, 5, 7, 8, and 9 each bearing 3 to 5 slightly smaller teeth, 2 narrower than 1 or 3 and punctured throughout. Vestiture consisting of fine and coarse interstrial hair on anterior half of disc, becoming scalelike toward declivity, scales abundant on declivity, each scale about three to five times as long as wide.

FEMALE.— Similar to male except frons convex, carina longer, granules largely obsolete; discal interstriae armed by numerous, confused, small crenulations; declivital interstriae 1 and 3 less strongly elevated, teeth smaller, scales somewhat more abundant.

DISTRIBUTION.— British Columbia and Washington to N Idaho.

CANADA: **British Columbia**: Pavillon Lake, 8-VII-72, *Juniperus scopulorum*, D. E. Bright. USA: **Idaho**: Harvard, Latah Co., 14-VIII-56, E. C. Clark. **Washington**: Fairfax, 14-V-34, Hopk. U.S. 18859-B, J. A. Beal, W. J. Buckhorn; Mt. Rainier N. P., 29-X-30, Hopk. U.S. 18924-C, F. P. Keen, W. J. Buckhorn; all from the following named host.

HOST.— *Chamaecyparis nootkatensis* and one series from *Juniperus scopulorum*.

BIOLOGY.— Reared from small branches of the host tree. Nothing more has been recorded.

NOTES.— The above descriptions were based on the holotype and on 103 other specimens.

### 29. *Phloeosinus hoferi* Blackman
Fig. 94

*Phloeosinus hoferi* Blackman, 1942, Proc. U.S. Nat. Mus. 92:412 (Holotype, male; Ute Pass, Colorado; U.S. Nat. Mus., 55397)

DIAGNOSIS.— This species is allied to *keeni* Blackman, but it is easily distinguished by characters summarized in the above key.

MALE.— Length 1.7–2.4 mm, 2.06 times as long as wide; color dark brown to black, elytra a lighter brown.

Frons rather narrowly, rather deeply concave from epistoma to upper level of eyes, median carina reduced to an epistomal tubercle; surface shining, rather finely, closely punctured, a few small granules on dorsolateral margins of concavity; vestiture consisting of fine, moderately abundant, short hair.

Pronotum 0.86 times as long as wide; outline, sculpture, and pubescence as in *keeni*.

Elytra 1.4 times as long as wide, 1.7 times as long as pronotum; outline as in *keeni*; basal margins each armed by 9 to 11 crenulations; striae rather shallowly impressed, punctures rather distinctly impressed; interstriae about twice as wide as striae, rather coarsely, closely punctured throughout, punctures confused, mostly with their anterior margins slightly elevated, a very few feebly granulate. Declivity steep, convex; striae slightly narrower than on disc; interstriae 1 and 3 moderately elevated, 1 and 3 each armed by nine coarse teeth, those near middle distinctly larger, 5, 7, and 9 each with about two smaller teeth, 2 narrower than 1 or 3 and rather coarsely punctured. Vestiture consisting of a mixture of fine and compressed setae of equal length on disc, becoming more nearly scalelike on declivity; each scale on declivity about two to three times as long as wide, some more slender setae also present.

FEMALE.— Similar to male except frons convex, a very fine median carina on lower half; declivital elevation and teeth greatly reduced in height, scalelike setae stouter and much more abundant.

DISTRIBUTION.— S British Columbia and North Dakota to Arizona and W Texas.

CANADA: **British Columbia**: Canyon House, Hat Creek, Kelowna, Marble Canyon, Williams Lake. USA: **Arizona**: Cave Creek Canyon in Chiricahua Mts., Lakeside, Oak Creek Canyon, Prescott N. F., Sedonia, Williams. **California**: Adin Summit in Modoc Co. **Colorado**: Blanca, Buena Vista, Boulder, Colorado N. F., Dolores, El Paso Co., Estes N. P., Ft. Collins, Ft. Garland, Garden of Gods, Golden, Poudre Canyon in Larimer Co., Ute Pass. **Nevada**: Baker, Caliente, Pioche. **New Mexico**: Capitan Mts., Capulin, Las Vegas, Meek, Ruidoso, Vermejo. **North Dakota**: Roosevelt N. P. in McKenzie Co. **South Dakota**: Black Hills. **Texas**: Davis Mts. **Utah**: Beaver, Brighton, Bryce Canyon N. P., Hatch, Kamas, Logan, Logan Canyon, Manila, Oak Creek Canyon in Millard Co., Panguitch. **Wyoming**: Cody, Ft. Bridger, Lusk, Yellowstone N. P.

HOSTS.— *Juniperus deppeana*, *J. osteosperma*, and *J. scopulorum*.

BIOLOGY.— Small branches and twigs usually are selected for attack by this species. The tunnels appear similar to those described above for the genus.

NOTES.— The above descriptions were based on the holotype and on 396 other specimens.

Characters correlated with geographic origin in this common species were not apparent.

## GENUS *CHRAMESUS* LECONTE

*Chramesus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:168 (Type-species: *Chramesus hicoriae* LeConte, monobasic).

*Rhopalopleurus* Chapuis, 1869, Synopsis des Scolytides, p. 46 (Type-species: *Rhopalopleurus tuberculatus* Chapuis, subsequent designation by Hopkins, 1914 Proc. U.S. Nat. Mus. 48:128); LeConte, 1876, Proc. Amer. Philos. Soc. 15:374. *Synonymy*

*Thaumasinulus* Reitter, 1913, Weiner Ent. Zeit. 32(Beiheft):39 (Type-species: *Dendrosinus bonnairei* Reitter =*Chramesus rotundatus* Chapuis; Eggers, 1940, Ent. Blätt. 36:61. *Synonymy*

*Prochramesus* Wood, 1956, Canadian Ent. 88:254 (Type-species: *Prochramesus annectans* Wood, original designation); Schedl, 1963, Ent. Abh. Ber. Mus. Tierk. Dresden 28:258. *Synonymy*

DIAGNOSIS.— This genus is distinguished from *Pseudochramesus* Blackman by the sexually dimorphic frons, by the 5-segmented antennal funicle, by the large, flattened, very strongly asymmetrical antennal club, which is aseptate and entirely devoid of indications of sutures, and by other characters mentioned in the above key to genera.

DESCRIPTION.— Length 1.2–2.7 mm, 1.4–2.3 times as long as wide. Male frons usually impressed or excavated, epistomal or lateral margins often armed, female flat to

convex, rarely armed, surface sculpture and vestiture simple. Eye entire; elongate. Antennal funicle 5-segmented; club strongly flattened, large, strongly asymmetrical, devoid of all indications of segmentation. Pronotum smooth to coarsely reticulate with moderately fine to coarse punctures; anterior half commonly asperate, particularly in lateral areas. Scutellum small, round, visible in all except one species. Crenulations on elytral bases variable, usually well developed; striae clearly indicated, punctures variable; interstriae usually feebly convex. Vestiture variable, consisting of scales and/or hair.

DISTRIBUTION.— S California and E Canada, to Argentina. Approximately 57 species are known; 36 of these occur in North and Central America.

BIOLOGY.— Except for the bigamous *incomptus*, the species are monogamous and mostly phloeophagous. The male constructs the entrance tunnel and turning niche; one (rarely two) egg tunnel, longitudinal, oblique, or transverse, is constructed by the female in the cambium region or, less commonly, entirely in the wood. The larval tunnels radiate out from the niches along the egg gallery and most commonly turn gradually to parallel the grain of the wood; initially they are largely in the phloem (except xylophagous species), but later may engrave the wood or enter it entirely. They usually breed in small branches and almost never in material larger than 10 cm in diameter.

NOTES.— Several very distinctive species groups occur within the genus; however, any division of the group into genera or subgenera appears unnecessary at this time.

Schedl (1940:337) reported *rotundatus* Chapuis from Mexico. Although several Mexican species superficially resemble *rotundatus*, I have yet to see an authentic specimen of Chapuis' species from Mexico. Schedl's specimens were not examined.

## Key to the Species of *Chramesus*

1. Slender, body 2.3 times as long as wide; male frons broad, transversely, concavely impressed below upper level of eyes, lateral margins not at all elevated or armed; male epistomal margin unarmed; scape not ornamented by a tuft of hair; scutellum not visible; setae on pronotum and elytra rather long, slender; declivital interstriae 2 strongly narrowed toward apex; Michoacán; *Clematus*; 1.9–2.1 mm ..... 1. ***incomptus*** **Wood**

— Male epistoma armed or else lateral margins of frons elevated and usually also armed (obscure in *editus*); scutellum small but distinct; usually stouter; in other hosts ..... 2

2(1). Male epistoma armed by a conspicuous, median tubercle, spine or carina; lateral margins of male frons subacute but not elevated or armed; antennal scape of male (and sometimes female) ornamented by a tuft of hair; vestiture of pronotum short, stout, almost scalelike, abundant; antennal club comparatively small, 1.6–2.1 times as long as wide; body rather slender, 1.7–2.0 times as long as wide ..... 3

— Male epistoma unarmed (except two tubercles in *corniger*), lateral margins elevated (except *editus*, *cecropiae*) and usually armed; male antennal scape not ornamented by hair (except *ingens*, *wisteriae*, *chapuisii*); at least part of pronotal vestiture hairlike; body stout, 1.5–1.7 times as long as wide (except slender in *annectans*, *gracilis*) ..... 7

3a(2). Male epistoma subacutely elevated on median fourth, not forming a median tubercle or spine; interstriae about as wide as striae, interstrial tubercles on declivity moderately coarse; pronotal asperities more numerous, more widely dispersed; male scape without a tuft of long setae; Costa Rica to Venezuela; Bignoniaceae vine; 1.2–1.3 mm ..... 2a. ***denticulatus*** **Wood**

— Male epistoma armed by a conspicuous median tubercle or spine; interstriae about twice as wide as striae (except *dentatus*), interstrial tubercles much smaller, pronotal asperities sparse, confined to anterolateral areas; male scape (sometimes female also) ornamented by a conspicuous tuft of long setae ..... 3b

3b(3a). Discal striae as wide as or slightly wider than interstriae; erect interstrial bristles in uniseriate rows, each almost as long as distance between rows, spaced within a row by much less than length of bristle; female epistoma unarmed, scape ornamented by very few hairlike setae; S Arizona to S California; *Quercus*; 1.5–1.7 mm ..... 2b. ***dentatus*** **Schaeffer**

— Discal striae distinctly narrower than interstriae; erect interstrial scales within uniseriate rows about half as long as distance between rows, spaced within a row by one to several times length of erect scale; female epistoma armed or not, female scape ornamented or not ..... 4

4(3). All pronotal and elytral setae light in color; female frons convex, epistoma unarmed; female scape not ornamented by a tuft of hair; striae coarser and deeper, almost as wide as interstriae; each scale in ground vestiture on pronotum and elytra as long as wide; Nayarit and Colima; 1.2–1.7 mm ..... 3. ***unicornis*** **Wood**

— Pronotum and elytra with dark and light setae intermixed; female frons flattened or concave, epistoma armed by a median tubercle similar to but smaller than in male; female scape bearing a tuft of hair; striae narrower, punctures usually elongate, not as deep; ground vestiture of setae mostly much longer than wide (except *secus*) ..... 5

5(4). Larger; pronotal scales only slightly longer than wide, not longer or more slender in posteromedian area, those on anterior margin only slightly longer; erect elytral scales stout, mostly two or three times as long as wide, none more than four times as long as wide; declivital interstriae unarmed; Nayarit to Oaxaca; 1.7 mm ..... 4. ***secus*** **Wood**

— Smaller; pronotal scales elongate, distinctly longer in posteromedian area, considerably longer on anterior margin; erect elytral scales almost all more than four times as long as wide ..... 6

6(5). Declivital interstriae unarmed; female frons moderately concave on central half; dark scales predominate on pronotum and elytra; Hidalgo; *Acacia*; 1.3–1.5 mm ..... 5. ***varius*** **Wood**

— Declivital and usually discal interstriae armed by minute, rather high, rounded granules; female frons weakly impressed, planoconcave; pale scales predominate on pronotum and elytra; Texas to Nuevo León and Tamaulipas; *Mimosa* etc.; 1.2–1.4 mm ..... 6. ***mimosae*** **Blackman**

7(2). Body slender, 2.3 or more times as long as wide; antennal club apically pointed, vestiture coarser, less abundant; male frons laterally armed by a pair of quadrate dentations distinctly displaced mesally from lateral margins (except unarmed in *editus*); in monocotyledonous hosts ..... 8

— Body stout, less than 1.7 times as long as wide; antennal club with apex rounded, vestiture usually much finer, dense; lateral margins armed by one or more pairs of pointed dentations (except unarmed in *cecropiae* and *corniger*); in dicotyledonous hosts ..... 10

8(7). Male frons with lateral margins obscurely elevated, unarmed; male scape ornamented by a tuft of long hair; interstriae as wide as striae; elytral ground vestiture short, confused, less than half as long as erect, blunt, flattened bristles; Durango, Oaxaca; 1.7–2.0 mm ..... 7. ***editus*** **(Bright)**

– Male frons with lateral margins more acutely elevated and armed by a pair of large subquadrate tubercles; interstriae twice as wide as striae; elytral vestiture three-ranked, shorter setae on margins, longer erect bristles form a median row ..... 9

9(8). Pronotal punctures moderately coarse, rather shallow, each usually accompanied by a small granule; striae feebly impressed, punctures moderately coarse; interstrial setae in ground cover less abundant, indistinctly plumose; erect declivital interstrial bristles at least two-thirds as long as distance between rows; Oaxaca; *Nolena*; 1.9–2.4 mm ..... 8. ***annectans*** **(Wood)**

– Pronotal punctures small to minute, often entirely replaced by accompanying granules; striae not at all impressed, punctures much less strongly impressed; interstrial setae in ground cover more abundant and much more strongly plumose; declivital bristles usually not more than half as long as distance between rows; Costa Rica to Panama; *Bambusa*; 2.2–2.7 mm ..... 9. ***gracilis*** **Wood**

10(7). Male frons longitudinally sulcate (weakly concave in *demissus*), sulcus ending well below upper level of eyes, lateral margins unarmed; interstrial bristles slender, ground vestiture entirely absent (except sparse scales on posterior half in *demissus*) ..... 11

– Male frons concavely impressed, lateral margins armed by one or two pairs of tubercles (margins acute but unarmed in *aquilus* and *signatipennis*); interstrial ground vestiture abundant, usually extending to elytral base ..... 14

11(10). Interstriae twice as wide as striae, crenulations and fine bristles confused on disc; pronotum glabrous except at margins, anterior margin in male armed by several low asperities; Costa Rica; 2.2–2.8 mm ..... 10. ***ingens*** **Wood**

– Interstriae little if any wider than striae, tubercles and bristles uniseriate; pronotal disc setose ..... 12

12(11). Larger; posterior half of elytra with sparse ground cover of small scales; interstriae rather broadly crenulate, particularly toward base; male frons impressed at and just above level of antennal insertion, surface reticulate; Guatemala; 2.0–2.3 mm ..... 13. ***demissus*** **Wood**

– Smaller; elytral ground vestiture absent; interstrial tubercles narrow to base ..... 13

13(12). Male frontal sulcus reaching epistomal margin on median third, with a pair of submarginal epistomal tubercles, upper area of frons finely rugose-reticulate; bristles on discal interstriae 2 confused; Veracruz; 1.3–1.4 mm ..... 11. ***corniger*** **Wood**

– Male frons slightly elevated just above level of antennal insertion, elevated area transversely strigose; *Cecropia* leaf petioles; Costa Rica; 1.2–1.3 mm ..... 12. ***cecropiae*** **Wood**

14(10). Male frontal excavation ending well below upper level of eyes, lateral margins armed at level of antennal insertions by two pairs of teeth of about equal size; posterior half of pronotal disc rather coarsely punctured, devoid of tubercles; pronotal vestiture of slender scales, each about six times as long as wide ..... 15

– Male frontal excavation extending at least to upper level of eyes (except *hicoriae*), lateral margins armed by not more than one pair of teeth; sculpture and vestiture variable ..... 16

15(14). Larger; elytral ground vestiture longer, more slender, each scale two or more times as long as wide, erect bristles short, stouter; pronotal punctures usually coarse; Puebla; 2.0–2.2 mm ..... 14. ***quadridens*** **Wood**

— Smaller; elytral ground vestiture very short, stout, each scale about as long as wide, erect bristles much more slender and longer, except in southern half of distribution; pronotal punctures usually smaller; *Canavalia villosa*; Nayarit to Panama; 1.4–2.0 mm ..... 15. ***pumilus*** **(Chapuis)**

16(15). Lateral margins of male frons acutely elevated but entirely unarmed; ground vestiture on basal half of elytral disc indistinguishable from erect bristles, confused, shorter posteriorly and erect bristles in rows; pronotum strongly reticulate; Chiapas; 1.5–1.8 mm ..... 16. ***aquilus*** **Wood**

— Lateral margins of male frons armed by a pair of denticles or strong serrations (except *signatipennis*); ground vestiture on elytra distinguishable from erect bristles to base ..... 17

17(16). (?)Male epistomal margin acutely elevated, lateral margins of frons unarmed; pronotum strongly reticulate; interstrial ground vestiture short, slender, erect scales in rows, short, each about twice as long as wide, one-third as long as distance between rows, less than half as long as distance between scales within a row; Costa Rica; 1.4 mm ..... 17. ***signatipenis*** **Schedl**

— Male epistoma not acutely elevated, lateral margins of frons armed by a pair of tubercles or strong serrations; vestiture not as above ..... 18

18(17). Lateral margins of male frons very strongly, acutely elevated, ending abruptly dorsally at a level one-third distance from antennal insertion to upper level of eyes; striae weakly impressed, punctures minute, interstriae at least four times as wide as punctures; pronotal disc minutely punctured, devoid of tubercles; elytral ground vestiture of short scales each very slightly longer than wide, erect scales about half as long as distance between rows, each about four to five times as long as wide; Florida and Arizona to Honduras; *Celtis*, *Condalia*; 1.7–2.4 mm ..... 18. ***subopacus*** **Schaeffer**

— Lateral margins of male frons weakly to moderately elevated, armed at level of antennal insertion by a pointed tubercle; elytral and pronotal sculpture and vestiture variable ..... 19

19(18). Elytral ground vestiture less abundant, oriented on each interstriae into one row on each side of erect bristles (obscure in some *asperatus*); each setae in elytral ground vestiture slender, three or more times as long as wide (except some *asperatus*); marginal crenulations on elytral bases near scutellum very coarse, isolated; proepimeral area transversely strigose (weak in *hicoriae*, *asperatus*) ..... 20

— Elytral ground vestiture abundant, confused, each scale less than twice as long as wide; marginal crenulations on elytral bases near scutellum not larger, usually basally contiguous and forming a continuous line (several exceptions); proepimeral area not modified (feebly strigose in *crenatus*) ..... 24

20(19). Male frontal excavation scarcely attaining upper level of eyes; erect interstrial bristles each at least equal in length to distance between rows of bristles; proepimeral area feebly if at all strigose; E Texas and Wisconsin to Quebec and Georgia; *Carya*; 1.5–1.9 mm (see also 19b. ***atkinsoni*** **Wood**) ..... 19a. ***hicoriae*** **LeConte**

— Male frontal excavation extending well above eyes; erect interstrial bristles each distinctly shorter than distance between rows of bristles ..... 21

21(20). Setae in interstrial ground vestiture slender, usually hairlike, at least four times as long as wide, erect bristles slender, their diameters usually not greater than setae in ground cover ..... 22

— Scales in interstrial ground cover rather stout, about three times as long as wide, erect bristles at least equal in diameter to width of a scale ..... 23

22(21). Larger; base of interstriae 2 with five or more submarginal crenulations in addition to uniseriate row of granules; male interstriae each with a row of fine tubercles; pronotal crenulations much smaller and confined to smaller anterior area; "Mexico"; 2.5 mm ..... 20. ***marginatus*** **Wood**

— Smaller; base of interstriae 2 with one submarginal crenulation; male interstriae entirely without tubercles; pronotal crenulations coarser, more widely distributed; Arizona to Chihuahua; *Rhamnus*, *Morus*; 1.2–1.8 mm ..... 21. ***setosus*** **Wood**

23(21). Proepimeral area feebly strigose over a very limited area; erect interstrial bristles uniformly coarse, few if any laterally compressed; female frons strongly reticulate, punctures largely obsolete; Arizona, New Mexico; *Robinia*; 1.4–1.9 mm ..... 22. ***asperatus*** **Schaeffer**

— Proepimeral area rather coarsely, transversely strigose over a rather large area; erect interstrial bristles strongly, laterally compressed on disc, more commonly slender, almost hairlike and often shorter on declivity; female frons very feebly reticulate, with rather abundant, shallow, somewhat obscure punctures over entire surface; Puebla; 1.4–1.8 mm ..... 23. ***strigatus*** **Wood**

24(19). Strial punctures very coarse, deep, their diameters about equal to width of an interstriae; interstriae crenulate, tubercles very coarse, each bearing on its posterior slope a coarse bristle, each bristle about equal in length to distance between rows of bristles; male declivital interstriae 2 devoid of tubercles and bristles; male antennal scape bearing a conspicuous tuft of long hair; Guatemala; 1.5–2.1 mm ..... 24. ***punctatus*** **Wood**

— Diameters of strial punctures considerably less than half as great as width of an interstriae; erect interstrial bristles much shorter than distance separating rows of bristles ..... 25

25(24). Erect interstrial bristles slender, almost hairlike; striae rather strongly impressed, interstrial tubercles coarse, about equally developed in both sexes, pronotal vestiture hairlike; male frons shallowly concave, concavity not attaining upper level of eyes; Panama; *Inga*; 2.4–2.7 mm ..... 25. ***vastus*** **Wood**

— Erect interstrial bristles scalelike; with a different combination of other characters ..... 26

26(25). Pronotal scales slender or bristlelike, each at least six times as long as wide (those near base sometimes stout); male interstriae unarmed by tubercles (except *xylophagus* and *wisteriae*) ..... 27

— Pronotal scales rather broad, each less than four times as long as wide; male interstriae armed or not ..... 34

27(26). Erect interstrial bristles short, about twice as long as ground setae, spaced within a row by three to four or more times length of a bristle; male strial punctures obsolete or at most feebly indicated toward base; Nayarit; *Inga*; 1.2–1.5 mm ..... 26. ***vitiosus*** **Wood**

— Erect interstrial bristles at least three times as long as ground setae, spaced within a row by less than two and one-half times length of a bristle ..... 28

28(27). Male scape bearing a tuft of long, yellow hair; antennal club smaller, rather stout, not more than 2.2 times as long as wide ..... 29

— Scape not ornamented by hair in either sex (a few hairs in male *microporosus*); antennal club larger and more slender, at least 2.4 times as long as wide ..... 30

29(28). Tuft of hair on male scape smaller, male frons less strongly impressed, particularly on upper half; male interstriae armed by granules about as large as those of female; Mississippi; *Wisteria*; 1.6–1.8 mm ..... 27. ***wisteriae*** **Wood**

— Tuft of hair on male scape larger, male frons more strongly impressed, particularly on upper half; male interstriae entirely devoid of rows of granules; Kansas and Pennsylvania to San Luis Potosí and Florida; *Celtis*; 1.5–2.0 mm ..... 28. ***chapuisi*** **LeConte**

30(28). Size larger; submarginal crenulations at elytral bases more numerous, about 10 to 12 pairs ..... 31

— Size smaller; usually fewer than 6 pairs of submarginal crenulations at elytral bases ..... 33

31(30). Male scape setose, strial punctures obsolete or nearly so, vestiture rather slender, interstrial bristles each six to eight or more times as long as wide; female strial punctures very small, interstrial granules smaller; Chiapas; 1.8–2.4 mm ..... 31. ***microporosus*** **Wood**

— Male scape without long setae, strial punctures normal, interstrial bristles about four times as long as wide ..... 32

32(31). Male frons more weakly impressed on upper third, ornamented by a few rather long setae near its upper margin, lateral denticles small, pointed, located at lower level of antennal insertion; strial punctures slightly larger, vestiture unicolorous; Veracruz; 2.2–2.5 mm ..... 29. ***periosus*** **Wood**

— Male frons more strongly impressed on upper third, setae obscure, very short, lateral denticles rather large, subquadrate, located at or slightly above upper level of antennal insertion; strial punctures smaller, vestiture of mixed light- and dark-colored setae; Veracruz; 1.8–2.3 mm ..... 30. ***variabilis*** **Wood**

33(30). Male discal interstriae each with a row of fine granules; pronotal setae slender, essentially of one kind; scales on elytral disc much smaller, each about one-fifth as wide as an interstriae or less; Nayarit, Sinaloa; *Inga*; 1.6–1.9 mm ..... 32. ***xylophagus*** **Wood**

— Male discal interstriae unarmed; pronotal setae of two types, stout and very slender; scales on elytral disc rather large, at least one-fourth as wide as interstriae; Veracruz to Yucatán; 1.3–1.6 mm ..... 33. ***crenatus*** **Wood**

34(26). Dark- and light-colored scales on pronotum and elytra forming a conspicuous color pattern; erect interstrial scales longer and more slender, at least two-thirds as long as distance between rows, each scale at least four times as long as wide; Honduras; *Cestrum scandens*; 1.4–1.7 mm ..... 34. ***bicolor*** **Wood**

— Pronotal and elytral scales uniformly pale in color; erect interstrial scales short, stout, not longer than half distance between rows, each less than three times as long as wide ..... 35

35(34). Erect interstrial scales little if any longer than ground scales; pronotal scales small, each very slightly longer than wide in discal area; Honduras; 1.2–1.3 mm ..... 35. ***minulus*** **Wood**

— Erect interstrial scales about twice as long as ground scales; pronotal scales slender, more than three times as long as wide ..... 36

36(35). Body stouter, 1.6 times as long as wide; declivital interstriae 1–3 of equal height and sculpture; male frons less strongly concave, denticles on lateral margins; Costa Rica to Venezuela; *Acacia*; 1.5–1.8 mm ..... 36. ***acacicolens*** **Wood**

— Body more slender, 1.9 times as long as wide; declivital interstriae 1 and 3 very slightly higher than 2 and with larger granules, 2 usually narrower; male frons much more deeply concave, with denticles displaced mesad slightly from lateral margins; Chiapas; *Acacia*; 1.4–1.7 mm ..... 37. ***disparilis*** **Wood**

### 1. *Chramesus incomptus* Wood

*Chramesus incomptus* Wood, 1967, Great Basin Nat. 27:90 (Holotype, male; Morelia, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— A slender species with unique sculpture of the pronotum, fine vestiture, and sculpture of the male frons not found elsewhere in the genus. It might be confused with *editus* (Bright).

MALE.— Length 1.9–2.1 mm, 2.3 times as long as wide; body color brown.

Frons strongly, transversely impressed just below middle, upper area flattened to vertex, lower area strongly raised to epistoma; lateral areas rounded, unarmed; epistomal lobe conspicuous, with a pair of small tubercles at its base; surface reticulate, with small, deep punctures at sides and above; vestiture fine, short, somewhat more abundant at sides and above, rather inconspicuous. Antennal club rather small, apically pointed, 1.6 times as long as wide.

Pronotum 0.9 times as long as wide; widest about one-third pronotum length from base, sides moderately arcuate, distinctly constricted just behind anterior margin; surface minutely granulate and with small, moderately close, shining, rounded granules on anterior or lateral margins of fine, obscure punctures; vestiture consisting of rather long, moderately abundant stout hair.

Elytra 1.35 times as long as wide, 1.7 times as long as pronotum; sides almost straight on basal two-thirds, very slightly wider posteriorly, broadly rounded behind; scutellum depressed, not present in usual sense; basal margins each armed by 13 small crenulations; striae rather weakly impressed, punctures rather large, deep; interstriae slightly wider than striae, weakly convex, surface irregular, punctures rather numerous, confused, most granulate or subgranulate on anterior side; interstriae 2 subcrenulate to well behind base. Declivity rather steep, broadly convex; only striae 1 weakly impressed, punctures somewhat reduced in size; interstriae almost smooth, 3 and upper third of 1 and 2 with sparse, uniseriate, rounded granules. Vestiture moderately long, consisting of coarse, delicate, hairlike setae, toward declivity median interstrial rows becoming distinctly longer than similar, shorter, ground vestiture.

FEMALE.— Similar to male except frons irregularly convex with an indefinite, subfoveate, median impression, surface reticulate-granulate; epistomal tubercles present; elytral declivity more narrowly convex, interstrial tubercles on 2 and especially 1 extending to middle or below.

DISTRIBUTION.— Michoacán.

MEXICO: Michoacán: 33 km W Morelia, 16-VI-65, 2200 m, *Clematis*, S. L. Wood.

BIOLOGY.— The biramous, diagonal parent tunnels were made in dying stems larger than 1 cm in diameter. This species is unique within the genus in that two females were usually associated with each male.

NOTES.— The above treatment was based on the type series of 17 specimens.

### 2a. *Chramesus denticulatus* Wood

*Chramesus denticulatus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):6 (20 km SW El Vigía, Merida, Venezuela; Wood Coll.)

DIAGNOSIS.— This unique species is distinguished from other known species by the small size, by the unarmed male frons, by the finely asperate anterolateral areas of the pronotum, and by the finely dentate declivital interstriae.

MALE.— Length 1.2–1.3 mm, 1.9 times as long as wide; color yellowish brown.

Frons rather deeply concave on a subcircular area from epistoma to upper level of eyes, lateral margins subacute, unarmed; epistomal margin carinately elevated, more strongly on median third; surface reticulate, punctures minute, obscure; vestiture uniformly short, of coarse, uniformly distributed setae.

Pronotum 0.77 times as long as wide; widest near base, sides convergently arcuate to broadly rounded anterior margin; surface reticulate, almost uniformly covered by isolated, rather widely spaced, small subasperate tubercles. Vestiture short, of almost equal numbers of very fine hair and rather broad scales.

Elytra 1.3 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on slightly more than basal half, broadly rounded behind, posterior outline interrupted by declivital teeth; striae moderately impressed, punctures rather coarse, shallow; interstriae subreticulate, weakly

convex, as wide as striae, punctures replaced by rows of granules, very fine at base, becoming coarse toward declivity. Declivity rather steep, broadly convex; striae narrower and deeper than on disc; interstriae more narrowly convex, each armed by a row of close, rather small pointed teeth, except almost obsolete on lower half of 2. Vestiture of ground cover formed by two indefinite rows of short, stout setae on margins of each interstriae, and a central row of short, erect scales; each scale about twice as long as wide, spaced within and between rows by slightly more than twice length of a scale; scales about twice as long as ground setae.

FEMALE.— Similar to male except frons weakly concave, epistoma weakly elevated, frontal vestiture of short scales; pronotal asperities larger in anterolateral areas; interstrial teeth on declivity slightly smaller, regularly present on 2.

DISTRIBUTION.— Costa Rica to Venezuela.

COSTA RICA: La Selva near Puerto Viejo, Heredia, 18-II-80, 50 m, H. and A. Howden (Canadian Nat. Coll.). VENEZUELA: 20 km SW El Vigía, Merida, 21-XI-69, Bignoniaceae vine (liana), S. L. Wood.

NOTES.— The above treatment was based on the type series of five specimens and on two other specimens.

### 2b. *Chramesus dentatus* Schaeffer

Fig. 97

*Chramesus dentatus* Schaeffer, 1908, J. New York Ent. Soc. 16:221 (Lectotype, female; Huachuca Mts., Arizona; U.S. Nat. Mus., 42487, subsequent designation by Blackman, 1938, J. Washington Acad. Sci. 28:544)

*Chramesus barbatus* Eggers, 1931, Ent. Blätt. 26:169 (Holotype, male; Valle de Mexico; Berlin Zool. Mus.); Wood, 1972, Great Basin Nat. 32:192. *Synonymy*

DIAGNOSIS.— In this and the four following species the male epistoma is armed by a large, median tubercle. This species differs from the other four by the coarser discal striae, by the much longer interstrial bristles, and by the tufted male scape.

MALE.— Length 1.5–1.7 mm, 1.9 times as long as wide; color dark brown.

Frons broadly, rather deeply concave from epistomal margin to vertex, lateral margins subacute, unarmed; epistomal margin armed by a conspicuous, median, pointed tubercle; surface rugose-reticulate, minute punctures obscure; vestiture moderately short, sparse, rather uniformly distributed. Scape elongate, bearing a tuft of yellow hair; club 1.9 times as long as wide.

Pronotum 0.81 times as long as wide; widest at base, sides arcuately converging to rather broadly rounded anterior margin; surface finely granulate-punctate, subasperate in anterolateral areas; vestiture of very stout, short, subscalelike bristles of two sizes.

Elytra 1.2 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; scutellum small, depressed; basal margins each armed by 13 crenulations, several submarginal crenulations on interstriae 2 to 4; striae weakly impressed, punctures coarse, deep interstriae as wide as striae, feebly convex, almost smooth, punctures small, close, confused, a median row very feebly granulate. Declivity steep, convex; striae and interstriae slightly narrower, otherwise as on disc. Vestiture of ground cover of small, suberect scales, each slightly longer than wide; and interstrial rows of erect bristles, each about four times as long as ground scales and almost equal in length to distance between rows, separated within a row by slightly shorter distances.

FEMALE.— Similar to male except frons very shallowly concave, epistomal tubercle smaller; pronotal and elytral granules slightly larger.

DISTRIBUTION.— S Arizona and S California.

USA: Arizona: Huachuca Mts., No. 186. California: Warner's, San Diego Co., VII-19, E. C. Van Dyke.

HOST.— *Quercus* sp.

BIOLOGY.— Collected from oak twigs girdled by *Oncideres quercus* Skinner.

NOTES.— The above treatment was based on the lectotype and on 13 other specimens.

### 3. *Chramesus unicornis* Wood

*Chramesus unicornis* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):4 (Holotype, male; Laguna Santa María, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *varius* Wood by the less extensive male frontal impression, by the smaller tuft of setae on the scape, by the subquadrate pronotum, by the more strongly impressed striae

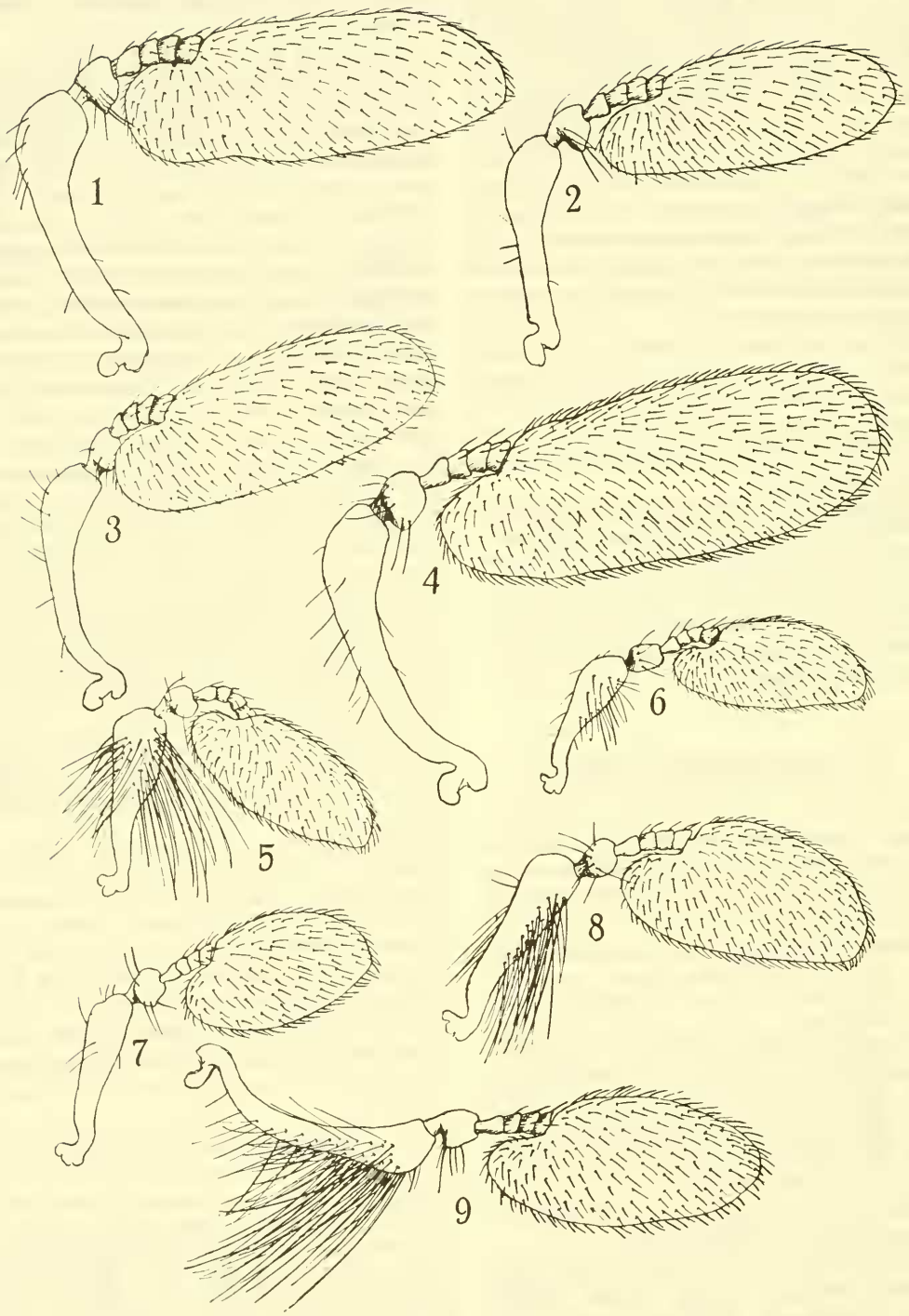



Fig. 97. *Chramesus* spp., antennae: 1, *subopacus*, male; 2, *asperatus*, female; 3, *hickoriae*, female; 4, *subopacus*, female; 5, *mimosae*, male, 6, same, female; 7, *dentatus*, female, 8, same, male; 9, *chapuisii*, male. (After Blackman 1938:540.)

and strial punctures, and by the uniformly pale vestiture.

MALE.— Length 1.3–1.6 mm, 2.0 times as long as wide; color medium to light brown.

Frons deeply excavated from eye to eye from upper level of eyes to epistoma; lateral margins acute from just above level of antennal insertion to epistomal margin; surface rather coarsely reticulate above, becoming obscurely reticulate and shining below, armed by a large, pointed, median tubercle immediately above epistomal margin; vestiture sparse, inconspicuous. Antennal scape bearing a small tuft of fewer than a dozen long, yellow setae; club small for this genus, 1.9 times as long as wide.

Pronotum 0.83 times as long as wide; widest at base, sides feebly arcuate and converging slightly on more than basal two-thirds, then rather abruptly constricted just before broadly rounded anterior margin; surface rather coarsely reticulate, punctures very close, rather shallow, irregular in outline, anterolateral asperities obscure. Vestiture consisting of short, rather abundant, stout, almost scalelike setae.

Elytra 1.2 times as long as wide, 1.5 times as long as pronotum; sides straight and subparallel on basal two-thirds to declivital base, then rather broadly rounded behind; basal margins armed by 14 crenulations; striae slightly impressed, large punctures deeply impressed; interstriae as wide as striae, convex, each bearing a row of fine, pointed tubercles. Declivity moderately steep, convex, essentially as on disc except area at junction of interstriae 3 and 9 slightly elevated. Vestiture consisting of moderately abundant, small broad scales, and rows of erect interstrial scales, each scale about three times as long as ground cover, each half as long as distance between rows and almost equal in length to distance between erect scales within a row, each about four times as long as wide; not longer on declivity.

FEMALE.— Similar to male except frons convex, coarsely reticulate to epistoma, median tubercle absent and pronotal asperities slightly larger.

DISTRIBUTION.— Colima and Nayarit.

MEXICO: **Colima**: 25 km W Armeria, 30-VI-65, 20 m, No. 143. **Nayarit**: Laguna Santa María, 6-VII-65, 1000 m, No. 201, S. L. Wood.

BIOLOGY.— The larval and adult mines were in the cambium of a large woody vine (liana), in which the larger stems were square in cross section.

NOTES.— The above treatment was based on the type series of 82 specimens.

### 4. *Chramesus secus* Wood

*Chramesus secus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):4 (Holotype, male; Laguna Santa María, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is very closely related to *varius* Wood, but differs by the larger size, by the uniformly pale color of the vestiture, by the more finely sculptured pronotum, and by the shorter, more scalelike vestiture.

MALE.— Length 1.7 mm, 1.7 times as long as wide; color brown with white vestiture on pronotum and interstriae 1, tan elsewhere.

Exactly as in *varius* except as noted above and also setae on all margins of pronotum shorter and stouter; median extension of basal margin of pronotum less pronounced; elytral vestiture appearing more abundant and each seta conspicuously wider.

DISTRIBUTION.— Nayarit and Oaxaca.

MEXICO: **Nayarit**: Laguna Santa María, 6-VII-65, 1000 m, No. 201, S. L. Wood. **Oaxaca**: 6 km N Totolapan, 20-VI-67, 1100 m, No. 66, *Acacia* sp., S. L. Wood.

BIOLOGY.— The holotype was taken with a long series of *unicornis* Wood from a large woody vine (liana) having the larger stems square in cross section.

NOTES.— The above treatment was based on the unique holotype. The Oaxaca series apparently represents this species, but the host was thought to be *Acacia*.

### 5. *Chramesus varius* Wood

*Chramesus varius* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):4 (Holotype, male; Ixmiquilpan, Hidalgo, Mexico; Wood Coll.)

DIAGNOSIS.— A species rather closely related to *mimosae* Blackman, but distinguished by the absence of interstrial granules, by the predominance of dark scales, and by the moderately concave female frons.

MALE.— Length 1.3–1.5 mm, 1.7 times as long as wide; color brown with light scales on basal fourth and lateral margins of pronotum and on interstriae 1 and lateral areas of elytral disc, dark scales predominant elsewhere.

Frons deeply, broadly concave from eye to eye from well above eyes to epistoma; excavated area reticulate-granulate; lateral margin acute only at level of antennal bases, unarmed; epistomal margin bearing a large, pointed median tubercle; vestiture consisting of moderately abundant, stout setae. Scape bearing small tuft of long, yellow, subplumose setae; club rather small for this genus, its apex not pointed, 2.1 times as long as wide.

Pronotum 0.82 times as long as wide; widest on basal third, sides strongly, convergently arcuate toward broadly rounded anterior margin; anterolateral areas with a few fine asperities; surface coarsely reticulate, punctures rather fine, shallow, moderately close, many of them subvulcanate on posterior area; basal margin bisinuate; vestiture stout, short, essentially scalelike.

Elytra 1.14 times as long as wide, 1.6 times as long as pronotum; bases each armed by 11 marginal crenulations on interstriae 2 to 9; scutellum depressed, not visible in usual sense; striae weakly impressed, stronger toward declivity, punctures small, impressed; interstriae twice as wide as striae, convex, surface evidently superficially reticulate, punctures very fine, usually obscured by setae. Declivity convex, steep; striae slightly deeper, interstriae slightly narrower than on disc. Vestiture consisting of moderately abundant, stout, almost scalelike, erect setae, and rows of erect scales each about twice as long as ground vestiture and about four or five times as long as wide.

FEMALE.— Similar to male except frons more narrowly, shallowly concave, with median tubercle very slightly smaller; pronotal crenulations larger and more numerous.

DISTRIBUTION.— Hidalgo.

MEXICO: Hidalgo: 25 km N Ixmiquilpan, 10-VII-67, 1900 m, No. 188, *Acacia* S. L. Wood.

BIOLOGY.— The newly formed parental galleries were in a broken branch about 4 cm in diameter.

NOTES.— The above treatment was based on the type series of 14 specimens.

### 6. *Chramesus mimosae* Blackman
Fig. 97

*Chramesus mimosae* Blackman, 1938, J. Washington Acad. Sci. 28:544 (Holotype, female; Brownsville, Texas; U.S. Nat. Mus., 57803)

DIAGNOSIS.— This species is distinguished from the closely related *varius* Wood by the presence of interstrial rows of small, rounded granules, by the predominance of pale scales on pronotum and elytra, and by the much less strongly concave female frons.

MALE.— Length 1.3–1.6 mm, 1.7 times as long as wide; color dark brown with pale scales predominating, dark scales usually on anteromedian area of pronotum and on declivity, extending anteriorly on interstriae 2 to 4 to base (variable).

Frons as in *varius* except slightly less strongly concave; antenna as in *varius*.

Pronotum as in *varius* except surface smoother, punctures finer, deeper, discal granules finer; vestiture shorter, stouter, pale in color.

Elytra 1.2 times as long as wide, 1.7 times as long as pronotum; basal crenulations and outline as in *varius*; striae feebly impressed, punctures oval, moderately coarse, deep; interstriae less than twice as wide as striae, surface smooth, fine punctures confused, median row finely granulate. Declivity convex, rather steep; striae moderately impressed, almost as wide as interstriae. Vestiture essentially as in *varius* except erect bristles very slightly longer and more slender, each about five to six times as long as wide.

FEMALE.— Similar to male except frons shallowly concave (much less strongly concave than female *varius*), epistomal tubercle slightly smaller.

DISTRIBUTION.— S Texas to Tamaulipas and Nuevo León.

USA: Texas: Brownsville, 21-V-04, *Mimosa lindheimeri*, H. S. Barber; Southmost, 27-III-51, *Mimosa*, S. L. Wood. MEXICO: Tamaulipas: Las Norias near San Fernando, 14-VI-53, *Mimosa*, S. L. Wood. Nuevo León: Monterrey, XI-25, E. A. Schwarz.

HOST.— *Mimosa* sp., *Cassia lindheimeriana*, *Leucaena pulverulenta*.

BIOLOGY.— Specimens were collected from broken branches less than 4 cm in diameter.

The gallery systems were in the cambium region.

NOTES.— The above treatment was based on the holotype and on 623 other specimens.

### 7. *Chramesus editus* (Bright)

*Prochramesus editus* Bright, 1972, Canadian Ent. 104:1495 (Holotype, female; 20.5 km N Oaxaca, Oaxaca, Mexico; Canadian Nat. Coll., 12610)

DIAGNOSIS.— This species is distinguished from *incomptus* Wood by the much more weakly rugose-reticulate pronotal surface, by the much shorter, stout pronotal setae, by the shorter, stouter, strongly plumose elytral setae in the ground cover, and by the absence of submarginal crenulations on the elytral bases.

MALE.— Length 1.7–2.0 mm, 2.3 times as long as wide; color very dark brown, elytra slightly lighter.

Frons very similar to *incomptus* except moderately concave from level of antennal insertion to slightly above upper level of eyes; lateral margins subacutely, feebly elevated from epistomal margin to level of antennal insertion; median half of lower third reticulate, glabrous. Antennal scape ornamented by about two dozen long setae; club rather small for this genus.

Pronotum 0.84 times as long as wide; surface rather rugose-reticulate, setiferous punctures very small, rather close, each with a small, rounded granule. Vestiture of short, stout setae, each about six times as long as wide.

Elytra 1.5 times as long as wide, 1.9 times as long as pronotum; outline as in *incomptus*; striae feebly impressed, punctures coarse, deep; interstriae as wide as striae, subshining, almost smooth, each with a row of rounded granules from base (without submarginal crenulations at base), punctures fine, obscure, confused. Declivity steep, convex; sculpture similar to disc except strial punctures slightly smaller. Vestiture of short, stout, plumose setae covering less than half of surface, and uniseriate rows of erect bristles, each bristle two to three times as long as ground cover, about eight times as long as wide, spaced between rows and within a row of about one and one-half times length of a bristle.

FEMALE.— Similar to male except frons convex, reticulate, with a median fovea; antennal scape with setae normal.

DISTRIBUTION.— Durango to Oaxaca.

MEXICO: **Durango**: 14 km (9 miles) E El Palmito, Durango, 2500 m, 15-VI-71, shrub, D. E. Bright. **Oaxaca**: 20.5 km N Oaxaca 31-V-71, 2800 m, leguminous shrub, D. E. Bright.

NOTES.— The above treatment was based on the holotype and on several paratypes.

### 8. *Chramesus annectans* (Wood)
Fig. 98

*Prochramesus annectans* Wood, 1956, Canadian Ent. 88:254 (Holotype, female: Nochixtlan, Oaxaca; Snow Ent. Coll., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from the very closely related *gracilis* Wood by the characters summarized in the above key.

MALE.— Length 1.9–2.4 mm, 2.3 times as long as wide; color black.

Frons rather deeply concave from epistoma to upper level of eyes; lateral margins rounded, armed just mesad of margin just above level of antennal insertion by a pair of subquadrate, rather large, blunt tubercles; surface reticulate, with sparse, minute, obscure punctures; vestiture fine, short, sparse. Antennal club apically pointed, 2.1 times as long as wide.

Pronotum 0.85 times as long as wide; widest at base, basal two-thirds weakly arcuate, feeble, converging anteriorly, then moderately constricted just behind rather broadly rounded anterior margin; surface subreticulate, rather coarsely, deeply, closely punctured on disc, punctures partly or largely replaced by rounded granules in lateral areas; vestiture short, rather abundant, consisting of fine and moderately stout bristles intermixed.

Elytra 1.5 times as long as wide, 2.0 times as long as pronotum; sides almost straight and parallel on very slightly less than basal three-fourths, broadly rounded behind; scutellum small, round; basal margins each armed by 16 small crenulations; striae rather weakly impressed, punctures moderately large, deep; interstriae as wide as striae, weakly convex, almost smooth, with uniseriate rows of subcrenulate, setiferous granules, each granule about half as wide as an interstriae. Declivity

convex, steep; strial punctures and interstrial granules smaller than on disc. Vestiture consisting of short, rather stout, rather abundant ground cover, and interstrial rows of erect, longer, slender bristles; each bristle about two-thirds as long as distance between rows.

FEMALE.— Similar to male except frons flattened or feebly convex, tubercles smaller; pronotal granules extend to disc, punctures somewhat reduced.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 11 km SE Nochixtlán, 5-VII-53, *Nolena*, S. L. Wood; 25 km SE Nochixtlán, 17-VI-67, No. 52, *Nolena*, S. L. Wood; 16 km S Oaxaca, 6-VII-53, *Nolena*, S. L. Wood.

HOST.— *Nolena* spp.

BIOLOGY.— This monogamous species attacks the dying fruiting stalks of its host. The transverse parental tunnels are in the woody tissue near the periphery. The larval mines follow the grain of the fibers.

NOTES.— The above treatment was based on 24 paratypes and 36 topotypes.

### 9. *Chramesus gracilis* Wood

*Chramesus gracilis* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):2 (Holotype, male; San José, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the very closely related *annectans* (Wood) by the larger average size, by the much more finely, shallowly punctured pronotum, by the smaller, shallow, strial punctures, and by other characters indicated in the above key.

MALE.— Length 2.2–2.7 mm, 2.25 times as long as wide; color dark brown to black, with white vestiture.

Frons rather deeply, concavely impressed from upper level of eyes to epistoma, lateral margins rounded, bearing mesad of margin just above level of antennal insertion a pair of large, squared processes as in *annectans*; surface coarsely reticulate, with a few fine, obscure punctures; vestiture fine, long, rather sparse. Antennal club acutely pointed, 2.6 times as long as wide.

Pronotum 0.9 times as long as wide; widest at base, sides weakly arcuate and converging slightly on basal two-thirds then rather strongly constricted before broadly rounded anterior margin; surface strongly reticulate, with fine, rather widely separated punctures, punctures subasperate in lateral areas; vestiture consisting of stout semirecumbent bristles.

Elytra 1.5 times as long as wide, 1.9 times as long as pronotum; basal margins each armed by 15 small crenulations; sides straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures small, round, shallow, distinct; interstriae about three times as wide as striae, almost flat, smooth and shining with rather abundant, minute, setiferous, confused punctures and median rows of fine setiferous granules. Declivity steep, convex; striae weakly impressed; interstriae feebly convex. Vestiture consisting of rather abundant, short, subplumose scales and interstrial rows of somewhat longer erect bristles, each bristle about two-thirds as long as distance between rows.

FEMALE.— Similar to male except frons very shallowly impressed, tubercles somewhat smaller; pronotal tubercles distinctly larger.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: University of Costa Rica Campus, San José, 12-IX-63, 1300 m, Japanese bamboo, S. L. Wood. PANAMA: Cerro Punta, Chiriquí, 19–23-V-77, H. and A. Howden.

HOST.— *Bambusa vulgaris*.

BIOLOGY.— This monogamous species was taken from dying stumps 10 cm or more in diameter. The diagonal, biramous, egg galleries were immediately below the surface of the wood. Larval mines were parallel to the grain of the wood.

NOTES.— The above treatment was based on the type series of 85 specimens.

### 10. *Chramesus ingens* Wood

*Chramesus ingens* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):3 (Holotype, male; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is unique in having the antennal bases closer together and displaced more dorsad than usual; in having the elytral vestiture fine and of uniform length; and in having the male frons not exacavated, but the lateral margins elevated with their summits at a point well above the level of antennal insertion and not armed by pointed tubercles.

MALE.— Length 2.2–2.8 mm, 1.6 times as long as wide; color dark brown to black.

Frons shallowly impressed from upper level of eyes to epistoma, with an indistinct elevation between antennal bases; lateral margins elevated on middle third, with a rounded summit just above antennal base; surface reticulate, with very fine punctures at sides and above; antennal bases closer together than eyes; distance from epistomal margin (omitting lobe) to antennal bases 1.6 times greatest width of an eye; frons subglabrous. Antennal scape with small tuft of hair; club 2.7 times as long as wide.

Pronotum 0.8 times as long as wide; base strongly bisinuate, basal angles broadly rounded, sides strongly arcuate, widest just behind middle, moderately constricted just behind broadly rounded anterior margin; entire surface reticulate, with small, sparse, finely subasperate punctures, much finer or absent in posteromedian area. Glabrous.

Elytra 1.03 times as long as wide, 1.5 times as long as pronotum; scutellum about twice as wide as long; basal margins each armed by about a dozen basally contiguous crenulations; sides straight and parallel on basal half, broadly rounded behind; striae narrowly impressed, punctures small, distinctly impressed; interstriae about three times as wide as striae, slightly convex, almost smooth with rather numerous, confused, small, rounded, setiferous granules. Declivity convex, moderately steep; about as on disc. Vestiture consisting of fine, erect, confused, hairlike setae, all of equal length, each shorter than a distance equal to width of an interstriae (about two-thirds as long).

FEMALE.— Similar to male except lateral margin of frons very feebly elevated; pronotal punctures almost entirely devoid of small asperities.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 24-X-63, 1300 m, S. L. Wood; Puerto Viejo, Heredia, 12-III-64, 70 m, No. 486, S. L. Wood; Guapiles, Limón, 22-VIII-66, 100 m, No. 105, S. L. Wood.

HOST.— *Serjania mexicana*? (probable error in identification).

BIOLOGY.— This monogamous species attacked a freshly cut vine 2 cm in diameter, and completed its development in less than 20 days. The egg galleries tended to be diagonal and in the cambium, but in the smaller parts of the stem they cut almost to the central axis. The host was identified by a plant taxonomist as *Serjania mexicana*, but the texture of the soft, nonwoody tissues that turned black with age suggests an error in identification.

NOTES.— The above treatment was based on the type series of 272 specimens and on 12 other specimens.

### 11. *Chramesus corniger* Wood

*Chramesus corniger* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):8 (Holotype, male; Lago Catemaco, Veracruz, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is unique in the genus. The male frons is very weakly impressed, the lateral margins are not elevated at all, and the lower frons in the male bears a pair of large denticles near but not on the epistomal margin. The elytral ground vestiture is absent.

MALE.— Length 1.3–1.4 mm, 1.7 times as long as wide; color very dark brown, almost black, vestiture pale.

Frons very shallowly concave from epistoma almost to upper level of eyes, lateral margins rounded, not elevated; a pair of rather large tubercles just above epistomal margin, their bases separated by about one-third width of frons; surface subshining, finely rugulose, a few small, indistinct granules on upper half; vestiture of sparse, fine, inconspicuous hair. Antennal club moderately large.

Pronotum 0.80 times as long as wide; widest near base, sides arcuately converging to rather weak constriction just before rather narrowly rounded anterior margin; entire surface strongly reticulate; punctures small, widely spaced, those on anterior half granulate to very finely asperate. Vestiture of short, stout bristles of moderate abundance.

Elytra 1.1 times as long as wide; sides almost straight and parallel on slightly more than basal half, broadly rounded behind; basal margins of elytra each armed by about 15 crenulations, one submarginal crenulation on interstriae 2; striae feebly impressed, punctures moderately coarse, close; interstriae slightly wider than striae, uniseriately, finely granulate except slightly confused on 2, punctures not evident. Declivity rather steep, convex; sculpture about as on disc. Vestiture of interstrial rows of stout bristles, each 8–10

times as long as wide, slightly shorter than distance between rows, slightly confused on discal interstriae 2.

FEMALE.— Similar to male except frons weakly convex, unarmed; pronotal granules smaller in median area, two or three of those on anterolateral angles crenulate.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: Lago Catemaco, 16-20-VI-69, D. E. Bright.

NOTES.— The above treatment was based on the type series of eight specimens.

### 12. *Chramesus cecropiae* Wood

*Chramesus cecropiae* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):5 (Holotype, male; Rincón de Osa, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This is a unique species having the male frons not exacavated, more nearly protuberant at a level just above antennal insertion, and with the elytral ground vestiture absent; a row of stout bristles marks each interstriae.

MALE.— Length 1.2–1.3 mm, 1.7 times as long as wide; color rather dark brown, elytra somewhat lighter.

Frons longitudinally flattened on two planes, transversely, weakly convex on upper third, then ascending rather abruptly to an indefinite, strongly arcuate line between antennal bases, its median point well above (dorsad) its lateral extremities; lower two-thirds almost flat, lateral margins below very slightly elevated; surface above coarsely reticulate, lower area transversely strigose; vestiture consisting of a few hairlike setae on lateral areas on lower half. Antennal club moderately large for this genus, 2.3 times as long as wide.

Pronotum 0.82 times as long as wide; widest on basal third, sides arcuately converging to a slight constriction just before rather broadly rounded anterior margin; surface shining, subreticulate, with scattered, rather abundant tubercles of variable size on anterior three-fourths, some of those on anterolateral areas finely asperate; a few large, obscure punctures evident toward base. Vestiture rather sparse, consisting of a few stout setae over entire surface.

Elytra 1.1 times as long as wide, 1.4 times as long as pronotum; elytral bases armed by about 12 crenulations; striae feebly if at all impressed, punctures large, moderately deep, distinct; interstriae very slightly wider than striae, very slightly irregular, brightly shining, each bearing a row of small, pointed, setiferous tubercles. Declivity rather steep, convex, sculptured essentially as on disc. Vestiture consisting of rows of interstrial bristles, each bristle somewhat flattened toward its apex and equal in length to distance between bristles within a row and three-fourths distance between rows; very minute strial hair also evident.

FEMALE.— Similar to male except frons more evenly convex, coarsely reticulate throughout, with a median fovea on upper half; pronotal asperities larger, tubercles largely absent but replaced by shallow, rather obscure punctures.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 4 km SW Rincón de Osa, Puntarenas, 21, 28-II-67, *Cecropia* petioles, D. D. Sliwa.

NOTES.— The above treatment was based on the type series of four specimens.

### 13. *Chramesus demissus* Wood

*Chramesus demissus* Wood, 1967, Great Basin Nat. 27:93 (Holotype, male; Volcán Pacaya, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *ingens* Wood by the smaller size, by the less deeply impressed, wider striae, and by the broad, very shallowly impressed male frons with the lateral margins less strongly elevated on the upper third.

MALE.— Length 2.0–2.3 mm, 1.7 times as long as wide; color dark brown.

Frons broadly, irregularly flattened, lateral margins weakly elevated, a pair of very small, very obscure granules below level of antennal insertion; surface rather coarsely reticulate, punctures minute; vestiture short, inconspicuous.

Pronotum 0.8 times as long as wide; widest behind middle, sides strongly arcuate, moderately constricted behind narrowly rounded anterior margin; surface strongly reticulate, dull, with rather numerous small, isolated asperities uniformly distributed, except median basal area with fine, shallow punctures; vestiture consisting of sparse, slender scales.

Elytra 1.1 times as long as wide, 1.6 times as long as pronotum; scutellum as

wide as long; basal margins each armed by 15 crenulations; sides straight and parallel on slightly more than basal half, broadly rounded behind; striae moderately impressed, punctures rather large, deep; interstriae wider than striae, essentially smooth, punctures very fine, each with a uniseriate row of coarse crenulate tubercles, each about half as wide as interstriae, interstriae 2 with double row of tubercles at base. Declivity steep, convex; declivital granules smaller than on disc. Vestiture consisting of small scales on posterior part of disc and on declivity, each scale longer than wide; and median rows of erect, interstrial bristles, each bristle slightly shorter than distance betweeen rows of bristles.

FEMALE.— Similar to male except lateral margins of frons not elevated.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán Pacaya, Esquintla, 1-VI-64, 1300 m, tree seedling, S. L. Wood.

BIOLOGY.— Specimens were extracted from new tunnels in the cambium region of twigs less than 1 cm in diameter.

NOTES.— The above treatment was based on the type series of 13 specimens.

### 14. *Chramesus quadridens* Wood
Fig. 98

*Chramesus quadridens* Wood, 1956, Canadian Ent. 88:256 (Holotype, male; Atlixco, Puebla, Mexico; Snow Ent. Coll., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *pumilus* (Chapuis), with some difficulty, by characters summarized in the above key. The primary reasons for maintaining it as a distinct species are the distinctly larger size and the habits.

MALE.— Length 2.0–2.2 mm, 1.6 times as long as wide; color almost black.

Essentially as in *pumilus* except lateral margins of male frons usually more strongly elevated, frontal impression usually attaining upper level of eyes; pronotal punctures tending to be larger, deeper, more numerous; elytral ground vestiture tending to be slightly longer, each scale two to four times as long as wide, erect bristles stouter, usually less than half as long as distance between rows.

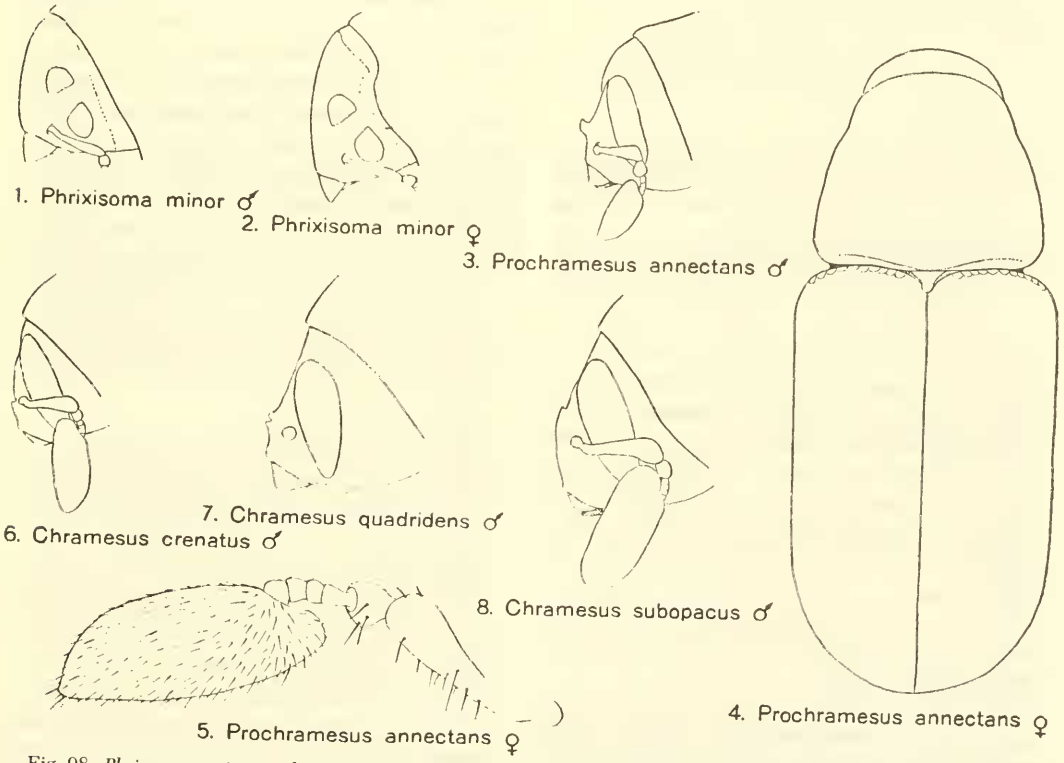



Fig. 98. *Phrixosoma minor* and *Chramesus* spp.: 1, *Phrixosoma minor*, male, 2, same, female; 3, 4, 5, *Chramesus annectans*, male head, female dorsal aspect and antenna; 6, *Chramesus crenatus*, male; 7, *Chramesus quadridens*, male; 8, *Chramesus subopacus*, male. (After Wood 1956:249.)

FEMALE.— Similar to male except frons weakly convex, unarmed.

DISTRIBUTION.— Puebla.

MEXICO: Puebla: 11 km S Atlixco, 13-VII-53, No. 101, S. L. Wood.

BIOLOGY.— Adult specimens and larvae were taken from axial pith tunnels in stems about 5 mm in diameter. The host was a climbing vine, having three leaflets on each leaf; the general character of the stem was quite unlike *Canavalia*.

NOTES.— The above treatment was based on four paratypes.

Mexican specimens of *pumilus* do not exceed 1.8 mm in length, and characters of body sculpture and vestiture are distinct. The larger specimens and those approaching anatomical similarity to *quadridens* are from the area south of Guatemala.

### 15. *Chramesus pumilus* (Chapuis)

*Rhopalopleurus pumilus* Chapuis, 1869, Synopsis des Scolytides, p. 47 (Holotype, male; Teapa, Tabasco, Mexico; Brussels Mus.)

*Chramesus tumidulus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):170 (Lectotype, female; Las Mercedes, Guatemala, male Bugaba, Panama; British Mus. Nat. Hist., subsequent designation by Wood, 1971, Great Basin Nat. 31:143. *Synonymy*

*Chramesus panamensis* Blackman, 1943 Proc. U.S. Nat. Mus. 94:391 (Holotype, female; Panama Canal Zone; U.S. Nat. Mus., 56569); Wood, 1971, Great Basin Nat. 31:143. *Synonymy*

*Chramesus mexicanus* Schedl, 1949, Rev. Brasil Biol. 9:264 (Holotype, female; Comitán, Chiapas, Mexico; Schedl Coll.); Wood, 1971, Great Basin Nat. 31:143. *Synonymy*

DIAGNOSIS.— This is a common, widely distributed, somewhat variable species. Except for the doubtfully distinct *quadridens* Wood, its closest known relatives occur in South America. The two pairs of denticles arming the lateral margins of the male frons distinguish it from most species; characters summarized in the above key distinguish it from *quadridens*.

MALE.— Length 1.4–2.0 mm, 1.7 times as long as wide; color dark brown to almost black, vestiture pale.

Frons rather deeply, broadly concave from epistoma to a point just below upper level of eyes; lateral margins acute on lower two-thirds, armed by two pairs of tubercles at and just below level of antennal insertion; surface finely rugose-reticulate, more nearly reticulate on lower fourth, a few minute, obscure punctures evident below, sparse, fine granules above; vestiture fine, sparse, inconspicuous. Antennal club large, 2.4 times as long as wide.

Pronotum 0.74 times as long as wide; widest one-third legnth from base, sides strongly arcuate, converging toward conspicuous constriction just before rather broadly rounded anterior margin; surface dull, reticulate, small asperities and small shallow punctures about equally abundant, distributed over entire surface, punctures predominate in posteromedian area, asperities in anterolateral areas; vestiture of moderatley short, very stout bristles, a few fine hairs intermixed.

Elytra 1.1 times as long as wide, 1.6 times as long as pronotum; basal margins each armed by 13 crenulations; sides straight and parallel on slightly more than basal half, broadly rounded behind; striae weakly impressed at base, moderately toward declivity, punctures rather coarse, deep; interstriae about one and one-half times as wide as striae, slightly convex, shining, with minute obscure punctures and each with a uniseriate row of coarse, rather close tubercles, each tubercle not more than half as wide as interstriae. Declivity convex, rather steep; striae and interstriae slightly narrower than on disc, tubercles narrower and more widely spaced. Vestiture of small, fringed ground scales, each little longer than wide (longer than this south of Honduras); and interstrial rows of erect bristles, each bristle two-thirds as long as distance between rows, separated within a row by length of a bristle.

FEMALE.— Similar to male except frons feebly convex, lateral margins neither elevated nor armed; pronotal asperities and elytral tubercles usually slightly longer.

DISTRIBUTION.— Nayarit to Panama.

MEXICO: Chiapas, Jalisco, Michoacán, Nayarit, Tabasco. CENTRAL AMERICA: Costa Rica, Guatemala, Honduras, Panama.

HOST.— *Canavalia villosa*.

BIOLOGY.— This monogamous species attacks the stems of wild bean vines larger than 5 mm in diameter. The egg gallery tends to spiral diagonally in the cambium region of smaller stems; it is more nearly transverse in

larger stems. The larval mines are irregular and may consume any portion of the stem.

NOTES.— The above treatment was based on the types of *pumilus*, *tumidulus*, *mexicanus* and *panamensis* and on 221 other specimens. Because Blandford's species was named from two syntypes, I here designate the female, from Las Mercedes, Guatemala, as the lectotype of *tumidulus* Blandford.

Specimens from Costa Rica and Panama tend to have scales in the elytral ground vestiture very slightly more slender than those from the northern part of the distribution; the erect bristles may also be slightly longer.

### 16. *Chramesus aquilus* Wood

*Chramesus aquilus* Wood, 1974, Brigham Young Univ. Sci. Bull, Biol. Ser. 19(1):10 (Holotype, male; 13 km N Ocasingo, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— Among Central American forms this species is most nearly allied to *demissus* Wood, but it is distinguished by the more deeply concave male frons with the lateral margins more strongly elevated, by the more distinctly punctured pronotal disc, by the more rounded interstrial tubercles, and by the different elytral vestiture.

MALE.— Length 1.5–1.8 mm, 1.5 times as long as wide; color black, vestiture pale.

Frons broadly, rather deeply concave from epistoma to slightly below upper level of eyes, lateral margins acutely, rather strongly elevated with highest point just below level of antennal insertion, devoid of denticles; surface strongly reticulate, smooth on epistoma, minute, obscure punctures on upper half of concavity; vestiture inconspicuous. Antennal club large.

Pronotum as in *demissus* except granules smaller, posterior fourth in median area with sparse, shallow, moderately large punctures. Vestiture slightly more slender than in *demissus*.

Elytra 1.02 times as long as wide; sides almost straight and parallel on slightly more than basal half, broadly rounded behind; basal margins each armed by 11 crenulations, one or more submarginal crenulations on interstriae 2–5; striae strongly impressed, punctures moderately coarse, deep; interstriae about one and one-half times as wide as striae, moderately convex, smooth, with rows of rather large, narrowly rounded tubercles, tubercles somewhat confused on 2 and 3. Declivity rather steep, convex; sculpture about as on disc. Vestiture of ground cover of rows of scales on both margins of each interstriae, each scale up to twice as long as wide; and erect bristles in interstrial rows except moderately confused on 2 and 3 on disc, each bristle two-thirds as long as distance between rows, spaced within a row by length of a bristle, each about eight times as long as wide, equal in width to scales in ground cover.

FEMALE.— Similar to male except frons weakly convex, lateral margins rounded; pronotal granules absent, entire surface with shallow, sparse punctures of moderate size.

DISTRIBUTION.— Chiapas.

MEXICO: Chiapas: 13 km N Ocosingo, 2-VI-69, D. E. Bright.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 17. *Chramesus signatipennis* Schedl

*Chramesus signatipennis* Schedl, 1962, Mitt. Münchn. Ent. Ges. 52:97 (Holotype, female; Hamburgfarm on Río Reventazon, Limón, Costa Rica; Schedl Coll.)

DIAGNOSIS.— The unique female holotype is distinguished from *denticulatus* Wood by the slightly larger size, by the stouter body form, by the slightly larger, deeper strial punctures, by the smooth (not reticulate) surfaces of striae and interstriae on the elytral declivity, and by the near absence of granules on the female frons.

FEMALE.— Length 1.4 mm, 1.9 times as long as wide; color yellowish brown.

Frons as in *denticulatus* except granules virtually absent, reticulate. Antennal club small (partly concealed); apparently as in *denticulatus*.

Pronotum 0.76 times as long as wide; as in *denticulatus*; surface strongly reticulate, punctures moderately coarse, obscure; vestiture short, of about equal numbers of slender hairs and stout bristles as in *denticulatus*.

Elytra 1.3 times as long as wide, 1.8 times as long as pronotum; basically as in *denticulatus* except strial punctures slightly larger and deeper and surfaces smooth and shining (not reticulate) on disc and declivity; vestiture as in *denticulatus* and as described in

above key except slightly more abundant and stouter.

MALE.— Unknown; characters cited in above key were based on male of *denticulatus*.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Hamburgfarm on Río Reventazon, Limón, 1-XI-34, at light, F. Nevermann.

BIOLOGY.— The very closely allied *denticulatus* was taken from stems 1–2 cm in diameter of a Bignoniaceae vine. Superficially identical vines occur throughout the lowland forests of Costa Rica and could serve as the host of this species.

NOTES.— The above treatment was based on the holotype.

### 18. *Chramesus subopacus* Schaeffer
Figs. 97, 98

*Chramesus subopacus* Schaeffer, 1908, J. New York Ent. Soc. 16:221 (Lectotype, female; Huachuca Mts., Arizona; U.S. Nat. Mus., 42934, subsequent designation by Blackman, 1938, J. Washington Acad. Sci. 28:541)

*Chramesus canus* Blackman, 1938, J. Washington Acad. Sci. 28:541 (Holotype, female; Tallulah, Louisiana; U.S. Nat. Mus., 43641); Wood, 1971, Great Basin Nat. 31:143. *Synonymy*

DIAGNOSIS.— The male frons of this species is unique in having the lateral margins very strongly, evenly elevated to a level well above the level of antennal insertion; this elevation ends precipitously in a small tubercle directed dorsad. The large size and small, weakly impressed strial punctures also serve as distinguishing features.

MALE.— Length 1.7–2.4 mm, 1.6 times as long as wide; color dark brown to almost black.

Frons rather deeply, broadly concave from epistomal margin to well above eyes; lateral margins elevated, acutely, very strongly elevated on lower half to a point well above level of antennal insertion, strongly elevated portion ending abruptly at this pointed tubercle or angle; surface finely rugose-reticulate above, becoming smooth toward epistoma. Antennal club very large, 2.4 times as long as wide.

Pronotum 0.75 times as long as wide; widest near base, sides strongly arcuate, converging anteriorly to slight constriction just before broadly rounded anterior margin; obscurely reticulate, punctures fine, rather close, not always clearly defined, their anterior margins usually very feebly raised to form a fine granule, a few of those in anterolateral areas asperate, granules absent in posteromedian area; vestiture of short, very stout bristles, a few fine hairs intermixed.

Elytra 1.0 times as long as wide, 1.4 times as long as pronotum; basal margins each armed by 10 crenulations; sides almost straight and parallel on basal half, broadly rounded behind; striae weakly impressed, punctures very small, shallow; interstriae three or more times as wide as striae, feebly convex, punctures minute, confused, each with a median row of slightly larger nongranulate punctures. Declivity convex, steep; essentially as on disc. Vestiture of rather dense, short scales forming a ground cover; each slightly longer than wider; and rows of erect, interstrial bristles, each bristle half as long as distance between rows, separated within a row by distances equal to length of a bristle.

FEMALE.— Similar to male except frons moderately convex, often foveate at center; each interstriae bearing a uniseriate row of granules on disc.

DISTRIBUTION.— Florida and Arizona to Honduras.

USA: **Arizona**: Huachuca Mts. **Florida**: Alachua Co., 15-IX-76, *Celtis laevigata*, T. H. Atkinson. **Louisiana**: Tallulah, 6-II-11, Hunter No. 1984, G. D. Smith. **Texas**: Brownsville, 26-III-51, *Condalia obtusifolia*, S. L. Wood; Kennedy, 30-III-51, *C. obtusifolia*, S. L. Wood; La Grange, 1907, *Celtis*, W. F. Fiske; San Antonio, 1907, *Celtis*, W. F. Fiske. MEXICO: **Colima**: 24 km W Armeria, 30-VI-65, 40 m, No. 142, *Celtis iguanae*, S. L. Wood. **Oaxaca**: 23 km W Tehuantepec, 8-VII-53, *C. iguanae*, S. L. Wood. **Tamualipas**: Encinal 15-VI-53, *Condalia*, S. L. Wood. HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 506, *C. iguanae*, S. L. Wood.

HOSTS.— *Celtis iguanae*, *Celtis* sp., *Condalia obtusifolia*, *C.* sp.

BIOLOGY.— This monogamous species constructs transverse galleries in cut or dying host material larger than 2 cm in diameter.

NOTES.— The above treatment was based on the holotypes of *subopacus* and *canus*, on a male paratype of *subopacus*, on the male allotype of *canus*, and on 126 other specimens. The Louisiana specimens have the elytra very slightly more slender (1.06 times as long as wide), but otherwise they agree completely with specimens from other areas.

### 19a. *Chramesus hicoriae* LeConte
Figs. 97, 99, 100

*Chramesus hicoriae* LeConte, 1868, Trans. Amer. Ent. Soc. 2:168 (Holotype, male; Pennsylvania; Mus. Comp. Zool.)

*Rhopalopleurus lecontei* Chapuis, 1869, Synopsis des Scolytides, p. 46 (Lectotype, male; Amerique Boreale; Brussels Mus., present designation); LeConte, 1876, Proc. Amer. Philos. Soc. 15:375. *Synonymy*

DIAGNOSIS.— This species is distinguished from *asperatus* Schaeffer and *setosus* Wood by the much longer interstrial bristles, by the less extensive male frontal exacavation, by the host, and by the distribution.

MALE.— Length 1.5–1.9 mm, 1.6 times as long as wide; color dark brown to almost black.

Frons broadly, rather deeply concave from epistoma to upper level of eyes; lateral margins acutely elevated, armed by a pair of small teeth just below level of antennal insertion; surface strongly reticulate, punctures fine, close, obscure; vestiture fine, sparse, inconspicuous. Antennal club large, 2.4 times as long as wide.

Pronotum 0.74 times as long as wide; posterior margin bisinuate, median area moderately produced behind; sides widest near base, arcuately converging to a slight constriction just before rather broadly rounded anterior margin; surface reticulate, small, isolated asperities in median area, becoming larger laterally, asperities in posteromedian area usually replaced by a few fine punctures; vestiture of stout, rather short bristles intermixed with less abundant hair.

Elytra 1.0 times as long as wide, 1.5 times as long as pronotum; anterior margins each armed by 9 crenulations; sides almost straight and parallel on basal half, broadly rounded behind; striae weakly impressed, punctures very fine, moderately deep; interstriae feebly convex, almost smooth, punctures very fine, confused, a median row on each interstriae slightly larger and weakly granulate. Declivity steep, convex; as on disc except striae more distinctly impressed. Vestiture of short, slender scales, each about four or more times as long as wide, oriented in a row on both margins of each interstriae, normally a few supplemental scales between these rows; and interstrial rows of erect blunt bristles, each bristle slightly longer than distance between rows, slightly closer than this within a row.

FEMALE.— Similar to male except frons weakly, irregularly convex, lateral margins neither elevated nor armed; pronotal tubercles and interstrial granules larger.

DISTRIBUTION.— Wisconsin, E Kansas, and E Texas to Quebec and Georgia.

CANADA: Ontario, Quebec. USA: Connecticut, Delaware, District of Columbia, Georgia, Illinois, Iowa, Kansas, Maryland, Massachusetts, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, Vermont, West Virginia, Wisconsin.

HOSTS.— *Carya* spp.

BIOLOGY.— Cut and broken hickory branches are selected for attack. The male constructs the entrance tunnel and turning niche, and the female then makes one simple, longitudinal egg gallery about 1–4 cm long that engraves the wood rather deeply. About 15 to 60 eggs (Blackman 1921:51) are deposited in niches along the margins in the cambium region. The larval mines engrave both bark and wood; they radiate out from the parental tunnel at right angles, then gradually curve to parallel the grain of wood. In small twigs with thin bark, larval mines cut progressively more deeply into the wood. Blackman recorded one generation each year in northern areas, but suggested that two generations might be completed in the southern part of the distribution.

NOTES.— The above treatment was based on the types of *hicoriae* and *lecontei* and on 346 other specimens. From the three male syntypes in the Brussels Museum, the second specimen is here designated as the lectotype for *lecontei* Chapuis.

### 19b. *Chramesus atkinsoni* Wood

*Chramesus atkinsoni* Wood, 1981, Great Basin Nat. 41:123 (Holotype, male; Cerro Chipinque, Monterrey, Nuevo León, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *hickoriae* LeConte by the different elytral vestiture as described below and by other minor characters.

MALE.— Length 1.6–1.8 mm, 1.5 times as long as wide; color very dark brown.

Frons similar to *hickoriae* except excavated area very slightly wider in proportion to its length (length/width = 1.36 compared to 1.42).

Pronotum similar to *hickoriae* except more strongly convex (female does not differ in this character).

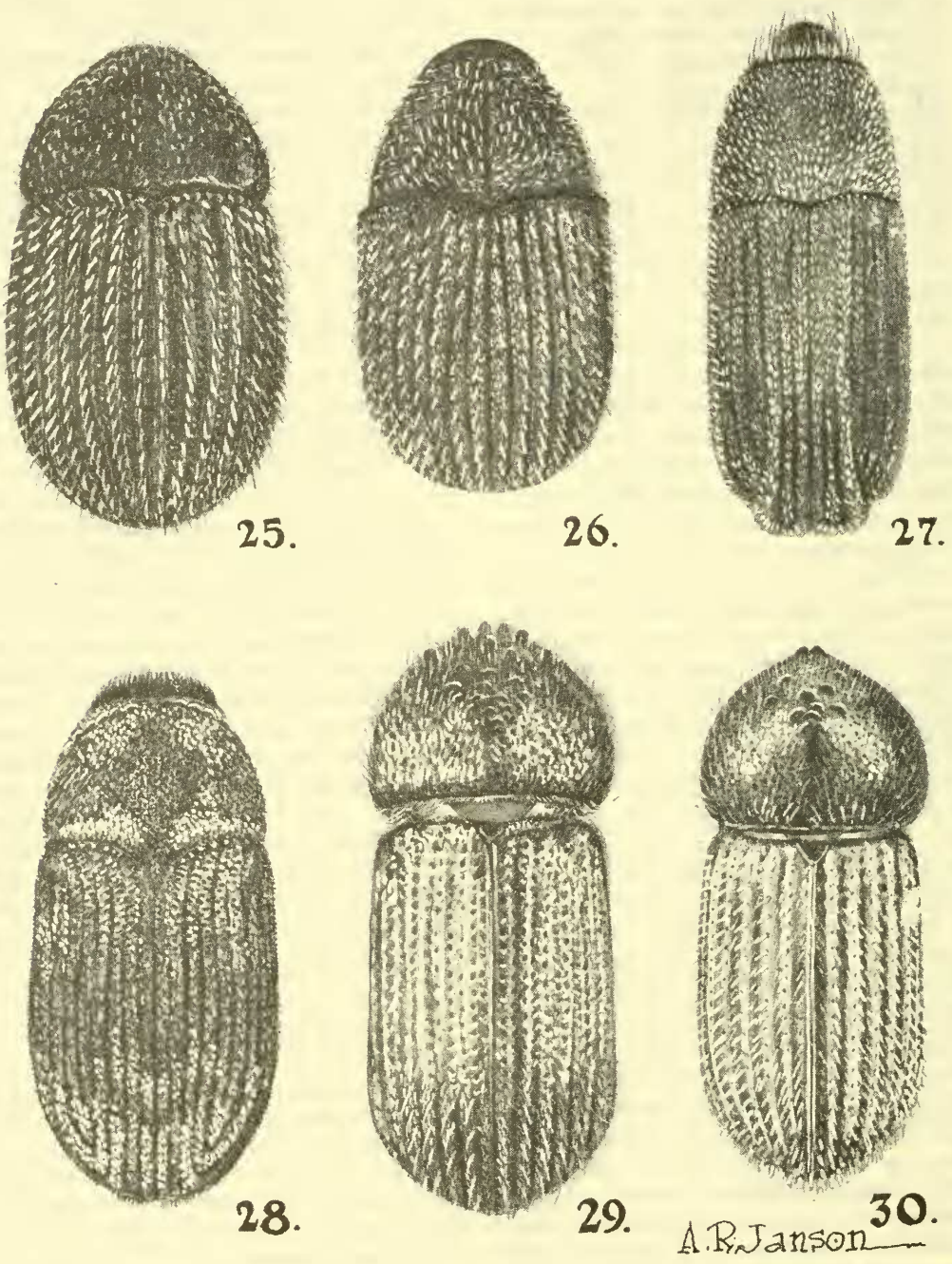



Fig. 99. Scolytidae spp.: 25, *Chramesus hickoriae*; 26, *Chramesus chapuisii*; 27, *Carphoborus bifurcus*; 28, *Hylesinus aculeatus*; 29, *Hypothenemus dissimilis*; 30, *Hypothenemus rotundicollis*. (After Blackman 1922: pl. V.)

Elytra similar to *hickoriae* except interstrial setae in ground cover (forming rows at each interstrial margin) more slender, erect bristles stouter and much shorter, bristles spaced between rows by three-fourths length of a bristle, by length of a bristle within a row (bristles slightly longer than either distance in *hickoriae*); each bristle about eight times as long as wide.

FEMALE.— Similar to male except frons convex and unarmed by a pair of tubercles; pronotum more strongly convex and with asperities averaging larger.

DISTRIBUTION.— Nuevo León.

MEXICO: Nuevo León: Cerro Chipinque, Monterrey, 31-V-80, 1350 m, No. S-021, *Persea*, T. H. Atkinson.

NOTES.— The above treatment was based on the type series of four specimens.

### 20. *Chramesus marginatus* Wood

*Chramesus marginatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):11 (Holotype, male; "Mexico"; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from *setosus* Wood by the larger size, by the larger number of submarginal crenulations on the elytral bases, particularly on interstriae 2, by the presence of interstrial rows of tubercles on the male elytra, and by the smaller, less numerous crenulations on the pronotum.

MALE.— Length 2.5 cm, 1.65 times as long as wide; color dark brown, vestiture pale.

Frons similar to *setosus* but not as deeply concave on upper half, punctures on upper half slightly larger. Pronotum outline as in *setosus*; surface reticulate, a few asperities in lateral areas, a few minute granules on median part of anterior third, punctures small, moderately close, very shallow on anterior half, somewhat deeper in posterior area. Vestiture of short, slender bristles of moderate abundance.

Elytral outline and basal armature as in *setosus*; striae distinctly impressed, punctures very small, moderately deep; interstriae at least four times as wide as striae, weakly convex, smooth, with a central row of fine granules and a row of minute punctures on each margin. Declivity rather steep, broadly convex; sculpture as on disc. Vestiture of sparse, short, erect, slender, bristlelike, ground cover arranged in approximate rows on margins of interstriae, and rows of interstrial bristles arising from granules, each bristle twice as long as ground cover, two-thirds as long as distance between rows, as long as distance between setae within a row.

FEMALE.— Similar to male except frons weakly convex, its lateral margins not elevated or armed; pronotal asperities larger; interstrial tubercles slightly larger.

DISTRIBUTION.— "Mexico."

MEXICO: Intercepted at Brownsville, Texas, 26-I-49, 67333, in dead wood coming from Mexico, 49-2948, D. J. Smith.

NOTES.— The above treatment was based on the type series of three specimens.

### 21. *Chramesus setosus* Wood

*Chramesus setosus* Wood, 1960, Great Basin Nat. 20:61 (Holotype, male; Madera Canyon, Santa Cruz Co., Arizona; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *asperatus* Schaeffer, by the much more slender elytral setae, both ground cover and bristles, by the finer elytral punctures, and by the host.

MALE.— Length 1.2–1.8 mm, 1.5 times as long as wide; color almost black.

Except for the slightly coarser sculpture and much finer vestiture, this species is as in *asperatus*. The two species were taken side by side in their respective hosts at Oak Creek Canyon, where they clearly maintained their specific identities.

DISTRIBUTION.— Arizona and Chihuahua.

USA: Arizona: Madera Canyon in Santa Cruz Co., 1-VIII-60, *Rhamnus betulaefolia*, S. L. Wood; Oak Creek Canyon in Coconino Co., 30-VII-60, 11-VI-69, *R. betulaefolia*, S. L. Wood; Bear Canyon in Santa Catalina Mts., 15-VIII-68, *Rhamnus*, D. E. Bright; Cave Creek in Chiricahua Mts., 20-VII-68, *Rhamnus*, D. E. Bright; Mingus Mts., 23-VIII-68, *Rhamnus*, D. E. Bright. MEXICO: Chihuahua: Colonia Juárez, 22-VII-60, *Morus alba*, S. L. Wood.

HOSTS.— *Rhamnus betulaefolia*, *Morus alba*.

BIOLOGY.— Essentially as in *asperatus*.

NOTES.— The above treatment was based on the type series of 186 specimens and on 98 additional specimens.

### 22. *Chramesus asperatus* Schaeffer

Fig. 97

*Chramesus asperatus* Schaeffer, 1908, J. New York Ent. Soc. 16:220 (Lectotype, female; Chiricahua Mts., Arizona; U.S. Nat. Mus., 42486, subsequent

designation by Blackman, 1938, J. Washington Acad. Sci. 28:539)

*Chramesus gibber* Blackman, 1938, J. Washington Acad. Sci. 28:541 (Holotype, female; Cloudcroft, New Mexico; U.S. Nat. Mus. 43143); Wood, 1971, Great Basin Nat. 31:143. *Synonymy*

DIAGNOSIS.— This species is distinguished from the very closely related *setosus* Wood by the much stouter elytral ground setae and bristles, by the slightly coarser elytral punctures, and by the host.

MALE.— Length 1.4–1.9 mm, 1.5 times as long as wide; color almost black.

Frons as in *hicoriae* except excavated area extending well above upper level of eyes. Antennal club large, 2.6 times as long as wide.

Pronotum 0.73 times as long as wide; as in *hicoriae* except posteromedian punctured area somewhat more extensive, punctures slightly larger, deeper.

Elytra as in *hicoriae* except strial punctures slightly larger, deeper; interstriae three or more times as wide as striae; ground vestiture apparently more abundant, stouter, each scale two to four times as long as wide; erect bristles stouter, about as wide as ground scales, each equal in length to or slightly shorter than distance between rows of bristles.

FEMALE.— Similar to male except frons convex, lateral margins not elevated or armed; pronotal asperities and interstrial tubercles larger.

DISTRIBUTION.— Arizona to New Mexico.

USA: **Arizona:** Chiricahua Mts., Flagstaff, Grand Canyon, Huachuca Mts., Kaibab N.F., Mt. Bigelow in Santa Catalina Mts., Parmalee Pinaleno Mts., Prescott, Sedonia, Williams. **New Mexico:** Cloudcroft, Coolidge, Sandia Mts., Vermejo.

HOST.— *Robinia neomexicana.*

BIOLOGY.— This monogamous species constructs transverse egg galleries in the cambium region of cut, broken, or unthrifty host material usually smaller than 5 cm in diameter. The larval mines wander in the phloem tissues until just before pupation, when they cut more deeply into the wood.

NOTES.— The above treatment was based on the male lectoparatype of *asperatus,* on the female holotype and male allotype of *gibber,* and on 505 additional specimens. Most of the specimens from New Mexico have the vestiture very slightly stouter than those from Arizona, but the difference is neither




Fig. 100. *Chramesus* spp., galleries; 75, *hickoriae*; 76, *chapuisii.* (After Blackman 1922: pl. XVII.)

consistent nor significant; those from the Chiricahua Mountains tend to be intermediate with respect to this character.

### 23. *Chramesus strigatus* Wood

*Chramesus striatus* Wood, 1956 (nec Eggers, 1943), Canadian Ent. 88:256 (Holotype, male; Atlixco, Puebla, Mexico; Snow Ent. Coll., Univ. Kansas)
*Chramesus strigatus* Wood, 1960, Great Basin Nat. 20:62 (Replacement name)

DIAGNOSIS.— This species is distinguished from *asperatus* Schaeffer by the rather closely, transversely strigose proepimeral area, by the much coarser strial punctures, and by the near absence of interstrial granules in both sexes.

MALE.— Length 1.4–1.8 mm, 1.6 times as long as wide; color dark brown to black.

Frons and pronotum essentially as in *asperatus*; antennal club 2.4 times as long as wide; propleural area strongly strigose, about eight transverse (vertical) ridges separated by grooves.

Elytra about 1.0 times as long as wide, 1.6 times as long as pronotum; basal margins each armed by eight coarse crenulations; outline as in *asperatus*; striae weakly impressed, stronger toward declivity, punctures moderately coarse, deep; interstriae not more than twice as wide as striae, punctures rather fine, confused, none granulate. Declivity convex, rather steep; essentially as on disc.

FEMALE.— Similar to male except frons weakly convex with a slight transverse impression just above epistoma; median row of granules on each interstriae very feebly granulate (about as in male *asperatus*).

DISTRIBUTION.— Puebla.

MEXICO: Puebla: 11 km S Atlixco, 13-VII-53, *Acacia*, S. L. Wood.

BIOLOGY.— The newly formed egg galleries of this monogamous species cut deeply into the wood of branches less than 3 cm in diameter.

NOTES.— The above treatment was based on six paratypes.

### 24. *Chramesus punctatus* Wood

*Chramesus punctatus* Wood, 1967, Great Basin Nat. 27:94 (Holotype, male; Volcán Pacaya, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is allied, but not closely related, to *demissus* Wood and *vastus* Wood; it is distinguished by the very coarse strial punctures and interstrial granules, by the longer declivital bristles (except these are absent on interstriae 2), and by the deeper male frontal excavation.

MALE.— Length 1.5–2.1 mm, 1.7 times as long as wide; color dark brown.

Frons broadly, rather deeply excavated from upper level of eyes to epistoma; lateral margins rather strongly, acutely elevated, armed just below level of antennal insertion by a pair of small tubercles; epistomal premandibular lobe long and narrow; surface reticulate, finely, obscurely punctured; vestiture inconspicuous. Antennal scape ornamented by a small tuft of hair.

Pronotum 0.80 times as long as wide; widest on basal fourth, sides moderately arcuate, feebly constricted just behind narrowly rounded anterior margin; surface reticulate, dull, with numerous small, isolated, shining asperities, posteromedian area with a few small punctures; vestiture consisting of short, stout, semirecumbent bristles.

Elytra 1.1 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on more than basal half, broadly rounded behind; basal margins each armed by about 12 crenulations; striae moderately impressed, punctures very large, deep; interstriae about as wide as striae, convex, irregular, punctures minute, each interstriae with a row of very coarse, isolated tubercles. Declivity moderately steep, broadly convex; striae and interstriae somewhat narrower; interstriae 2 and 4 devoid of tubercles (some paratypes with one or more on each). Vestiture consisting of numerous small scales on declivity, and median interstrial rows of erect bristles from base to apex; each bristle as long as distance between rows of bristles and between adjacent bristles in a row; declivital interstriae 1 and 4 (usually) devoid of bristles (in a few specimens both bear one or more bristles).

FEMALE.— Similar to male except frons weakly convex, lateral margins not elevated or armed, a slight transverse impression just above epistoma.

DISTRIBUTION.— Guatemala.

GUATEMALA: Guatemala City, 30-V-64, S. L. Wood; Volcán Pacaya, Esquintla, 1-VI-64, S. L. Wood. Both taken from the same host species.

HOST.— Probably *Canavalia* sp.

BIOLOGY.— This species attacked recently cut vines larger than 1 cm in diameter. The egg galleries were transverse; larval mines apparently wandered at random.

NOTES.— The type series of 121 specimens was used to prepare the above treatment.

### 25. *Chramesus vastus* Wood

*Chramesus vastus* Wood, 1967, Great Basin Nat. 27:92 (Holotype, male; Cerro Punta, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from all others in the genus by the large size, by the sculpture and hairlike vestiture of the pronotum, and by the scalelike ground vestiture of the elytra with median interstrial rows of longer, hairlike setae.

MALE.— Length 2.4–2.7 mm, 1.7 times as long as wide; color dark brown.

Frons broadly, shallowly excavated from epistoma to a point well below upper level of eyes, lateral margins acutely, rather strongly elevated and armed just below level of antennal insertion by a pair of tubercles; epistomal margin slightly elevated; surface rugose-reticulate, with fine punctures on marginal areas; vestiture inconspicuous.

Pronotum 0.8 times as long as wide; widest just behind middle, sides strongly arcuate, moderately constricted just behind anterior margin, broadly rounded in front; surface reticulate, dull, with rather numerous small, isolated, shining asperities uniformly distributed from base to anterior margin except small and sparse in posteromedian area; vestiture consisting of short, sparse, coarse hair.

Elytra 1.1 times as long as wide, 1.6 times as long as pronotum; sides straight and parallel on basal half, broadly rounded behind; basal margins each armed by 10 crenulations; striae 1 and 2 deeply, others moderately impressed, punctures small, occasionally subconfluent on 1 and 2; interstriae about one and one-half times as wide as striae, weakly convex, punctures shallow, minute, confused, each interstriae with a median row of large tubercles except small on base of 1 and often a partial double row at base of 2. Declivity rather steep, convex; striae and interstriae narrower than on disc; tubercles narrower and higher, except absent on lower half of interstriae 1 and 2. Vestiture consisting of very small, abundant scales, each scale slightly longer than wide except hairlike along suture, and median rows of erect interstrial, hairlike bristles, each bristle slightly shorter than distance between rows.

FEMALE.— Similar to male except frons convex; pronotum with punctures on disc impressed and feebly or not at all asperate toward base, lateral areas more strongly asperate; elytral striae more deeply impressed, interstrial tubercles continuing to apex on 1 and 2.

DISTRIBUTION.— Panama.

PANAMA: Cerro Punta, Chiriquí, 11-19-I-64, 2000 m, Nos. 315, 348, 371, 376, *Inga* sp., S. L. Wood.

BIOLOGY.— This monogamous species attacked cut or unthrifty limbs and branches up to about 10 cm in diameter. The subtransverse parental galleries penetrated directly into the sapwood; the larvae evidently spent their entire period of development in the sapwood.

NOTES.— The above treatment was based on the type series of 19 specimens.

### 26. *Chramesus vitiosus* Wood

*Chramesus vitiosus* Wood, 1969, Great Basin Nat. 29:125 (Holotype, male; Rosamorada, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the closely related *crenatus* Wood by the shorter, erect, interstrial bristles, by the complete absence of male strial punctures, and by the greater distribution of pronotal punctures.

MALE.— Length 1.2–1.5 mm, 1.4 times as long as wide; color very dark brown, vestiture pale.

Frons broadly, deeply concave from epistoma to well above eyes, lateral margins acutely, strongly elevated, attaining a subserrate summit at level of antennal insertion, lower tubercle usually predominating; surface shining, finely reticulate, punctures not clearly evident; vestiture fine, inconspicuous. Antennal club moderately large, 2.3 times as long as wide.

Pronotum 0.72 times as long as wide; widest on basal fourth, sides arcuately converging to slight constriction just before rather broadly rounded anterior margin; surface subreticulate, rather closely asperate, asperities largely replaced by fine punctures in

posteromedian area, a few punctures occur almost to anterior margin in median area; vestiture of moderately abundant, short, stout, pale bristles over entire surface.

Elytra 0.91 times as long as wide, 1.4 times as long as pronotum; basal margins each armed by about 12 partly contiguous, low crenulations; sides straight and parallel on less than basal half, broadly rounded behind; striae distinctly impressed, glabrous, punctures obsolete; interstriae as wide as striae, almost smooth, small punctures close, confused. Declivity convex, rather steep; a few strial punctures obscurely present. Vestiture consisting of a ground cover of closely set, short scales, each scale about twice as long as wide; and interstrial rows of erect scalelike bristles, each bristle not more than twice as long as ground scales, about half as long as distance between rows or between bristles within a row.

FEMALE.— Similar to male except frons weakly convex, foveate at center, a weak, transverse impression just above epistoma; punctures on pronotum slightly coarser and more widely distributed; strial punctures small, distinctly impressed; occasional very small interstrial granules evident; scales in interstrial ground cover only slightly longer than wide.

DISTRIBUTION.— Nayarit.

MEXICO: **Nayarit**: Los Corchos, 10-VII-65, 10 m, No. 211, *Inga paterno*, S. L. Wood; 48 km N Rosamorada, 15-VII-65, 100 m, No. 255, 8 km S, 14-VII-65, 100 m, No. 248, *Inga paterno*, S. L. Wood.

BIOLOGY.— This monogamous species was taken from longitudinal egg galleries in dying branches up to 10 cm in diameter.

NOTES.— The above treatment was prepared from the type series of 65 specimens.

### 27. *Chramesus wisteriae* Wood

*Chramesus wisteriae* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):11 (Holotype, male; Bay St. Louis, Mississippi; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from *chapuisi* LeConte by the smaller tuft of hair on the male scape, by the less strongly impressed male frons, by the presence of interstrial tubercles on the male elytra, and by the slightly shorter elytral bristles in both sexes.

MALE.— Length 1.6–1.8 mm, 1.6 times as long as wide; color very dark brown, vestiture pale.

Frons as in *acacicolens* except surface with sparse, minutely granulate, small, obscure punctures. Pronotum as in *acacicolens* except granules evidently smaller, less conspicuous, punctures much larger, deeper, closer, punctures discernible from base to anterior fourth; vestiture slightly more abundant.

Elytra 1.2 times as long as wide; as in *acacicolens* except striae weakly impressed, punctures larger, more distinctly impressed; interstriae slightly less than twice as wide as striae; erect interstrial bristles very slightly shorter and more slender than in *acacicolens*, each bristle six to eight times as long as wide, half as long as distance between rows.

FEMALE.— Similar to male except frons weakly convex, lateral margins not elevated or armed, foveate at center; pronotal asperities in lateral areas larger; interstrial tubercles distinctly larger.

DISTRIBUTION.— Mississippi.

USA: **Mississippi**: Bay St. Louis, 12-V-45, *Wisteria*, 45-9773, presumably taken by W. H. Anderson.

NOTES.— The above treatment was based on the type series of five specimens.

### 28. *Chramesus chapuisi* LeConte

Figs. 97, 99, 100

*Chramesus chapuisi* LeConte, 1876, Proc. Amer. Philos. Soc. 15:375 (Holotype, female; Louisiana; Mus. Comp. Zool.)

DIAGNOSIS.— This species is allied to *periosus* Wood, but it is distinguished by the smaller size, by the smaller, stouter antennal club, and by the tuft of hair on the male scape.

MALE.— Length 1.5–2.0 mm, 1.7 times as long as wide; color dark brown.

Frons broadly, deeply concave from epistoma to above upper level of eyes, lateral margins acutely elevated and armed by a pair of small teeth just below level of antennal insertion; surface reticulate, with fine, obscure punctures; vestiture rather fine, inconspicuous. Antennal scape bearing a large tuft of long yellow hair; club 2.2–2.4 times as long as wide.

Pronotum 0.76 times as long as wide; outline as in related species; surface reticulate (somewhat obscure) with isolated asperities

over entire surface except partly or entirely replaced by moderately fine punctures in posteromedian area (somewhat variable within a series), asperities rather coarse laterally; vestiture of mixed stout bristles and fine hair of moderate length.

Elytra 1.05 times as long as wide, 1.5 times as long as pronotum; anterior margins each armed by 11 crenulations; sides almost straight and subparallel on slightly more than basal half, rather broadly rounded behind; striae weakly impressed, punctures rather small, deep; interstriae about two and one-half times as wide as striae, feebly convex, smooth with a few very minute points, punctures fine, confused, none granulate. Declivity convex, steep; striae, particularly 1, somewhat more strongly impressed, otherwise essentially as on disc. Vestiture consisting of ground cover of rather abundant, confused scales, each scale about twice as long as wide except near suture; and erect, interstrial rows of rather slender bristles, each slightly shorter than distance between rows, spaced within a row by slightly shorter distances.

FEMALE.— Similar to male except frons irregularly, weakly convex, foveate at center; tuft of hair on antennal scape greatly reduced or absent; pronotal asperities slightly coarser; each interstriae with a median row of pointed tubercles.

DISTRIBUTION.— Kansas and Pennsylvania to San Luis Potosí and Florida.

USA: Florida, Kansas, Louisiana, Maryland, Mississippi, Pennsylvania, Texas. MEXICO: San Luis Potosí.

HOSTS.— *Celtis occidentalis*, *C.* sp., and possibly *Robinia*.

BIOLOGY.— Small, cut, broken or unthrifty branches are selected for attack. The egg galleries are from 1–3 cm long, longitudinal, and engrave the wood rather deeply. Larval mines radiate out from the parental tunnel and usually gradually curve to parallel the grain of the wood.

NOTES.— The above treatment was based on the holotype and on 465 other specimens. The holotype is a female, not a male, as has been reported.

### 29. *Chramesus periosus* Wood

*Chramesus periosus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):5 (Holotype, male; Jáltipan, Veracruz, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *crenatus* Wood by the larger size, by the larger number of fused crenulations on the elytral bases, and by other characters.

MALE.— Length 2.0–2.5 mm, 1.4 times as long as wide; color brown.

Frons broadly concave from epistomal margin to upper level of eyes; lateral margins acutely elevated from well below upper level of eyes to epistomal margin, bearing a pointed tubercle at level of antennal insertion; surface reticulate, obscurely, finely punctured; vestiture fine, inconspicuous. Antennal scape with several hairlike setae; club 2.4 times as long as wide.

Pronotum 0.73 times as long as wide; posterolateral angles one-third pronotum length from base, median area slightly produced posteriorly; sides widest at posterolateral angles, strongly, arcuately convergent to moderate constriction just before rather broadly rounded anterior margin; surface finely reticulate, with fine, moderately deep, rather close punctures, about half of those in central area finely asperate on their anterior margins, asperities larger and more numerous toward anterolateral angles; vestiture consisting of stout, rather short, recumbent bristles and similar, very fine hair.

Elytra 0.90 times as long as wide, 1.4 times as long as pronotum; anterior margins armed by low, basally fused crenulations that merge lateral to striae 4 into a continuous costa; striae moderately impressed, punctures small, moderately deep, rather widely spaced; interstriae about twice as wide as striae, weakly convex, a median row of rather fine nongranulate punctures and many confused minute punctures on each interstriae. Declivity rather steep, convex; sculpture essentially as on disc. Vestiture consisting of ground cover of small nonoverlapping interstrial scales, each slightly longer than wide, and median rows of erect interstrial bristles, each bristle twice as long as ground vestiture and four to five times as long as wide and spaced within a row by slightly more than length of a bristle.

FEMALE.— Similar to male except frons not impressed, almost flat, lateral margins not elevated or armed; lateral asperities on

pronotum coarse, those in posteromedian area somewhat reduced; each interstriae bearing a uniseriate row of coarse, narrow tubercles, each almost as high as wide.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: 5 km W Jáltipan, 25-VI-67, 10 m, No. 99, S. L. Wood.

HOST.— A tree awaiting identification.

BIOLOGY.— This monogamous species attacked recently cut branches 3 to 8 cm in diameter. The somewhat biramous, transverse parental tunnels extended into the sapwood about 5 mm below the surface. *Chramesus crenatus* and *Scolytus propinguus* shared the same host material.

NOTES.— The above treatment was based on the type series of 58 specimens.

### 30. *Chramesus variabilis* Wood

*Chramesus variabilis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):9 (Holotype, male; Lago Catemaco, Veracruz, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *periosus* Wood by the smaller size, by the smaller strial punctures, by the bicolored elytral setae, and by the very different male frons.

MALE.— Length 1.8–2.3 mm, 1.6 times as long as wide; color dark brown, vestiture forming a slightly variegated pattern in most specimens.

Frons broadly, deeply concave from epistoma to slightly above eyes, lateral margins acutely, rather strongly elevated, armed just above level of antennal insertion by a large triangular dentation; surface reticulate, epistoma and large premandibular lobe smooth, shining; vestiture of sparse, minute hair. Antennal club large.

Pronotum 0.74 times as long as wide; outline as in *disparilis*; surface finely reticulate, punctures small, shallow, close, spaced by distances equal to diameter of a puncture, devoid of granules. Vestiture of short hair and equal numbers of scales, each scale four to six times as long as wide; central and anterior setae darker.

Elytra 1.05 times as long as wide; sides almost straight and parallel on basal half, broadly rounded behind; 12 pairs of crenulations on basal margins, six submarginal crenulations scattered on bases of interstriae 2–4; striae distinctly impressed, punctures small, rather shallow; interstriae three times as wide as striae, smooth, bristle-bearing punctures small, almost uniseriate, those punctures bearing ground scales minute. Declivity rather steep, convex; sculpture as on disc. Vestiture of ground cover of small scales, each scale one to two times as long as wide; and rows of erect bristles, each bristle about twice as long as ground cover, half as long as distance between rows, as long as distance between bristles within a row, each bristle about six times as long as wide; in an obscure variegated pattern.

FEMALE.— Similar to male except frons weakly convex, lateral margins rounded, unarmed, surface rugose-reticulate; anterolateral areas of pronotum sparsely asperate.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: Lago Catemaco, 16–20-VI-69, D. E. Bright.

NOTES.— The above treatment was based on the type series of 26 specimens.

### 31. *Chramesus microporosus* Wood

*Chramesus microporosus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):10 (Holotype, male; El Sumidero, 24 km N Tuxtla Gutierrez, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *periosus* Wood by the deeper male frontal concavity that extends slightly above the upper level of the eyes, by the finer pronotal punctures and granules, by the fewer submarginal crenulations on the elytral bases, by the minute strial punctures, by the more slender, nonsubplumose scales of the elytral ground vestiture.

MALE.— Length 1.8–2.4 mm, 1.6 times as long as wide; color very dark reddish brown.

Frons as in *periosus* except concavity extending slightly above eyes, much deeper on upper half. Pronotum as in *periosus* except punctures less than one-third as large as granules, much smaller and less numerous.

Elytra as in *periosus* except submarginal crenulations near base of elytra about half as

numerous, strial punctures very minute to entirely obsolete, striae smooth, shining, interstrial punctures also minute; scales in ground cover about four times as long as wide, not subplumose; bristles about three times as long as ground cover, scalelike, each about six to eight times as long as wide.

FEMALE.— Similar to male except frons convex, foveate at center; lateral areas of pronotum asperate; strial punctures very small, but distinctly larger; interstriae each with a row of moderately large, pointed tubercles.

DISTRIBUTION.— Chiapas.

MEXICO: Chiapas: El Sumidero, 24 km N Tuxtla Gutierrez, 7-VI-69, D. E. Bright.

NOTES.— The above treatment was based on the type series of 17 specimens.

### 32. *Chramesus xylophagus* Wood

*Chramesus xylophagus* Wood, 1956, Canadian Ent. 88:255 (Holotype, male; Rosario, Sinaloa, Mexico; Snow Ent. Coll., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *crenatus* Wood by the larger size, by the slender pronotal setae, by the presence of male interstrial granules, and by the xylophagous habit.

MALE.— Length 1.6–1.9 mm, 1.6 times as long as wide; color very dark brown.

Frons broadly, rather deeply concave from epistoma to just above upper level of eyes, lateral margins acutely elevated and armed by a pair of small teeth just below level of antennal insertion; surface minutely reticulate (almost rugose-reticulate), very finely, obscurely punctured; vestiture fine, sparse, inconspicuous. Antennal club 2.6 times as long as wide.

Pronotum 0.75 times as long as wide; widest near base, sides strongly, arcuately convergent to moderate constriction just before broadly rounded anterior margin; surface subreticulate, closely, rather coarsely, deeply punctured, anterior margins of a few anteromedian punctures minutely asperate, anterolateral areas with slightly larger asperities; vestiture of flattened, moderately short bristles, hairlike setae almost absent.

Elytra 1.0 times as long as wide, 1.5 times as long as pronotum; basal margins each armed by 11 crenulations; sides almost straight and parallel on basal half, rather broadly rounded behind; striae 1 moderately, others weakly impressed, punctures rather coarse, deep; interstriae almost twice as wide as striae, weakly convex, each with a uniseriate row of rounded granules, punctures numerous, minute, confused. Declivity broadly convex, steep; essentially as on disc. Vestiture consisting of ground cover of small, interstrial scales, each slightly longer than wide; and uniseriate rows of erect, flattened bristles, each bristle about three times as long as ground scales, at least five times as long as wide, each about half as long as distance between rows and within a row.

FEMALE.— Similar to male except frons convex, lateral margins not elevated or armed; pronotal asperities and interstrial granules distinctly larger.

DISTRIBUTION.— Sinaloa to Nayarit.

MEXICO: Nayarit: 8 km S Rosamorada, 14-VII-65, 100 m, No. 248, *Inga paterno*, S. L. Wood; 48 km N Rosamorada, 15-VII-65, 100 m, No. 255, *Inga paterno*, S. L. Wood. Sinaloa: Rosario, 21-VII-53, 40 m, S. L. Wood.

BIOLOGY.— Broken branches 1–5 cm in diameter were attacked. The parental tunnels cut deeply into the wood; larval mines were only partly developed, but they tended to follow the grain deep in the wood.

NOTES.— The above treatment was based on seven paratypes and on 59 other specimens.

### 33. *Chramesus crenatus* Wood

Fig. 98

*Chramesus crenatus* Wood, 1956, Canadian Ent. 88:257 (Holotype, male; Veracruz, Mexico; Snow Ent. Coll., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from the very closely related *vitiosus* Wood by the longer interstrial bristles, by the presence of distinct strial punctures in the male, and by the more restricted distribution of pronotal punctures.

MALE.— Length 1.3–1.6 mm, 1.6 times as long as wide; color very dark brown.

Frons as in *vitiosus* except with a central fovea. Antennal club 2.0 times as long as wide.

Pronotum 0.75 times as long as wide; as in *vitiosus* except punctures mostly larger, very shallow, confined to posteromedian fourth, asperities very slightly larger; vestiture of stout and very fine setae intermixed.

Elytra 1.0 times as long as wide, 1.4 times as long as pronotum; as in *vitiosus* except striae more strongly impressed, punctures small, rather deep, interstriae more strongly convex; scales in ground vestiture wider; erect interstrial bristles much longer, more slender, each bristle at least three times as long as ground scales, almost as long as distance between rows.

FEMALE.— Similar to male except frons convex, foveate; pronotal asperities evidently coarser.

DISTRIBUTION.— Veracruz to Yucatán.

MEXICO: Veracruz: Veracruz, 30-VI-53, S. L. Wood; 5 km W Jáltipan, 25-VI-67, 10 m, No. 99, S. L. Wood. Yucatán: "Yucatán," 23-III-61, E. J. Davidson.

BIOLOGY.— Small branches, up to 4 cm in diameter, of trees cut about three days previously were attacked by this species. The new parental tunnels were transverse, rather deeply engraving wood. This species was associated with *Chramesus periosus* and *Scolytus propinguus* in a moderately large tree that awaits identification.

NOTES.— The above treatment was based on 138 paratypes and on 72 other specimens.

## 34. *Chramesus bicolor* Wood

*Chramesus bicolor* Wood, 1967, Great Basin Nat. 27:91 (Holotype, male; La Lima, Cortez, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the unique bicolored pattern of scales.

MALE.— Length 1.4–1.7 mm, 1.6 times as long as wide; body color very dark brown, with white scales except dark scales on a subcordate area occupying median third of pronotum anterior to basal fourth, and on elytra a pair of dark areas on posterior half of disc from interstriae 2 to 8 but not extending on declivity.

Frons broadly excavated from epistoma to upper level of eyes, lateral margins acute, armed just below level of antennal insertion by a pair of small teeth; surface strongly reticulate, punctures very fine; vestiture short, sparse.

Pronotum 0.83 times as long as wide; widest at base, sides arcuately converging, then distinctly constricted just behind broadly rounded anterior margin; surface rather coarsely, deeply punctured, dull; surface largely obscured by scalelike vestiture, each scale at least three times as long as wide, a few fine, slender bristles intermixed.

Elytra 1.0 times as long as wide, 1.3 times as long as pronotum; basal margins each armed by 12 crenulations; sides straight and parallel on basal half, broadly rounded behind; striae moderately impressed, punctures large, rather deep; interstriae slightly wider than striae, moderately convex, punctures squamiferous, confused, median row weakly subvulcanate, largely obscured by vestiture. Declivity steep, convex; sculpture as on disc except striae and interstriae somewhat narrower. Vestiture consisting of short, broad scales, each scale as wide as long; and median interstrial rows of longer erect scales, each about five times as long as wide and almost as long as distance between rows of scales.

FEMALE.— Similar to male except frons weakly convex, lateral margins not elevated, unarmed; anterolateral areas of pronotum more coarsely asperate; interstrial granules slightly larger.

DISTRIBUTION.— Honduras.

HONDURAS: La Lima, Cortez, 5-V-64, 50 m, *Cestrum scandens*, S. L. Wood.

BIOLOGY.— This monogamous species attacks stems less than 5 mm in diameter. The diagonal or longitudinal egg galleries are more or less in the cambium region, although in smaller stems they cut rather deeply.

NOTES.— The above treatment was based on the type series of 63 specimens.

## 35. *Chramesus minulus* Wood

*Chramesus minulus* Wood, 1969, Great Basin Nat. 29:126 (Holotype, female; La Ceiba, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *acacicolens* Wood by the smaller size, by the more slender form, by the much shorter, erect, interstrial scales, and by the stouter pronotal scales.

FEMALE.— Length 1.2–1.3 mm, 1.8 times as long as wide; color yellowish brown.

Frons weakly convex, somewhat flattened on upper half, a slight transverse impression just above epistoma; surface minutely rugulose-reticulate, fine punctures indistinct; vestiture short, rather sparse, stout. Antennal club rather small for this genus, 2.0 times as long as wide.

Pronotum 0.80 times as long as wide; widest at base, sides rather weakly arcuate and converging slightly on basal two-thirds, broadly rounded in front; surface rather finely, closely granulate-punctate (largely obscured by scales), becoming finely asperate toward anterolateral angles; vestiture of short, oval almost white scales.

Elytra 1.2 times as long as wide, 1.7 times as long as pronotum; basal margins each armed by 13 crenulations; sides almost straight and parallel on slightly more than basal half, rather broadly rounded behind; striae weakly impressed, punctures coarse, sharply impressed, rather shallow; interstriae about one and one-half times as wide as striae, moderately convex, smooth with minute confused punctures, each interstriae with a median row of very fine granules. Declivity convex, moderately steep; essentially as on disc. Vestiture consisting of a ground cover of short scales, each scale as long as wide, slightly more than a third as wide as an interstriae, and median interstrial rows of erect scales, each only slightly longer than ground scales and mostly about twice as long as wide.

DISTRIBUTION.— Honduras.

HONDURAS: La Ceiba, Atlantida, 29-V, 10-VI-49, at light, E. C. Becker.

NOTES.— The above treatment was based on the two females in the type series.

### 36. *Chramesus acacicolens* Wood

*Chramesus acacicolens* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):3 (Holotype, male; Cañas, Guanacaste, Costa Rica; Wood Coll.)

DIAGNOSIS.— A species closely related to *minulus* Wood, but distinguished by the smaller size, by the less slender body form, by the longer, erect, interstrial scales, and by the more slender pronotal scales.

MALE.— Length 1.5–1.8 mm, 1.65 times as long as wide; color light brown.

Frons broadly, concavely excavated from above upper level of eyes to epistoma, deepest point near middle, subfoveate; lateral margins acute below, armed by a pair of tubercles just below level of antennal insertion; surface coarsely reticulate, a few minute punctures scarcely visible; vestiture fine, short, inconspicuous.

Pronotum 0.73 times as long as wide; median basal area slightly produced into scutellar notch, sides widest near base, rather strongly arcuate, constricted just behind broadly rounded anterior margin; surface minutely rugulose, dull, rather finely, shallowly punctured, punctures becoming finely asperate toward anterior and lateral areas; vestiture consisting of short, stout bristles intermixed with similar fine hair.

Elytra 1.07 times as long as wide, 1.6 times as long as pronotum; basal margins each armed by 11 crenulations; sides straight and parallel on basal half, broadly rounded behind; striae impressed, punctures rather large, deep; interstriae about twice as wide as striae, convex, with small, abundant, squamiferous punctures and median rows of small tubercles that decrease in size posteriorly. Declivity convex, moderately steep, as on disc, except tubercles not evident. Vestiture consisting of abundant short scales, each slightly longer than wide; and interstrial rows of erect scales each slightly more than twice as long as ground vestiture and about three times as long as wide.

FEMALE.— Similar to male except frons weakly convex, transversely impressed just above epistoma, minute punctures more evident, lateral margins not elevated or armed; pronotal asperities evident only at anterolateral angles; interstrial granules larger; interstrial bristles often longer, each up to five times as long as wide.

DISTRIBUTION.— Costa Rica to Venezuela.

COSTA RICA: 4 km NW Cañas, Guanacaste, 13-VII-66, 50 m, *Acacia* sp., No. 10, S. L. Wood.

BIOLOGY.— This species attacks broken branches and twigs less than 2 cm in diameter. The parental tunnels are in the cambium region.

NOTES.— The above treatment was based on the type series of 82 specimens.

### 37. *Chramesus disparilis* Wood

*Chramesus disparilis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):9 (Holotype, male; Lagos de Colores, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species superficially resembles *acacicolens* Wood, but the male frons is entirely different; the elytral ground vestiture and erect bristles are broad. It is not

closely related to any species from North or Central America.

MALE.— Length 1.4–1.7 mm, 1.9 times as long as wide; color dark brown, vestiture pale.

Frons very deeply, broadly concave from epistoma to slightly above eyes; lateral margins subacutely elevated, armed just above level of antennal insertion by a pair of low, blunt, subquadrate denticles having their bases displaced mesad from crest of lateral margins; surface finely rugose-reticulate, shining; vestiture of sparse, minute hair in concavity, a few stout setae of moderate length at margins. Antennal club small for this genus, apex narrowly rounded.

Pronotum 0.76 times as long as wide; widest at base, sides and anterior margin almost forming a semicircular arc, anterior constriction almost obsolete; surface finely reticulate, shining, small granules of moderate abundance extending from anterior margin to base. Vestiture rather abundant, short, scalelike, each scale about two to three times as long as wide.

Elytra 1.3 times as long as wide; sides almost straight and parallel on slightly more than basal half, rather broadly rounded behind; basal margins each armed by 13 crenulations, about 6 submarginal crenulations scattered from interstriae 2–4; striae distinctly, weakly impressed, punctures rather coarse, deep; interstriae slightly wider than striae, each with a uniseriate row of fine granules and minute, obscure punctures. Declivity rather steep, convex; as on disc except interstriae 2 on lower half devoid of granules and feebly impressed. Vestiture consisting of ground cover of short, recumbent, interstrial scales, each scale about twice as long as wide; and interstrial rows of erect, scalelike bristles, each about six times as long as wide, each slightly more than half as long as distance between rows or between bristles within a row.

FEMALE.— Similar to male except frons feebly convex, lateral margins rounded and unarmed; scales in elytral ground cover only slightly longer than wide.

DISTRIBUTION.— Chiapas.

MEXICO: **Chiapas**: Lagos de Colores, 14-VI-69, *Acacia*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 49 specimens.

## Tribe HYPOBORINI

Hypoborinae Nüsslin, 1911, Zeitschr. wissensch. Insektenbiol. 7:376 (Type-genus: *Hypoborus* Erichson, 1836)

Anatomical features.— The frons of some American *Liparthrum* species is sexually dimorphic, with the male frons flat to convex, the female impressed; most species are not dimorphic; in the remainder of the tribe the male frons is impressed, the female flat to convex. In addition, the eye is entire, the antennal funicle is 4–5-segmented, the pronotum usually is armed, the procoxae are contiguous, the third tarsal segments are slender, the scutellum is not visible, the elytral crenulations do not extend laterad from striae 5, and the metatergum is fused to the postnotum.

Biological features.— All species are monogamous and phloeophagous. Parental tunnels in *Liparthrum* are a simple cave or enlarged nuptial chamber, with the eggs placed in niches along the margin. In *Chaetophloeus* short, crude egg galleries may extend from the central chamber, with the eggs placed in obscure niches. Larval mines wander considerably, but rarely cross one another. Symbiotic relationships with fungi have not been reported.

Taxonomy.— *Liparthrum* is apparently a relic genus with a few rare species scattered almost worldwide except Australia. *Chaetophloeus* is largely restricted to southwestern North America, with two species in South America. Allied genera occur in Africa. Members of this tribe apparently prefer arid or semiarid areas and tend to be rather rare. The two American genera are very different and easily distinguished from one another.

### Genus *CHAETOPHLOEUS* LeConte

*Chaetophloeus* LeConte, 1876, Proc. Amer. Philos. Soc. 15:382 (Type-species: *Hylesinus hystrix* LeConte, monobasic)

*Renocis* Casey, 1886, California Acad. Sci. Bull. 6:257 (Type-species: *Renocis heterodoxus* Casey, monobasic); Schedl, 1963, Ent. Abh. Ber. Mus. Tierk. Dresden 28:363. *Synonymy*

*Pseudocryphalus* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):20 (Type-species: *Pseudocryphalus brittaini* Swaine, original designation); Blackman, 1940, Proc. U.S. Nat. Mus. 88:374. *Synonymy*

Diagnosis.— In the American fauna this genus is most nearly related to *Liparthrum*. It is distinguished from *Liparthrum* by the larger size, by the 5-segmented antennal funicle, by the reduced, different pronotal armature, and by other characters.

Description.— Length 1.1–2.5 mm, 1.4–2.1 times as long as wide; color brown to black. Frons dimorphic, males transversely impressed to deeply, rather broadly concave, females convex to transversely impressed; epistomal brush very conspicuous; eye elongate, sinuate to feebly emarginate; about 3.5 times as long as wide. Antennal scape moderately short, not reaching posterior margin of eye; funicle 5-segmented; club slender to subcircular, usually marked by three, aseptate, transverse sutures. Pronotum wider than long, armed by two or three paired groups of asperities in anterolateral areas. Scutellum absent. Elytral bases armed between suture and striae 4 by coarse crenulations, submarginal crenulations present or absent; striate. Third tarsal segments slender. Vestiture of plumose to scalelike setae, often in various patterns of dark and light colors.

Distribution.— Canada to Brazil. Nineteen species are known, 15 are from North and Central America, 2 are from South America, and 2 are from Jamaica.

Biology.— All species attack branches and twigs of trees and shrubs, particularly in desert areas. They are monogamous; the male constructs the entrance tunnel and a large nuptial chamber in the cambium region; the female constructs from one to three rather short, broad, egg galleries. The eggs are deposited in obscure, contiguous egg niches at the ends of the egg galleries. The larval mines usually radiate out individually from

the apical half of the egg gallery, usually curving so as to parallel the grain of wood by the later stages of growth. Larval mines are comparatively long and form a definite pattern; they engrave both the phloem and the wood, usually engraving the latter rather deeply in the later stages. Evidently two or more generations can be completed annually.

NOTES.— All 19 species were included in the key, although four are extratentorial.

## Key to the Species of *Chaetophloeus*

1. Elytral bases armed by 6 to 8 pairs of marginal crenulations (5 pairs in occasional *maclayi*), usually in a continuous marginal line, crenulations 2 and 3 not more widely separated than others, 2 not displaced posteriorly; 1 or 2 pairs of submarginal crenulations often present on interstriae 1 or 2 ..... 2

— Elytral bases armed by 3 to 5 pairs of marginal crenulations, 1 and 2 partly or completely fused, lateral margin or all of 2 strongly displaced posteriorly forming with 1 a median crescent-shaped elevation, a conspicuous gap between 2 and 3 at least as wide as 3; submarginal crenulations never present ..... 17

2(1). Pronotal and elytral setae all long, subplumose, each apically hairlike or at least very strongly acuminate, those on interstriae at least as long as width of an interstriae; antennal suture 3 at middle of club; female frons armed by a pair of tubercles; larger species; in *Rhus* ..... 3

— Pronotal and elytral setae at least partly scalelike, longer setae never subplumose or slender at their apices; suture 3 on apical third of antennal club ..... 4

3(2). Elytral declivity strongly sulcate, lateral convexities bearing a series of coarse teeth on interstriae 3; pronotal punctures moderately coarse, deep; S California to Baja California; *Rhus*; 1.9–2.5 mm ..... 1. ***hystrix*** **(LeConte)**

— Elytral declivity strongly, shallowly sulcate, all interstriae devoid of granules or teeth; pronotal punctures smaller, rather shallow; Oaxaca to Chiapas; *Rhus*; 1.8–2.5 mm ..... 2. ***lasius*** **Wood**

4(2). Male frons abruptly impressed immediately above epistoma, impression not attaining upper level of eyes, bearing in female (usually in both sexes) a pair of small, widely separated denticles on upper half; elytral declivity shallowly to rather strongly sulcate; submarginal crenulations on elytral bases absent (except *sulcatus*) ..... 5

— Male frons shallowly to deeply concave from epistoma to well above upper level of eyes, female frons convex, neither sex armed by denticles; elytral declivity convex; one or two submarginal crenulations at base of interstriae 1 or 2 present except absent in *insularis* and *chapini* ..... 8

5(4). Elytral ground cover of sharply acuminate, subplumose, subscalelike setae; all setae on pronotum and elytra white; S California to Arizona; *Encelia farinosa*; 1.8–2.2 mm ..... 3. ***pruinosus*** **(Blackman)**

— Scales of elytral ground cover blunt, not at all plumose; dark and light setae variously distributed on pronotum and elytra ..... 6

6(5). Erect, elongate scales absent on declivital interstriae 1 and 2; pronotal and elytral scales in a distinctive color pattern, white predominating, pronotum with conspicuous dark patches at center and in anterolateral areas; S California; *Encelia californica*; 1.7–1.9 m ..... 4. ***maclayi*** **(Bruck)**

— Rows of erect, elongate scales on declivital interstriae 1 and 2 as on other interstriae; dark and light setae intermixed on pronotum and elytra except all white on interstriae 1 (except *sulcatus*) ..... 7

7(6). Submarginal crenulations on elytral bases entirely absent; declivital sulcus poorly developed; pronotum and elytra without distinct patches of white scales except interstriae 1; erect interstrial scales at least four times as long as wide; British Columbia and Manitoba to California and W Texas; *Prunus*, *Cercocarpus*, etc.; 1.6–2.2 mm ..... 5. ***heterodoxus*** **(Casey)**

— One pair of small submarginal crenulations present at base of interstriae 2; declivital interstriae 2 more strongly impressed, 3 weakly but distinctly elevated at least apically; small patches of light scales irregularly scattered on pronotum and elytra; erect interstrial scales less than three times as long as wide; Hidalgo; *Rhus*?; 1.6–2.0 mm ..... 6. ***sulcatus*** **(Wood)**

8(4). Male frons shallowly excavated, longest ornamental setae less than half length of excavated area; female epistomal margin straight (except weakly emarginate in *brasiliensis*); smaller, less than 1.6 mm; body more slender, at least 1.7 times as long as wide ..... 9

— Male frons deeply excavated, upper margin of excavation ornamented by very long hair, some of it attaining epistomal margin; epistoma of both sexes broadly emarginate; larger than 1.6 mm; body stout, less than 1.6 times as long as wide; in mistletoe ..... 14

9(8). Base of elytra on interstriae 1 and 2 with one or two pairs of submarginal crenulations ..... 10

— Submarginal crenulations entirely absent from bases of elytra, only marginal crenulations represented ..... 13

10(9). Erect elytral scales and pronotal scales each three or more times as long as wide; male epistomal margin very deeply, broadly emarginate; male frons shallowly impressed, impression extending only slightly above upper level of eyes; declivital striae not at all impressed, punctures small, deep; Yucatán; 1.8 mm ... ..... 7. ***coronatus*** **(Chapuis)**

— Erect interstrial scales and some pronotal scales each less than twice as long as wide; male epistomal margin straight or weakly emarginate (*brasiliensis*); male frons more deeply, more extensively impressed; declivital striae 1 at least weakly impressed ..... 11

11(10). Setae on pronotum and elytra forming a color pattern of dark and light scales; male frons more abruptly impressed below, epistomal margin straight; Arizona to Guatemala; *Eysenhardtia*; 1.2–1.6 mm ..... 8. ***mexicanus*** **(Blackman)**

— All pronotal and elytral setae pale in color; male frons evenly concave, epistomal margin weakly to shallowly emarginate ..... 12

12(11). Erect interstrial scales almost twice as long as wide; striae more strongly impressed, punctures toward suture less distinct; Brazil; 1.2–1.4 mm ..... ..... ***braziliensis*** **(Blackman)**

— Erect interstrial scales almost as wide as long; discal interstriae not impressed, punctures rather deep; Colima; 1.1–1.3 mm ..... 9. ***minimus*** **Wood**

13(9). Strial punctures moderately small, rather deep; interstriae as wide or slightly wider than striae; antennal club large, subcircular, its width 1.5 times greater than length of scape; S Florida, Cuba, Virgin Islands; *Acras*; 1.3–1.5 mm ..... ..... 10. ***insularis*** **(Blackman)**

— Strial punctures coarse, deep; interstriae mostly slightly narrower than striae; antennal club smaller, narrowly oval, its width and length of scape equal; Jamaica; 1.6 mm ..... ***chapini*** **(Blackman)**

14(8). Erect interstrial scales slightly shorter, indistinguishable from setae in ground cover on anterior half of disc; long hair on male vertex yellow, longest setae attain epistoma; female frons more strongly convex, more coarsely granulate; anterior mandibular process pointed, smaller ..... 15

— Erect interstrial scales longer, distinguishable from setae in ground cover to base; hair on male vertex reddish, longest setae attain tips of mandibles; female frons less strongly convex, more finely granulate; anterior mandibular process pointed or quadrate, larger ..... 16

15(14). Strial punctures near base of declivity coarse, deep, interstriae less than twice as wide as striae; elytral setae pale; male frons less deeply concave; Jamaica; *Phoradendron*; 1.8–2.1 mm ..... ***howdeni*** **Bright**

— Strial punctures very small, interstriae at least four times as wide as striae; elytral setae with irregular small patches of dark brown setae interspersed among pale setae; male frons more strongly concave; Jalisco to Oaxaca; *Phoradendron* and *Struthanthus*; 1.6–2.3 mm ..... 11. ***struthanthi*** **Wood**

16(14). Anterior mandibular process pointed; male epistomal margin bidentate near median line; erect elytral bristles on disc slightly longer, broad, about two to four times as long as wide; Venezuela; *Mimosa*, etc.; 1.3–1.8 mm ..... ***andinus*** **Wood**

— Anterior mandibular process quadrate; male epistomal margin obtusely pointed at median line; erect elytral bristles on disc shorter, more slender, each four to six times as long as wide; Honduras to Costa Rica; *Phoradendron*; 1.5–2.0 mm ..... 12. ***phoradendri*** **Wood**

17(1). Elytral declivity sulcate; declivital interstriae 3 rather strongly elevated; male frontal excavation more shallow, less extensive; S California to S Arizona; *Cercidium*; 1.8–2.4 mm ..... 13. ***parkinsoniae*** **(Blackman)**

— Elytral declivity convex; declivital interstriae about equally convex; male frontal excavation deeper, more extensive; smaller than 1.8 mm ..... 16

18(17). Median rows of erect, interstrial setae about twice as long and some at least twice as wide as setae in ground cover; setae unicolorous; anterior fifth of pronotum bearing a pair of small, very long tufts of setae; California and Colorado to Queretaro; *Rhus*; 1.0–1.5 mm ..... 14. ***penicillatus*** **(Bruck)**

— Median rows of erect, interstrial setae little if any longer or wider than setae in elytral ground cover; setae dark and light, in a mottled pattern; longest setae on anterior margin of pronotum more generally distributed, increasing in length gradually; S California and Arizona to W Texas and "Mexico"; *Larrea*, *Prosopis*; 1.4–1.8 mm ..... 15. ***fasciatus*** **(Blackman)**

### 1. *Chaetophloeus hystrix* (LeConte)

Figs. 101, 102

*Hylesinus hystrix* LeConte, 1858, Proc. Acad. Sci. Philadelphia 4:81 (Holotype, male; San Diego, California; Mus. Comp. Zool., 1027)

DIAGNOSIS.— The large size, the sulcate elytral declivity with dentate interstriae 3, and the long, fringed (subplumose) elytral setae distinguish this species from all others in the genus.

MALE.— Length 1.8–2.5 mm, 1.9 times as long as wide; color black, vestiture pale.

Frons strongly, broadly, transversely impressed (essentially concave) from epistoma to upper level of eyes; surface almost smooth, with rather fine, moderately close punctures, a pair of rather large, widely separated granules at upper level of eyes; vestiture abundant, very coarse, moderately long, obscuring much of surface, epistomal brush

conspicuous. Antennal club 1.7 times as long as wide; suture 3 obscure, near middle of club; sutures somewhat procurved.

Pronotum 0.74 times as long as wide; basal margin almost straight; widest one-fourth from base, sides strongly arcuate, converging to conspicuous constriction just behind broadly rounded anterior margin; surface smooth, shining, closely, rather coarsely, deeply punctured, with two pairs of groups of asperities in anterolateral areas, one to three asperities in each group; vestiture of rather abundant, moderately long subplumose setae, some bifid setae in marginal areas.

Elytra 1.2 times as long as wide, 1.7 times as long as pronotum; basal margins each armed by six crenulations, increasing in height until very strongly elevated at suture, two or three pairs of submarginal crenulations on interstriae 1 and 2; sides almost straight and parallel on slightly less than basal half, broadly rounded and converging to projecting declivital teeth, broadly excavated between these elevated areas; striae 1 weakly, others not at all impressed, punctures small, deep; interstriae three times as wide as striae, punctures coarse, almost as large as those of striae, close, confused. Declivity steep; broadly, rather strongly impressed between third interstriae; interstriae 3 on middle third strongly, rather gradually elevated, armed at summit by about four coarse teeth, 1 and 2 essentially as on disc except lateral half of 2 ascending toward elevated area. Vestiture rather long, abundant, consisting of tapered subplumose (fringe often of very inconspicuous) setae.

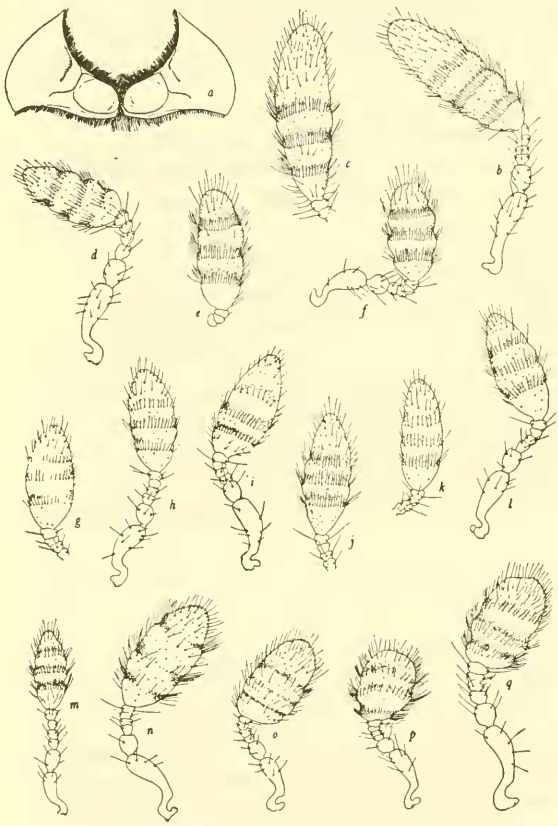


Fig. 101. *Chaetophloeus* spp., prosternum and antennae: a, g, h, i, j, k, l, *heterodoxus*; b, c, *parkinsoniae*; d, *pruinosus*; e, f, *fasciatus*; m, *penicillatus*; n, *mexicanus*; o, *braziliensis*; p, *insularis*; q, *hystrix*. (After Blackman 1940:379.)

FEMALE.— Similar to male except frontal impression not as deep; antennal club larger, 1.5 times as long as wide; elevation on elytral declivity slightly smaller, usually fewer dentations.

DISTRIBUTION.— S California to Baja California.

USA: **California**: Arroyo Seco near Pasadena, Los Angeles N. F., 12-XI-34, A. T. McClay, 18-IV-62, *Rhus ovata*, D. E. Bright, B. A. Barr; Peters Canyon, 26-I-32, *R. integrifolia*, A. T. McClay; San Diego, 17-XII-1890, F. E. Blaisdell, 29-XII-12, *R. integrifolia*; Aguanga; El Segundo; La Canada; Montrose; Pinyon Flat 16 miles SW Palm Desert, *R. laurina*. MEXICO: **Baja California**: 16 km S California border.

HOSTS.— *Rhus integrifolia*, *R. ovata*, *R. laurina*.

BIOLOGY.— Presumably as described for the genus.

NOTES.— The above treatment was based on the holotype and on 71 other specimens.

## 2. *Chaetophloeus lasius* Wood

*Chaetophloeus lasius* Wood, 1956, Canadian Ent. 88:251 (Holotype, female; Nochixtlán, Oaxaca, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *hystrix* (LeConte) by the more finely, shallowly punctured elytra with strial and interstrial punctures confused, by the absence of declivital armature, and by the longer, more nearly plumose vestiture.

MALE.— Length 1.8–2.5 mm, 1.9 times as long as wide; color dark brown to black, vestiture pale brownish.

Frons as in *hystrix*; antennal club 1.3 times as long as wide, sutures somewhat procurved.

Pronotum 0.72 times as long as wide; as in *hystrix* except punctures distinctly smaller, anterolateral areas with three pairs of groups of asperities; vestiture slightly longer.

Elytra 1.1 times as long as wide, 1.5 times as long as pronotum; basal armature as in *hystrix*; sides straight and parallel on slightly more than basal half, broadly, shallowly emarginate behind; strial and interstrial punctures subequal in size, confused, rather small, deep, close (very indistinct striae discernible on some specimens). Declivity steep, broadly sulcate; suture weakly elevated, area of striae 1 impressed, ascending to lateral summit at position of interstriae 3; setae in rows where interstriae 1 and 2 normally located. Vestiture consisting of abundant, very long, tapered, subplumose setae, most setae transversely flattened at their bases.

FEMALE.— Similar to male except frons shallowly impressed; antennal club very slightly larger; elytral declivity very slightly less strongly impressed.

DISTRIBUTION.— Oaxaca to Chiapas.

MEXICO: **Chiapas**: 32 km NW Comitán 17-VI-64, 2000 m, No. 708, *Rhus*, S. L. Wood; 14 km SE Teopisca on Highway 24, 30-V-69, *Rhus*, D. E. Bright. **Oaxaca**: 11 km SE Nochixtlán, 5-VII-53, S. L. Wood; 25 miles SE Nochixtlán, 17-VI-67, about 2400 m, No. 53, *Rhus*, S. L. Wood.

HOST.— *Rhus* sp.

BIOLOGY.— Evidently as described above for the genus.

NOTES.— The above treatment was based on 53 paratypes and on 266 other specimens.

### 3. *Chaetophloeus pruinosus* (Blackman)

Figs. 101, 102

*Renocis pruinosus* Blackman, 1940, Proc. U.S. Nat. Mus. 88:383 (Holotype, female; San Bernardino Co., California; U.S. Nat. Mus., 52950).

DIAGNOSIS.— This species is distinguished from *maclayi* (Bruck) by the slightly larger size, by the more strongly impressed elytral declivity, by the acuminate scales of the elytral ground cover, and by the uniformly white vestiture.

MALE.— Length 1.8–2.2 mm, 1.8 times as long as wide; color brown, with white vestiture.

Frons rather strongly, broadly impressed from epistoma almost to upper level of eyes; surface reticulate above, more irregular below, finely punctured; largely obscured by abundant, coarse, subplumose setae (frontal granules evidently present). Antennal club 2.6 times as long as wide; sutures straight, transverse.

Pronotum 0.62 times as long as wide; widest one-third length from base, sides moderately arcuate and converging very slightly on posterior two-thirds, then rather strongly converging to moderate constriction just before very broadly rounded anterior margin; surface finely, rather deeply, very closely punctured; two pairs of groups of asperities, anterior group with two or three, posterior with four or five dentations; vestiture of small, dense, subacuminate scales, each about two to three times as long as wide, slightly longer on anterior margin.

Elytra 1.1 times as long as wide, 1.9 times as long as pronotum; basal margins each armed by five to seven crenulations as in *hystrix*; sides almost straight and subparallel on basal two-thirds, broadly rounded behind; striae 1 weakly, others not impressed, punctures rather small, moderately deep; interstriae about twice as wide as striae, minutely granulose, fine punctures confused, median row sometimes minutely granulate. Declivity rather steep, broadly, rather shallowly impressed between third interstriae; sutural interstriae very feebly elevated, remaining sculpture essentially as on disc. Vestiture consisting of ground cover of numerous small, strongly acuminate, semirecumbent scales; and interstrial rows of erect, slightly longer, almost scalelike bristles, each bristle four to six times as long as wide and about two-thirds as long as distance between rows, irregularly but usually more closely spaced within a row.

FEMALE.— Similar to male except frons less strongly impressed, almost flat.

DISTRIBUTION.— S California to Arizona.

USA: **Arizona**: Catalina Springs, *Encelia farinosa*, H. G. Hubbard and E. A. Schwarz. **California**: Indio, 29-VI-33, R. H. Beamer; San Bernardino Co., Coquillet; Picacho, 23-II-40; "Cal."

HOST.— *Encelia farinosa*.

BIOLOGY.— The habits have not been recorded, except for the host.

NOTES.— The above treatment was based on the holotype and on 14 other specimens.

4. *Chaetophloeus maclayi* (Bruck)

*Pseudocryphalus maclayi* Bruck, 1936, Bull. S. California Acad. Sci. 35:35 (Holotype, female; Westwood Hills, Los Angeles Co., California; Ohio State Univ.)

DIAGNOSIS.— This species is distinguished from *pruinosus* (Blackman) and *heterodoxus* (Casey) by the more broadly flattened elytral declivity, by the absence of erect scalelike bristles on declivital interstriae 1 and 2, and by the definite color pattern of dark and light scales.

MALE.— Length 1.7–1.9 mm, 1.8 times as long as wide; color dark brown with pale and dark brown scales forming a definite color pattern, pronotum pale with dark oval patches on central third and anterolateral angles, elytra pale with dark transverse bands at base and on upper part of declivity and posterior part of disc, these two bands sometimes connected along interstriae 3 and 5.



Fig. 102. *Chaetophloeus* spp., *protibiae*: a, b, *parkinsoniae*; c, *pruinosus*; d, *fasciatus*; e, f, g, h, i, *heterodoxus*; j, *penicillatus*; k, *mexicanus*, l, m, *braziliensis*; n, *insularis*; o, *hystrix*. (After Blackman 1940:381.)

Frons transversely, subconcavely impressed from immediately above epistoma to slightly above upper level of eyes; surface subshining, minutely punctured, largely obscured by rather abundant, coarse, subplumose setae of moderate length; a pair of coarse, widely separated granules at upper level of eyes. Antennal club 2.0 times as long as wide.

Pronotum 0.71 times as long as wide; widest one-third length from base, sides strongly arcuate, converging anteriorly to distinct constriction just before broadly rounded anterior margin; surface rather finely, shallowly, very closely punctured; anterolateral areas armed by two pairs of groups of asperities, each group with two or three dentations; vestiture of small, abundant scales, each bluntly pointed at its apex and two to three times as long as wide, slightly longer on anterior margin.

Elytra 1.1 times as long as wide, 1.6 times as long as pronotum; basal margins armed as in *hystrix* by six pairs of crenulations, submarginal crenulations absent; striae not impressed, punctures moderately large, rather deep, each wider than long; interstriae as wide as striae, minutely, shallowly punctured, punctures confused. Declivity rather steep, broadly convex, very feebly impressed between third interstriae; evidently as on disc except strial punctures greatly reduced in size. Vestiture of abundant, short, oval scales in interstrial ground cover, each about two to three times as long as wide; and uniseriate interstrial rows of longer erect scales, each erect scale twice as long as ground scales and two to three times as long as wide, about half as long as distance between rows; erect setae absent on declivital interstriae 1 and 2.

FEMALE.— Similar to male except frontal impression reduced, almost flat, frontal vestiture shorter, less abundant.

DISTRIBUTION.— S California.

USA: California: Westwood Hills, Los Angeles Co., 8,11-V-35, 30-XII-35, 9-VII-36, *Encelia californica*, A. T. McClay.

BIOLOGY.— Not recorded except for the host.

NOTES.— The above treatment was based on the holotype and on more than 48 paratypes. A male "holotype" is in the collection of the University of California at Davis. It is obvious from Bruck's description that the

holotype was deposited in his collection, which is now at Ohio State University. The label on the Davis specimen is considered to be a labeling error and the specimen should be regarded as a paratype.

### 5. *Chaetophloeus heterodoxus* (Casey)
Figs. 96, 101–103

*Renocis heterodoxus* Casey, 1886, California Acad. Sci. Bull. 6:258 (Holotype, female; Reno, Nevada; U.S. Nat. Mus., 37489)

*Pseudocryphalus brittaini* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):20 (Lectotype, male; Salmon Arm, British Columbia; Canadian Nat. Coll., designated by Bright, 1967, Canadian Ent. 99:679); Wood, 1957, Canadian Ent. 89:402. *Synonymy*

*Pseudocryphalus criddlei* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):21 (Lectotype, male; Aweme, Manitoba; Canadian Nat. Coll., designated by Bright, 1967, Canadian Ent. 99:679); Wood, 1957, Canadian Ent. 89:402. *Synonymy*

*Renocis brunneus* Blackman, 1940, Proc. U.S. Nat. Mus. 88:389 (Holotype, female; Cloudcroft, New Mexico; U.S. Nat. Mus., 52952); Wood, 1971, Great Basin Nat. 31:142. *Synonymy*

*Renocis fuscus* Blackman, 1940, Proc. U.S. Nat. Mus. 88:391 (Holotype, female; Williams, Arizona; U.S. Nat. Mus., 52953); Wood, 1971, Great Basin Nat. 31:142. *Synonymy*

*Renocis commixtus* Blackman, 1940, Proc. U.S. Nat. Mus. 88:392 (Holotype, female; Williams, Arizona; U.S. Nat. Mus., 52594); Wood, 1971, Great Basin Nat. 31:142. *Synonymy*

DIAGNOSIS.— This is the most abundant, most widely distributed species in the genus. It is not nearly as variable as the above list of synonyms might suggest. It is distinguished from *pruinosus* (Blackman) and *maclayi* (Bruck) by the much more slender pronotal and elytral ground cover scales, by the more narrowly convex elytral declivity, and by the different coloration.

MALE.— Length 1.6–2.2 mm, 1.9 times as long as wide; color black, with scale color pattern normally white on pronotum and on interstriae 1, dusky to very dark scales elsewhere, with a few pale or dark scales scattered at random, occasional specimens much lighter or much darker.

Frons rather strongly, transversely impressed from epistoma almost to upper level of eyes; surface very finely punctured, largely obscured by abundant, coarse, subplumose setae; a pair of large, widely separated granules at upper level of eyes; epistomal brush very conspicuous. Antennal club 2.2 times as long as wide.

Pronotum 0.62 times as long as wide; outline and surface sculpture as in *maclayi* except often a third paired group of lateral asperities may occur on anterior margin, rarely consisting of more than one dentation; vestiture consisting of small slender scales, usually each scale three or more times as long as wide, occasionally a few larger, broader scales intermixed, setae on anterior margin longer.

Elytra 1.2 times as long as wide, 2.1 times as long as pronotum; basal margins and outline about as in *maclayi*; striae 1 weakly,



Fig. 103. *Chaetophloeus heterodoxus*, galleries. (After Furniss and Barr 1975:17.)

others not at all impressed, punctures rather small, deep, close; interstriae twice as wide as striae, minutely punctured, punctures close, confused. Declivity steep, rather broadly convex; striae moderately impressed, more strongly on 1, punctures smaller, not as deep. Vestiture of abundant small, semirecumbent scales, each scale about four to six or more times as long as wide (variable on any specimen); and uniseriate interstrial rows of erect scalelike bristles, each more than twice as long as ground scales, about three to six times as long as wide.

FEMALE.— Similar to male except frons much less strongly impressed.

DISTRIBUTION.— British Columbia and Manitoba to California and W Texas.

CANADA: British Columbia, Manitoba, Saskatchewan. USA: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Texas, Utah, Washington, Wyoming.

HOSTS.— *Amelanchier utahensis, Cercocarpus betulifolia, C. ledifolia, C. parvifolius, Cowania mexicana, Peraphyllum ramosissimum, Prunus americana, P. virginiana, Pyrus malus, Ribes* spp.

HABITS.— The above generic treatment of habits was based largely on this species.

NOTES.— The holotypes or lectotypes of *heterodoxus, brittaini, criddlei, brunneus, fuscus,* and *commixtus* were all examined and used in the preparation of the above treatment along with 387 other specimens. The presence of boring dust, body oils, or wear on the surface of specimens of this species can drastically alter their appearance. Its broad distribution and wide host range evidently have also contributed to the description of synonyms.

In the southeastern part of its range the elytral ground scales and erect bristles tend to be very slightly wider and there is a tendency for two rather than three paired groups of pronotal asperities. These appear to be gradual clinal differences, however, and do not warrant a distinct name.

### 6. *Chaetophloeus sulcatus* (Wood)

*Renocis sulcatus* Wood, 1956, Canadian Ent. 88:252 (Holotype, female; Ixmiquilpan, Hidalgo, Mexico; Snow Ent. Coll., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *maclayi* (Bruck) by the less strongly impressed frons, by the smaller frontal tubercles, by the more strongly elevated lateral areas of the elytral declivity, by the presence of erect scales on declivital interstriae 1 and 2, and by the different color pattern.

MALE.— Length 1.6–2.0 mm, 1.8 times as long as wide; color dark brown, with very dark and pale scales forming a variegated pattern with dark and light areas about equal.

Frons rather weakly, transversely impressed above epistoma, impression ending below upper level of eyes; surface minutely granulate-punctate above, becoming smooth toward epistoma; a pair of widely separated granules at upper level of eyes; vestiture of rather abundant, moderately short, stout, subplumose setae. Antennal club 2.4 times as long as wide.

Pronotum 0.68 times as long as wide; essentially as *maclayi* except scales rather broad, with rounded apeces; distinctly longer on anterior margin.

Elytra 1.2 times as long as wide, 1.6 times as long as pronotum; basal margins each armed by six crenulations, median one much larger, higher, one submarginal crenulation; sides almost straight and subparallel on basal two-thirds, broadly subemarginate behind; striae 1 weakly, others not impressed, punctures moderately small, rather deep; interstriae almost twice as wide as striae, punctures very small, shallow, confused. Declivity rather steep, broadly, shallowly sulcate between third interstriae; suture feebly elevated, interstriae 1 moderately impressed on its median side, 3 moderately elevated particularly near its apex; sculpture essentially as on disc. Vestiture of small, abundant, ground scales, each from one to three times as long as wide and narrowly rounded at apex; and uniseriate interstrial rows of erect scales, each scale about twice as long as ground scales and twice as long as wide, those on declivital interstriae 1 smaller, those on 2 small and less abundant.

FEMALE.— Similar to male except frons very weakly impressed, almost flat below upper level of eyes.

DISTRIBUTION.— Hidalgo.

MEXICO: Hidalgo: Ixmiquilpan, 23-VI-53, S. L. Wood.

BIOLOGY.— Similar to those described for the genus. The unidentified host was a shrub having a growth habit much like *Condalia.*

NOTES.— The above treatment was based on 11 paratypes.

### 7. *Chaetophloeus coronatus* (Chapuis)

*Phloeosinus coronatus* Chapuis, 1869, Synopsis des Scolytides, p. 39 (Holotype, male; Yucatán, Mexico; Brussels Mus.)

DIAGNOSIS.— This species apparently is more closely allied to *brasiliensis* (Blackman) than to other known species, but it is distinguished by the more slender body, by the very deeply, broadly emarginate epistomal margin of the male, with the frontal impression less extensive and shallow, by the less strongly impressed striae, and by the very different elytral vestiture.

MALE.— Length 1.8 mm, 1.9 times as long as wide; rather dark brown, elytra lighter, all setae pale, almost white.

Frons shallowly concave from epistomal margin to very slightly above upper level of eyes; epistomal margin slightly elevated, deeply emarginate on a broad arc one-fourth as deep as wide; upper two-thirds of frons rather coarsely granulate; marginal fringe of subplumose setae longer above, longest setae about equal to half length of frons. Both antennae missing from type except left club loosely clinging to normal position, club 2.1 times as long as wide; three sutures mark approximately equal fourths.

Pronotum 0.70 times as long as wide; basal margin somewhat bisinuate, sides widest on basal third, strongly, arcuately convergent on posterior two-thirds, moderately constricted just before rather broadly rounded anterior margin; lateral areas armed by two pairs of groups of asperities; surface minutely subgranulose, with fine punctures; vestiture scalelike, each about two to four times as long as wide, longer at posteromedian margin.

Elytra 1.5 times as long as wide, 2.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; basal margins each armed by six crenulations at bases of interstriae 1 to 4, one submarginal crenulation on 1; striae not at all impressed, punctures rather small, moderately deep; interstriae about twice as wide as striae, subshining, punctures fine, confused, rather close. Declivity convex, moderately steep; as on disc; striae not at all impressed. Vestiture consisting of white scales, each three to four times as long as wide, median row on each interstriae slightly longer and identifiable only toward declivity.

DISTRIBUTION.— Yucatán.

MEXICO: "Yucatán, Deyr."

NOTES.— The above treatment was prepared directly from the male holotype.

### 8. *Chaetophloeus mexicanus* (Blackman)

Figs. 101, 102

*Renocis mexicanus* Blackman, 1940, Proc. U.S. Nat. Mus. 88:397 (Holotype, female; Guadalajara, Jalisco, Mexico; U.S. Nat. Mus., 52955)

*Renocis mexicanus* Eggers, 1951 (nec. Blackman, 1940), Ent. Blätt. 45–46:149 (Holotype, evidently a male; Mexico; Schedl Coll.); Wood, 1971, Great Basin Nat. 31:142. *Synonymy*

*Renocis eggersi* Wood, 1956, Canadian Ent. 88:253 (Replacement name)

*Renocis blackmani* Nunberg, 1956, Ann. Zool. (Warsaw) 16:208 (Replacement name)

DIAGNOSIS.— This species is distinguished from *minimus* Wood by the larger average size, by the stouter, more abundant scales in the elytral ground cover, by the more abundant, more generally distributed frontal vestiture, by the less extensively excavated male frons, and by the color pattern.

MALE.— Length 1.2–1.6 mm, 1.9 times as long as wide; color very dark brown, scales dark brown except pale band across base and usually sides of pronotum, sides of elytral disc mostly pale laterad from interstriae 4 with some pale scales on disc between interstriae 4 (pattern variable).

Frons moderately concave from epistomal margin to well above eyes; surface finely punctate-granulate; vestiture of abundant, coarse, moderately long, subplumose setae, particularly concentrated on margins. Club 2.3 times as long as wide; all sutures indicated only at margins.

Pronotum 0.65 times as long as wide; outline and surface structure essentially as in *maclayi* except groups of small granules instead of asperities in anterolateral areas; vestiture of a mixture of short, subcircular scales and equally long, slender, recumbent setae, slightly longer on anterior margin.

Elytra 1.2 times as long as wide, 1.9 times as long as pronotum; basal margins each armed by 6 to 8 crenulations, increasing in height toward suture, and two rather coarse submarginal crenulations, one each at bases of interstriae 1 and 2; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae feebly if at all impressed, punctures moderately large, rather deep; interstriae slightly less than twice as wide as striae, punctures close, confused, very fine, shallow. Declivity steep, convex; striae 1 more distinctly impressed; sculpture essentially as on disc. Vestiture consisting of abundant, interstrial ground scales, each scale three to four times as long as wide; and uniseriate rows of erect interstrial scales, each scale only slightly longer than ground scales, slightly longer than wide.

FEMALE.— Similar to male except frons convex, a feeble impression above epistoma; two groups of anterolateral crenulations present.

DISTRIBUTION.— Arizona to Guatemala.

USA: Arizona: Phoenix, 16-XII-40, C. D. Lebert. MEXICO: Jalisco, Michoacán, Nuevo León, Oaxaca, Tamaulipas. GUATEMALA: Volcán Pacaya, 1-VI-64, 1300 m, No. 686, S. L. Wood.

HOSTS.— *Eysenhardtia* spp.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotypes of *mexicanus* Blackman and *mexicanus* Eggers and on 587 other specimens.

The holotype of Eggers species is badly abraded and in rather poor condition; however, the unique submarginal crenulations at the elytral bases, coupled with other characters, leave no doubt concerning the synonymy with Blackman's species.

### 9. *Chaetophloeus minimus* Wood

*Chaetophloeus minimus* Wood, 1967, Great Basin Nat. 27:95 (Holotype, male; Armeria, Colima, Mexico; Wood Coll.)

DIAGNOSIS.— The small size and vestiture of this species are more nearly like *Liparthrum* than other species in this genus, but the antennal and other characters clearly place it in *Chaetophloeus*. It is distinguished from *mexicanus* (Blackman) by the smaller size, by the more slender form, by the less strongly impressed striae, by the vestiture, and by the less strongly impressed male frons. Its much closer relationship to *braziliensis* (Blackman) is treated above under that name.

MALE.— Length 1.1–1.3 mm, 1.9 times as long as wide; color almost black, with white vestiture.

Frons rather shallowly concave from eye to eye and from epistoma to vertex; surface reticulate-granulate, vestiture consisting of moderately long, coarse hair, more abundant and longer at sides and above. Antennal club large, 1.8 times as long as wide; three sutures indicated.

Pronotum 0.60 times as long as wide; widest one-fourth of pronotum length from base, sides strongly arcuate on basal half, rather weakly constricted just behind anterior margin; surface subreticulate-granulate, with moderately large, obscure punctures; lateral area armed by one paired group of minute asperities; vestiture consisting of short, stout, hairlike bristles and equally abundant, erect scales, each scale as wide as long.

Elytra 1.3 times as long as wide, 2.0 times as long as pronotum; basal crenulations as in *mexicanus*, with two pairs of submarginal ones, one each on interstriae 1 and 2; striae not impressed, punctures moderately large, deep; interstriae feebly convex, as wide as striae, punctures fine, confused. Declivity steep; convex; striae and interstriae somewhat narrower than on disc, interstrial punctures evidently subgranulate. Vestiture consisting of short, slender interstrial bristles along both margins of each interstriae, each about four times as long as wide; and median, interstrial rows of erect round scales; scales separated within a row by distances equal to length of a scale, and between rows by distances equal to twice length of a scale.

FEMALE.— Similar to male except frons weakly convex, minutely granulate, vestiture short, sparse; pronotum armed by two pairs of groups of asperities.

DISTRIBUTION.— Colima.

MEXICO: Colima: 3 km E Armeria, 28-VI-65, 70 m, No. 128, S. L. Wood.

BIOLOGY.— The small branches of a dead shrub 2 to 3 m tall, from which specimens of this species were removed, were riddled by galleries typical of this genus. The host had a growth habit much like *Amelanchier*.

NOTES.— The above treatment was based on the type series of 17 specimens.

### 10. *Chaetophloeus insularis* (Blackman)
Figs. 101, 102

*Renocis insularis* Blackman, 1940, Proc. U.S. Nat. Mus. 88:400 (Holotype, female; Key West, Florida; U.S. Nat. Mus., 52957)

DIAGNOSIS.— This species is distinguished from the closely related *chapini* (Blackman) by the much smaller strial punctures and wider interstriae, by the larger, broad antennal club with procurved sutures, and by the distribution.

MALE.— Length 1.3–1.5 mm, 1.7 times as long as wide; color almost black, with pale vestiture.

Frons rather deeply concave from eye to eye from epistoma to vertex; surface finely punctate-granulate; vestiture of rather long, moderately fine, subplumose hair of moderate abundance, longer and more concentrated on margins above. Antennal club 1.3 times as long as wide, sutures moderately procurved.

Pronotum 0.63 times as long as wide; widest one-third pronotum length from base, sides on posterior two-thirds very strongly arcuate, converging to feeble constriction just before broadly rounded anterior margin; surface obscurely subreticulate, punctures moderately coarse, very close, rather shallow; one paired group of lateral asperities; vestiture short, abundant, consisting of slender and stout bristles, stout setae about four times as long as wide.

Elytra 1.1 times as long as wide, 1.9 times as long as pronotum; basal margins each armed by seven crenulations, progressively larger toward suture. No submarginal crenulations; outline as in *mexicanus*; striae 1 weakly, others not impressed, punctures rather coarse, shallow; interstriae as wide or slightly wider than striae, punctures fine, shallow, close, confused. Declivity steep, convex; essentially as on disc except striae more distinctly impressed, punctures somewhat smaller. Vestiture consisting of small, abundant, interstrial scales, each scale one to three times as long as wide; and uniseriate, interstrial rows of erect scales, each slightly longer than ground setae and slightly longer than wide.

FEMALE.— Similar to male except frons convex, finely granulate, vestiture short, stout, less abundant; lateral areas of pronotum with two pairs of groups of asperities.

DISTRIBUTION.— S Florida, Cuba, and the Virgin Islands.

USA: **Florida**: Matacumba Key, 28-VI-51, *Acras sapota*, S. L. Wood; Lower Matacumba Key, 29-VI-51, *Acras sapota*, S. L. Wood; Key West, H. G. Hubbard and E. A. Schwarz; Sugarloaf Key, 9-V-67, D. E. Bright. CUBA: Cayamas, H. G. Hubbard and E. A. Schwarz.

HOST.— *Acras sapota*.

BIOLOGY.— This species attacked small broken branches of the host. The gallery systems were similar to those described for the genus.

NOTES.— The above treatment was based on the holotype, allotype, two paratypes, and on 92 other specimens.

### 11. *Chaetophloeus struthanthi* Wood

*Chaetophloeus struthanthi* Wood, 1967, Great Basin Nat. 27:96 (Holotype, male; Volcán de Colima, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is closely related to *phoradendri* Wood, but it is distinguished by the shorter, erect, elytral scales, by the more strongly convex, granulate, female frons, by the shorter, yellow pubescence on the upper part of the male frons, and by the smaller, pointed, mandibular processes in both sexes.

MALE.— Length 1.6–1.9 mm, 1.6 times as long as wide; color very dark brown.

Frons rather deeply concave from eye to eye from vertex to broadly emarginate epistomal margin; surface reticulate, with rather close, fine, shallow, subgranulate punctures; vestiture largely confined to marginal areas, longer on upper margin, longest hairs not reaching epistoma, yellow. Antennal club 2.1 times as long as wide; sutures very obscure.

Pronotum 0.60 times as long as wide; widest one-fourth of pronotum length from base, sides very strongly arcuate on basal half, moderately constricted just behind broadly rounded, subemarginate, anterior margin; surface subrugose, rather finely,

closely punctured, lateral areas armed by three pairs of groups of asperities; vestiture consisting of short, slender, erect scales, about eight much longer ones in median basal area, setae along anterior margin slightly longer.

Elytra 1.1 times as long as wide, 2.1 times as long as pronotum; outlines and basal asperities as in *phoradendri*; basal margins each armed by seven crenulations, progressively larger and higher toward suture; striae weakly impressed, punctures very small, shallowly, distinctly impressed; interstriae convex, two or more times as wide as striae, setiferous punctures small, very close, confused. Declivity convex, steep; striae and interstriae narrower and less clearly marked than on disc. Vestiture consisting of short, semierect, small, slender scales of equal length on disc, median row on each declivital interstriae slightly longer.

FEMALE.— Similar to male except frons convex above, flattened below, more nearly granulate; mandibular process smaller; antennal club 1.7 times as long as wide.

DISTRIBUTION.— Jalisco to Oaxaca.

MEXICO: **Jalisco**: Volcán de Colima, 23-VI-65, 2500 m, No. 105, *Struthanthus* probably *venetus*, S. L. Wood. **Oaxaca**: 17 km N Huajuapan, 15-VI-67, No. 43, *Phoradendron*, S. L. Wood; 19 km S Matías Romero, 24-VI-67, No. 93, *Phoradendron*, S. L. Wood. **Puebla**: 13 km W Texmelucan, 13-VI-67, 2600 m, No. 26, *Phoradendron*, S. L. Wood.

HOSTS.— *Phoradendron* spp., *Struthanthus* prob. *venetus*.

BIOLOGY.— This monogamous species attacks the larger stems of unthrifty or dying mistletoe. The parental galleries cut much more deeply into the wood than usual for the genus, and evidently are shorter and with fewer egg galleries than in other species. Larval mines are fewer in number, are shorter, and wander more than in other species.

NOTES.— The above treatment was based on the type series of 88 specimens and on 20 other specimens.

### 12. *Chaetophloeus phoradendri* Wood

*Chaetophloeus phoradendri* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):8 (Holotype, male; Zamorano, Morazán, Honduras; Wood Coll.); Wood, 1969, Great Basin Nat. 29:122 (corrected spelling)

DIAGNOSIS.— This species has the same arrangement of crenulations at the base of the elytra as *braziliensis* (Blackman), but it differs by the much larger size, by the reduction of elytral striae, by the very different vestiture, and by other characters.

MALE.— Length 1.5–2.0 mm, 1.4 times as long as wide; color black, vestiture cinereus.

Frons broadly, deeply concave from vertex to broadly emarginate epistomal margin, from eye to eye; surface minutely granulose-reticulate; vestiture sparse in concavity, a few erect gray setae along sides below eye, margin above eyes ornamented by a row of very long, reddish hair, tips of which reach mandibles; mandibles each with an anterior quadrate extension a third as large as mandible. Antennal club 1.9 times as long as wide; two sutures indicated.

Pronotum 0.57 times as long as wide; widest at base, strongly arcuate, converging slightly to very broadly rounded anterior margin; surface reticulate, with very small, rather close, setiferous punctures; lateral areas armed by two groups of asperities; vestiture consisting of mixed slender and stout, short bristles and a few bifid hairs in lateral areas, slightly longer on anterior margin, about eight longer setae in posteromedian area.

Elytra 1.1 times as long as wide, 1.8 times as long as pronotum; anterior margins each armed by six crenulations, median one twice as wide as others, an additional submarginal pair at base of interstriae 1; striae reduced, obscure, punctures only slightly larger than those of interstriae; interstriae wide, flattened, with numerous, confused punctures variable in size. Declivity steep, convex. Vestiture consisting of short, rather abundant, slender scales, and median rows of erect interstrial scales (distinct to base), each scale about three times as long as wide, separated from other scales in same row by distances equal to length of a scale and between rows by one and one-half times length of a scale.

FEMALE.— Similar to male except frons flattened, with a small median impression, frontal vestiture short, not specialized; pronotum armed by three pairs of groups of asperities.

DISTRIBUTION.— Honduras to Costa Rica.

HONDURAS: Zamorano, Morazán, 18-VI-64, 700 m, No. 569, *Phoradendron robustissimum*, S. L. Wood. COSTA RICA: 6 km W Cañas, Guancacaste, 10-VI-66, 50 m, No. 1, *Phoradendron*, S. L. Wood; 20 km SE Liberia, Guanacaste, 10-VII-66, No. 16, *Phoradendron*, S. L. Wood.

HOSTS.— *Phoradendron robustissimum*, *P.* sp.

BIOLOGY.— As in *struthanthi*.

NOTES.— The above treatment was based on the type series of 45 specimens.

### 13. *Chaetophloeus parkinsoniae* (Blackman)
Figs. 101, 102

*Renocis parkinsoniae* Blackman, 1940, Proc. U.S. Nat. Mus. 88:378 (Holotype, female; Catalina Springs, Arizona; U.S. Nat. Mus., 52949)

DIAGNOSIS.— In this and the following two species, the crenulations on the basal margins of the elytra are reduced in number, and the sutural crenulation is unusually broad and laterally curved away from the margin, leaving a distinct gap between the first and second crenulations; submarginal crenulations are always absent. This species is distinguished from *fasciatus* (Blackman) and *penicillatus* (Bruck) by the larger size, by the sulcate elytral declivity, with interstriae 3 rather strongly elevated, and by the very long, slender, erect, interstrial bristles.

MALE.— Length 1.8–2.4 mm, 1.6 times as long as wide; color dark brown, vestiture with pale and dark setae intermixed.

Frons broadly, very shallowly, concavely impressed from epistoma to above upper level of eyes, shining, very finely punctured; vestiture rather abundant on margins, of moderately long, fine, subplumose hair. Antennal club 3.3 times as long as wide, three straight, transverse sutures.

Pronotum 0.62 times as long as wide; widest one-third pronotum length from base, sides on basal two-thirds very strongly arcuate, strongly converging on anterior third, distinctly constricted just before broadly submarginate anterior margin; surface densely, finely, shallowly punctured; three paired groups of asperities on lateral areas; vestiture of short, abundant, erect scalelike bristles of two widths, some two, some four times as long as wide, setae on anterior margin four or more times longer than scales.

Elytra 1.2 times as long as wide, 2.0 times as long as pronotum; sides almost straight and parallel on slightly less than basal two-thirds, broadly rounded behind except profile interrupted by elevated interstriae 3; basal margins each armed by three crenulations, median one apparently double, much enlarged in width and height, its lateral half curved posteriorly, leaving a distinct gap between it and second crenulation; submarginal crenulations absent; striae rather weakly impressed, punctures moderately small, deep; interstriae almost twice as wide as striae, minutely rugulose, punctures fine, shallow, close, confused. Declivity steep, rather deeply, narrowly sulcate; strongly impressed between interstriae 3, 1 and 2 slightly narrowed, 3 rather strongly, abruptly elevated, elevation ending before apex. Vestiture consisting of rather abundant, short ground scales, each scale slightly longer than wide; and uniseriate, interstrial rows of erect bristles, each bristle about three times as long as ground scales, almost as long as distance between rows on declivity, slightly shorter on disc, more closely spaced within a row.

FEMALE.— Similar to male except frons less strongly, less extensively impressed.

DISTRIBUTION.— S California to S Arizona.

USA: **Arizona**: Catalina Springs, 14-IV-1898, H. G. Hubbard, E. A. Schwarz; Gila Mts., 8-VIII-36, J. N. Knull; Hot Springs, 27-VI, H. G. Hubbard, E. A. Schwarz; Sabino Canyon, Santa Catalina Mts., *Parkinsonia microphylla*, G. Hofer. **California**: Los Angeles, 14-III-41.

HOST.— *Cercidium microphyllum*.

BIOLOGY.— Essentially as described for the genus.

NOTES.— The above treatment was based on the holotype and on 103 other specimens.

### 14. *Chaetophloeus penicillatus* (Bruck)
Figs. 101, 102

*Renocis penicillatus* Bruck, 1933, Canadian Ent. 65:239 (Holotype, male; Peter's Canyon, Orange Co., California; California Acad. Sci.)

DIAGNOSIS.— This species is distinguished from *fasciatus* (Blackman) by the smaller size, by the more conspicuous erect, interstrial setae, by the long, slender tufts of setae on the anterior margin of the pronotum, and by the much more extensively concave male frons.

MALE.— Length 1.1–1.5 mm, 1.6 times as long as wide; color almost black, vestiture pale to medium brown, unicolorous except usually lighter on sutural striae.

Frons broadly, rather deeply concave from eye to eye from epistoma to well above eyes; surface reticulate-granulate, almost smooth toward epistoma; vestiture short and sparse in concavity, very long, abundant on lateral margins. Antennal club 1.6 times as long as wide; three sutures indicated.

Pronotum 0.60 times as long as wide; outline and general sculpture as in *fasciatus* except vestiture of slender and stout, short, abundant setae, stout scales slightly longer than wide, slender ones about four times as long as wide; anterior margin bearing a pair of very long tufts of yellow, subplumose setae, usually fewer than a dozen setae in each tuft.

Elytra 1.2 times as long as wide, 2.0 times as long as pronotum; general outline and armature of basal margins as in *fasciatus*; striae weakly impressed, punctures rather small, deep; interstriae slightly less than twice as wide as striae, weakly convex, surface marked by numerous minute points, punctures small, close, shallow, confused. Declivity steep, convex; striae more distinctly impressed, sculpture about as on declivity. Vestiture of rather abundant, short scales in ground cover, each scale about twice as long as wide; and uniseriate rows of erect scales, each scale about three times as long as ground scales, two to three times as long as wide, length about half as great as distance between rows, similarly spaced within a row.

FEMALE.— Similar to male except frons convex and a slight, transverse impression just above epistoma, frontal vestiture of uniform length and distribution; pronotum with three paired groups of asperities, tufts of hair on anterior margin usually smaller, scalelike setae more elongate.

DISTRIBUTION.— California and Colorado to Queretaro and San Luis Potosí.

USA: Arizona, California, Colorado, Nevada, New Mexico, Utah. MEXICO: Queretaro: 16 km or 10 miles E Landa de Matamoros, 11-VI-71, 1500 m, *Rhus*, D. E. Bright. San Luis Potosí: 48 km or 30 miles E San Luis Potosí, 12-VI-71, D. E. Bright.

HOSTS.— *Rhus integrifolia*, *R. microphylla*, *R. ovata*, *R. trilobata*, *R.* sp.

BIOLOGY.— Essentially as described for the genus.

NOTES.— The above treatment was based on 18 paratypes and on 282 other specimens.

### 15. *Chaetophloeus fasciatus* (Blackman)

Figs. 101, 102

*Renocis fasciatus* Blackman, 1940, Proc. U.S. Nat. Mus. 88:385 (Holotype, female; Tucson, Arizona; U.S. Nat. Mus., 52951)

DIAGNOSIS.— This species is somewhat allied to *parkinsoniae* (Blackman) and *penicillatus* (Bruck), but it is distinguished by the intermediate size, by the almost indistinguishable erect, interstrial scales, by the deeply, narrowly excavated frons, and by the distinctive color pattern.

MALE.— Length 1.4–1.8 mm, 1.7 times as long as wide; color dark, almost black, vestiture of very dark and white setae, dark on sides and basal fourth of pronotum, on elytral declivity except interstriae 1, and on basal third of elytral disc between fifth striae.

Frons deeply concave on about median two-thirds from epistoma to slightly above upper level of eyes; surface finely punctate-granulate; vestiture of rather abundant, moderately long, coarse, subplumose setae. Antennal club 2.7 times as long as wide; three straight, transverse sutures.

Pronotum 0.60 times as long as wide; widest one-third pronotum length from base, strongly arcuate and converging to distinct constriction just before very broadly rounded anterior margin; surface smooth, punctures close, shallow, rather fine; lateral areas with two pairs of groups of asperities; vestiture of abundant, short, scales, each scale about two to three times as long as wide except much longer and more slender on anterior margin.

Elytra 1.2 times as long as wide, 2.0 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; basal margins as in *parkinsoniae* except median pair bent somewhat posteriorly; striae feebly impressed, punctures small, moderately deep; interstriae twice as wide as striae, punctures small, shallow, close, confused. Declivity steep, convex; interstriae 1 and 3 weakly elevated, 2 slightly impressed, sculpture about as on disc. Vestiture of abundant, short ground scales, each scale about three times as long as wide, rather narrowly rounded at its apex; and uniseriate rows of erect interstrial scales little if any longer than ground setae, usually clearly discernible only on declivity.

FEMALE.— Similar to male except frons moderately, transversely impressed, frontal vestiture evidently shorter.

DISTRIBUTION.— S California and S Arizona to W Texas and "Mexico."

USA: **Arizona**: Benson, mesquite, Chissman; 24 km W Douglas, 15-VIII-58, mesquite, J. H. Russell; Patagonia, 20-V-68, *Prosopis*, D. D. Lucht; Portal, *Larrea tridentata*; Redington, 10-IV-13, *Prosopis juliflora*, M. Chrisman; Tucson, 14-IV, greasewood, Hubbard and Schwarz, and 17-II-08, mesquite, M. Chrisman. **California**: Fish Springs, Imperial Co., 1-I-39, mesquite, A. T. McClay. **Texas**: Presidio, 14-VII-41, mesquite. MEXICO: Intercepted at U.S. border, 10-XII-48, mesquite, J. M. Russell.

## GENUS *LIPARTHRUM* WOLLASTON

*Leiparthrum* Wollaston, 1854, Insecta Maderensia, p. 294 (Type species: *Leiparthrum bituberculatum* Wollaston, original designation)

*Liparthrum* Wollaston, 1864, Catalogue of the Coleopterous Insects of the Canaries in the collection of the British Museum, p. 265 (valid emendation, Internat. Comm. Zool. Nomencl. 1981:64)

*Erineosinus* Blackman, 1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:53 (Type-species: *Erineosinus squamosus* Blackman, monobasic); Wood, 1957, Canadian Ent. 89:399. *Synonymy*

*Phloeochilus* Schedl, 1953, Ann. Mag. Nat. Hist. (12)6:292 (Type-species: *Phloeochilus palaquius* Schedl, monobasic); Schedl, 1963, Ent. Abh. Ber. Tierk. Dresden 28:263. *Synonymy*

*Phloeotrypetus* Wood, 1960, Insects of Micronesia 18(1):16 (Type-species: *Phloeotrypetus palauensis* Wood, monobasic); Schedl, 1963, Abh. Ber. Tierk. Dresden 28:263. *Synonymy*

DIAGNOSIS.— In the American fauna *Chaetophloeus* LeConte is the only group even moderately closely related to this genus. It is distinguished from *Chaetophloeus* by the much smaller size, by the 4-segmented antennal funicle, by the unsegmented antennal club, by the different pronotal armature, and by the much more conspicuous strial setae.

DESCRIPTION.— Length 0.75–1.30 mm, 2.0–2.2 times as long as wide. Frons convex in male or in both sexes, females in some species concave and ornamented by setae. Eye oval, rather short, entire; twice as long as wide. Antennal scape not reaching posterior margin of eye, funicle 4-segmented, club aseptate, without any indications of sutures. Pronotum finely asperate over entire surface, anterior margin in male armed by a pair of teeth. Scutellum not visible; basal margins of elytra armed by five or six pairs of coarse crenulations of about equal size mesad to striae 5; coarsely striate, declivital sculpture simple. Vestiture of rows of very broad, short, interstrial scales and slender, recumbent, strial setae; interstrial setae uniseriate, broad scales alternating with slender setae.

DISTRIBUTION.— S United States to Venezuela; S Europe and Asia, and Micronesia. About 23 species are known; 6 of these occur in North and Central America; 2 are from South America.

BIOLOGY.— The species are monogamous and phloeophagous. Evidently the male constructs the entrance tunnel and both sexes contribute to the formation of an irregular cavity about 3 mm wide and 5 mm long, engraving both wood and phloem. The eggs apparently are placed in individual niches. The larvae construct individual mines that engrave both wood and phloem and wander without definite direction. The larval mines are rather long and frequently join one another in the later stages. The parent adults may continue to enlarge the egg cavity long after oviposition is complete. In some instances several generations might be completed in the same twig of a living tree.

NOTES.— Wollaston originally spelled the name of this genus *Leiparthrum* (1854), then later, evidently deliberately, changed it to *Liparthrum* (1864). The apparent reason for the change was an oversight in transliteration in converting the Greek *leipo* to the Latin *lipo*. I have regarded the change, apparently correctly, as a valid emendation and have used the spelling that has been applied to this genus consistently in the literature for more than a century, except for Bright (1968). I considered the name *Leiparthrum* Wollaston (1854) to be a *nomen oblitum* and replaced it with *Liparthrum* Wollaston (1864) to preserve stability. An appeal to the Commission upholds my views (Internat. Comm. Zool. Nomencl. 1981:64).

Among the 11 Palaearctic species presently known to me, only *arnoldi* Semenov shares a distinctive character found in all American species. In these species the uniseriate, interstrial rows of discal setae include broad scales that alternate, at least in part, with slender, recumbent setae similar to those in the strial rows. This unusual character was not mentioned in the key to species in Schedl's (1959) revision of the genus.

Key to the Species of *Liparthrum*

1. Pronotum with very small, isolated asperities only, devoid of punctures; female frons convex, not ornamented by abundant setae; elytra more slender, 1.4–1.6 times as long as wide ..... 2
— Pronotum with minute asperities and very fine punctures intermixed; female frons concavely impressed and ornamented by rather abundant setae, elytra stouter, 1.2–1.3 times as long as wide ..... 5

2(1). Elytra stouter, 1.4 times as long as wide; strial punctures coarse, deep, but smaller, interstriae almost as wide as striae; Arizona to Durango; *Arbutus*; 1.0–1.3 mm ..... 1. ***arizonicum*** **Wood**
— Elytra more slender, 1.5–1.6 times as long as wide; strial punctures very coarse, larger, interstriae about half as wide as striae ..... 3

3(2). Interstrial setae almost all scalelike, rarely alternating with a slender seta, scales closely set within a row by less than length of a scale, almost all wider than long; lower half of elytral declivity not as steep; pronotal asperities averaging smaller, more numerous; Oaxaca; *Thevetia* (?); 0.75–0.85 mm ..... 2. ***cracentis*** **Wood**
— Scalelike and slender interstrial setae alternating within a row, scales mostly spaced within a row by two or more lengths of a scale, scales more slender, each at least as long as wide; lower half of declivity steeper; pronotal asperities fewer in number but averaging larger ..... 4

4(3). Smaller; punctures on discal striae smaller, not as deeply, sharply impressed; interstrial scales about as wide as long, slender interstrial setae conspicuously longer than scales; Morelos; *Thevetia ovata*; 0.8–0.9 mm ..... 3. ***thevetiae*** **Wood**
— Larger; punctures on discal striae coarse, deeply, sharply impressed; interstrial scales each 1.5–2.0 times as long as wide, equal in length to slender interstrial scales; Baja California; shrub; 1.2–1.3 mm ..... 4. ***albosetosum*** **(Bright)**

5(1). Female frons broadly concave from epistoma to well above upper level of eyes, concavity ornamented by dense, very short, fine pile; strial punctures slightly smaller; elytra slightly more slender; Costa Rica; *Ficus*; 0.8 mm ..... 5. ***americanum*** **Wood**
— Female frons rather broadly concave from epistoma to upper level of eyes, concavity ornamented by fine, rather long, moderately abundant hair; strial punctures slightly larger; elytra slightly stouter; Mississippi; *Maclura*; 0.8–1.0 mm ..... 6. ***squamosum*** **(Blackman)**

### 1. *Liparthrum arizonicum* Wood
Fig. 104

*Liparthrum arizonicum* Wood, 1959, Great Basin Nat. 19:57 (Holotype, male; Miller Canyon, Huachuca Mts., Arizona; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *cracentis* Wood by the larger size, by the stouter body form, and by the smaller strial punctures and slightly wider interstriae.

FEMALE.— Length 1.0–1.3 mm, 2.1 times as long as wide; body color brown, vestiture and antennae much lighter.

Frons flattened, slightly impressed above epistoma; surface minutely rugulose, without definite punctures; vestiture rather short, sparse, somewhat more conspicuous along epistoma.

Pronotum 0.70 times as long as wide; widest at base, sides arcuately converging toward rather broadly rounded anterior margin; surface minutely rugulose, evidently without definite punctures (actually, minute punctures present, visible at 200X); anterior margins unarmed; very small, isolated asperities uniformly distributed. Vestiture consisting of almost equal numbers of rather short recumbent, stout hair and somewhat shorter semierect, very broad scales.

Elytra 1.4 times as long as wide, 1.9 times as long as pronotum; basal margins each armed by a row of five subcontiguous rather large crenulations mesad of interstriae 4; sides straight and subparallel on basal three-fourths, broadly rounded behind; striae not impressed, punctures rather large, close, deep; interstriae narrower than striae, punctures small, uniseriate. Declivity convex, steep; striae somewhat narrower than on disc. Vestiture consisting of rows of rather short recumbent strial hair, and uniseriate rows of somewhat shorter, very broad interstrial scales, each subquadrate scale wider than long and separated from other scales in same row by a space greater than length of a scale, slender setae similar to those of striae alternating with scales in each interstrial row.

MALE.— Similar to female except frons more convex above; anterior margin of pronotum armed by a pair of very narrowly separated teeth, about three other successive pairs of pronotal asperities larger.

DISTRIBUTION.— S Arizona to Durango.

USA: **Arizona**: Miller Canyon, Huachuca Mts., 22-VIII-58, *Arbutus arizonicus*, S. L. Wood. MEXICO: **Chihuahua**: 37 km S Creel, 18-VII-60, *Arbutus*, S. L. Wood; La Laja, 13-VII-60, *Arbutus*, S. L. Wood. **Durango**: 16 km W El Salto, 1964, No. 478, J. B. Thomas; La Ciudad, 4-VII-64, *Arbutus*, D. E. Bright; 14 km E El Palmito, 15-VI-71, *Arbutus*, D. E. Bright.

HOSTS.— *Arbutus arizonicus*, *A.* spp.

BIOLOGY.— This species attacks small, unthrifty, or partly broken branches and twigs on living trees. The tunnels are made in the wood immediately below the microscopically thin bark. The above description of tunnels for the genus was based largely on this species.

NOTES.— The above treatment was based on the type series of 44 specimens and on 213 other specimens.

### 2. *Liparthrum cracentis* Wood

*Liparthrum cracentis* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):9 (Holotype, female; Niltipec, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is rather closely allied to *arizonicum* Wood, but it is distinguished by the smaller size, by the more slender body form, and by the larger strial punctures and narrower interstriae.

FEMALE.— Length 0.75–0.85 mm, 2.2 times as long as wide; color brown.

Frons moderately convex, slightly impressed on lower half; surface rather coarsely reticulate, vestiture sparse, more conspicuous toward epistoma, consisting of rather fine, subplumose setae. Eye and antenna as in allied species.

Pronotum 0.81 times as long as wide; widest on basal third, sides weakly arcuate from base, converging on anterior half to rather broadly rounded anterior margin; surface shining, feebly subreticulate, obscure, setiferous granules rather close, in anterior area their anterior margins very finely asperate. Vestiture consisting of truncate, subtriangular scales, each about one and one-half times as long as wide, and equally abundant stout, hairlike setae, each about one and one-half times as long as scales.

Elytra 1.6 times as long as wide, 1.96 times as long as pronotum; sides almost straight and parallel on basal three-fourths, broadly rounded behind; basal margins each armed by five crenulations mesad of interstriae 4; striae not impressed, punctures very coarse, rather deep; interstriae about half as wide as striae, punctures fine, uniseriate, evidently not granulate. Declivity rather steep, convex; sculpture about as on disc. Vestiture consisting of strial rows of slender, recumbent bristles equal in length to scales in interstrial

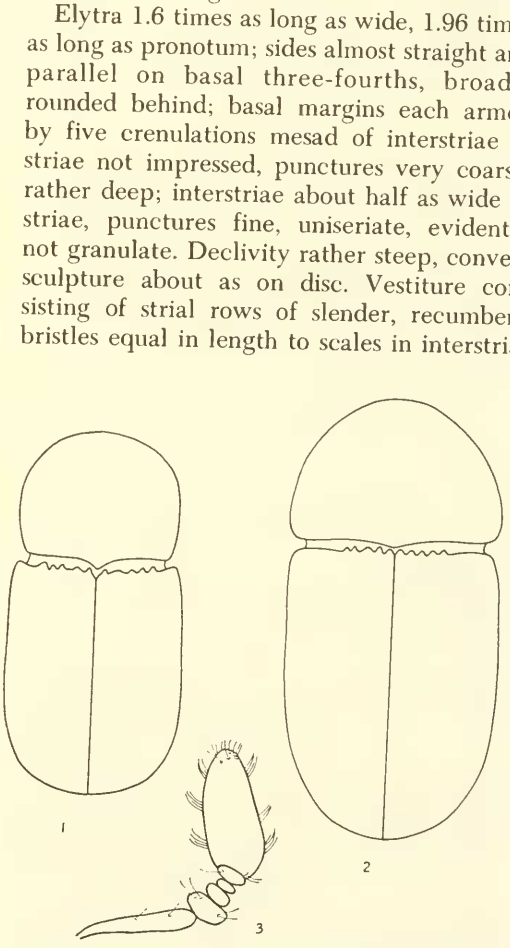



Fig. 104. *Liparthrum* spp., dorsal aspect and antenna: 1, *arizonicum*; 2, 3, *albosetosum*. (After Bright 1968:639.) See also Fig. 142.

rows; each subquadrate interstrial scale almost as wide as a strial puncture and slightly longer than wide, scales alternating within row with slender recumbent bristles less regularly than in other species.

MALE.— Similar to female except pronotum bearing a pair of small, often obsolete, median tubercles on anterior margin, a smaller submarginal pair about one-fourth pronotum length from anterior margin.

DISTRIBUTION.— S Oaxaca.

MEXICO: Oaxaca: 29 km W Niltipec, 23-VI-67, about 30 m, No. 87, *Thevetia* (?), S. L. Wood.

BIOLOGY.— Essentially as described for the genus. Specimens were removed from phloem in twig terminals of a tree having narrow, thick, waxy leaves, with the leaves somewhat concentrated in a whorls at the terminals.

NOTES.— The above treatment was based on the type series of 31 specimens.

### 3. *Liparthrum thevetiae* Wood

*Liparthrum thevetiae* Wood, 1981, Great Basin Nat. 41:123 (Holotype, female; Las Piedras Moyotepec, Morelos, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *albosetosum* (Bright) by the smaller size, by the smaller, less strongly impressed strial punctures on the disc, and by the more slender interstrial scales.

FEMALE.— Length 0.8–0.9 mm, 2.2 times as long as wide; color very dark brown, vestiture pale.

Frons largely concealed in specimens at hand, convex, apparently about as in *albosetosum*.

Pronotum about as in *albosetosum* except asperities slightly larger, scales less abundant, shorter, and wider.

Elytra about as in *albosetosum* except only three or four basal crenulations present, first three contiguous (five present in *albosetosum*); strial punctures smaller, less strongly impressed; interstrial scales smaller, little if any longer than wide, spaced within a row by three to five lengths of a scale and alternating within a row with slender setae each about one and one-half times as long as a scale, scales about two-thirds as long as distance between rows.

DISTRIBUTION.— Morelos.

MEXICO: Morelos: Las Piedras Moyotepec, 17-VII-80, 1060 m, *Thevetia ovata*, T. H. Atkinson.

NOTES.— The above treatment was based on the type series of five females.

### 4. *Liparthrum albosetum* Bright

Fig. 105

*Leiparthrum albosetum* Bright, 1968, Canadian Ent. 100:638 (Holotype, male; 35 km or 22 miles NW Pénjamo, Baja California, Mexico; California Acad. Sci.)

DIAGNOSIS.— This species is distinguished from *arizonicum* Wood by the larger strial punctures, by the more slender interstrial scales, by the slightly larger interstrial granules, and by the much more strongly reticulate pronotum.

MALE.— Length 1.3 mm, 2.2 times as long as wide; color very dark brown.

Frons as in *arizonicum* except more distinctly convex, with a distinct, transverse impression above epistoma. Pronotum as in *arizonicum* except surface rather strongly reticulate.

Elytra 1.5 times as long as wide; essentially as in *arizonicum* except striae slightly impressed, punctures much larger, deeper; interstriae about half as wide as striae, interstrial granules distinctly larger; interstrial scales more slender, about twice as long as wide.

DISTRIBUTION.— Baja California.

MEXICO: Baja California: 35 km or 22 miles NW Pénjamo, 29-VII-59, light trap, K. W. Radford, F. G. Werner; La Paz, 27-III-74, shrub, M. M. Furniss.

NOTES.— The above treatment was based on the holotype and on five other specimens.

### 5. *Liparthrum americanum* Wood

*Liparthrum americanum* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):8 (Holotype, female; Río Tempisque, Guanacaste, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *squamosum* Blackman by the extensively concave female frons which has dense golden, pilelike hair over the entire surface, by the slightly smaller strial punctures, and by the more slender body form.

FEMALE.— Length 0.8 mm, about 2.1 times as long as wide; color rather light brown.

Frons shallowly concave almost from eye to eye and from vertex to epistoma; surface reticulate; vestiture largely confined to impressed area, consisting of very fine, minute, abundant, pilose hair of uniform length.

Pronotum 0.8 times as long as wide; widest one-third from base, sides moderately arcuate, rather narrowly rounded in front; surface obscured by vestiture, evidently minutely subgranulate and with small setiferous granules uniformly distributed; vestiture consisting of stout recumbent bristles and erect, broad scales in about equal numbers.

Elytra about 1.3 times as long as wide (slightly spread in type), 1.7 times as long as pronotum; sides straight and parallel on basal two-thirds, rather broadly rounded behind; bases each armed by six crenulations mesad of striae 4; striae not impressed, punctures rather large, deep; interstriae almost as wide as striae, weakly convex, moderately large, setiferous punctures uniseriate, each very feebly granulate on anterior side. Declivity steep, convex; striae and interstriae somewhat narrower than on disc. Vestiture consisting of strial rows of short, recumbent, stout hair, and interstrial rows of erect, broad scales; each subquadrate scale almost as wide as long, scales mostly alternating with slender setae similar to those of striae.

MALE.— Specimen presumed to be male, with very weakly concave frons devoid of pile; anterior margin of pronotum not armed by a pair of teeth; otherwise as in female.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Lower Río Tempisque, Guanacaste, 25-III-64, 30 m, No. 501, *Ficus*, S. L. Wood; Dominical, Puntarenas, 9-XII-63, 10 m, No. 297, S. L. Wood.

BIOLOGY.— The two specimens were taken from new entrance tunnels in small branches.

NOTES.— The above treatment was based on the female holotype and on a male that is presumed to belong to this species.

### 6. *Liparthrum squamosum* (Blackman)

Figs. 104, 143

*Erineosinus squamosus* Blackman, 1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:53 (Lectotype, sex?; Agricultural College or Starkville, Mississippi; U.S. Nat. Mus., 24740, present designation)

*Liparthrum squamosum* Wood, 1957, Canadian Ent. 89:399.

DIAGNOSIS.— This species is distinguished from *americanum* Wood by the slightly stouter body form, by the slightly larger strial punctures and, in the female, by the less extensively concave frons, with less abundant, longer frontal vestiture.

FEMALE.— Length 0.8–1.0 mm, 2.0 times as long as wide; color light brown, vestiture pale.

Frons rather deeply concave on median three-fourths from epistoma to upper level of eyes; surface reticulate, minutely punctured; vestiture largely confined to concavity, of very fine, moderately long, rather sparse hair.

Pronotum 0.80 times as long as wide; widest near base, sides rather weakly, convergently arcuate to broadly rounded anterior margin; surface shining, subreticulate, with small, isolated, rounded granules uniformly distributed over entire surface, a few minute, obscure punctures intermixed; vestiture of rather long, slender, recumbent scales over entire surface, a few erect, very broad, short scales intermixed on posterior areas.

Elytra 1.2 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; basal margins each armed by five or six rather coarse crenulations of equal size mesad of striae 4, no submarginal crenulations; striae not impressed, punctures very coarse; interstriae about half as wide as striae, punctures fine, uniseriate. Declivity steep, convex; striae very weakly impressed, slightly narrower than on disc; interstriae almost as wide as striae, weakly convex. Vestiture consisting of short, recumbent, coarse strial setae, one from each puncture; and erect, very broad scales in uniseriate, interstrial rows, each scale subquadrate, as wide as long, scales alternating in a row with slender, recumbent setae similar to those of striae.

MALE.— Similar to female except frons convex, more coarsely punctured, vestiture reduced in abundance and length; anterior margin of pronotum armed by a pair of teeth, anterior slope of pronotum with about a dozen asperities.

DISTRIBUTION.— Mississippi.

USA: Mississippi: Agricultural College (Starkville), 20,21-II, 19-20-V, *Toxylon pomiferum*, M. W. Blackman; Holly Springs, 25-VIII, 21-IX, Osage Orange, C. J. Drake.

HOST.— *Maclura pomifera*.

BIOLOGY.— According to Blackman (1920:53), the habits are about as described for the genus. The tunnels were almost entirely in the phloem and larval mines tended to be longitudinal.

NOTES.— The above treatment was based on 16 syntypes and on 14 other specimens. This species was described from 16 syntypic specimens from Agricultural College. The Holly Springs "paratypes" must be regarded as no more than Blackman's metatypes. The syntype specimen labeled "type, 24740," in the U.S. National Museum has never been so designated; I here designate that specimen as the lectotype of this species.

## Tribe POLYGRAPHINI

Polygraphidae Chapuis, 1869, Synopsis des Scolytides, p. 48 (Type-genus: *Polygraphus* Erichson, 1836)
Carphoboridae Nüsslin, 1912, Verh. deutsch. Naturf. Arzte 1911:430 (Type-genus: *Carphoborus* Eichhoff, 1864)

Anatomical features.— The frons is sexually dimorphic, with the male variously impressed, the female flat or convex and usually ornamented by hair, the eye is emarginate to divided, the antennal funicle is 5–6-segmented, the club is asymmetrical, flattened, and with or without sutures, the procoxae are contiguous, the third tarsal segments are slender, the pronotum is unarmed, the scutellum is not visible, and the crenulations at the bases of the elytra extent laterally to the humeral angle.

Biological features.— All are phloeophagous. *Carphobius* is monogamous, the other genera are polygynous. Parental tunnels have a large nuptial chamber; they are monoramous in *Carphobius* and of the radiate type in the other genera. Eggs are deposited in niches. Larval mines have a greater tendency to cross one another than is seen in most other tribes. Symbiotic relationships with other genera have not been reported.

Taxonomy.— American *Carphoborus* and *Polygraphus* are restricted to Abietineae hosts in northern North America and undoubtedly were derived from the Eurasian-African area, where both genera are well represented. *Carphobius* is unique to the Cupressineae from Arizona to Guatemala, where it appears to be a relic of a former age. An exchange of *Carphoborus* and *Polygraphus* species between North America and Asia appears to have taken place rather recently; in fact, *Polygraphus rufipennis* (Kirby) and *poligraphus* (Linnaeus) are distinguished with considerable difficulty. The three American genera are quite distinctive and rather easily distinguished from one another.

### Genus *CARPHOBIUS* Blackman

*Carphobius* Blackman, 1943, Proc. U.S. Nat. Mus. 94:398 (Type-species: *Carphobius arizonicus* Blackman, monobasic)

Diagnosis.— This genus superficially resembles *Phloeosinus*, but it is distinguished by the 6-segmented antennal funicle, by the shallowly emarginate eye, and by the transverse sutures of the antennal club. It evidently is much more closely related to *Carphoborus* and *Polygraphus*.

Description.— Length 1.6–2.1 mm, 2.2 times as long as wide; color dark brown. Frons convex in female, impressed in male. Eye elongate, shallowly emarginate. Antennal scape elongate, not reaching posterior margin of eye; funicle 6-segmented; club with three transverse sutures, first septate. Pronotum wider than long, unarmed. Scutellum reduced, not visible. Crenulations at elytral bases extending from interstriae 1 to 7; elytra striate, interstriae punctate; declivity unarmed or armed in male. Vestiture hairlike. Fore coxae contiguous; precoxal ridge on prothorax obsolete. Third tarsal segments wide, bilobed.

Distribution.— Two species are known; they occur from Arizona to Guatemala.

Biology.— These are monogamous, phloeophagous species that occur in small broken or cut branches of their host trees.

#### Key to the Species of *Carphobius*

1. Elytral declivity rather strongly bisulcate, male interstriae 3 armed by a row of teeth; surfaces subshining, vestiture rather coarse; frons more coarsely punctured; Arizona and New Mexico to Durango; *Juniperus deppeana*, 1.6–2.1 mm ..... 1. **arizonicus Blackman**

– Elytral declivity convex, unarmed; surface appearing brightly polished, vestiture finer; frons more finely punctured; Guatemala; *Cupressus lucitanica*; 2.2–3.2 mm ..... 2. ***cupressi*** **Wood**

### 1. *Carphobius arizonicus* Blackman
Fig. 105

*Carphobius arizonicus* Blackman, 1943, Proc. U.S. Nat. Mus. 94:398 (Miller Canyon, Huachuca Mts., Arizona; U.S. National Mus., 56575)

DIAGNOSIS.— This unique species bears a superficial resemblance to some small *Phloeosinus*, but the body is more slender, the elytral armature quite different; the characters summarized in the above key distinguish it from *cupressi* Wood.

FEMALE.— Length 1.6–2.1 mm, 2.23 times as long as wide; color dark brown.

Frons convex, central half of area below upper level of eyes flattened to weakly impressed; epistomal margin weakly elevated, a broad, short premandibular lobe present but not bilobed; surface smooth, shining, punctures fine, deep, rather close, somewhat reduced toward center; vestiture fine, hairlike, rather sparse, uniformly distributed.

Pronotum 0.80 times as long as wide; widest at base, sides weakly arcuate, converging to a rather well-developed constriction just before broadly rounded anterior margin; surface unarmed, smooth, shining, punctures coarse, very deep, close, separated by less than diameter of a puncture; vestiture rather fine, hairlike, long, rather abundant.

Elytra 1.45 times as long as wide, 2.0 times as long as pronotum; bases of elytra arcuate, each armed by nine crenulations, scutellar notch broad, rather well-developed, but scutellum not evident on surface of closed elytra; striae 1 slightly impressed, others not impressed, punctures rather large, moderately deep; interstriae slightly wider than striae, very feebly convex, surface subreticulate, punctures rather fine; confused, a median row on each interstriae very slightly larger. Declivity steep, convex, impressed between third interstriae; interstriae 1 and 3 slightly elevated, unarmed, 2 flat and impressed on median side. Vestiture hairlike, short, abundant, with a median row on each interstriae somewhat longer, erect.

MALE.— Similar to female except frons transversely impressed; third declivital interstriae more strongly elevated, particularly below, and armed by about four rather large, slender teeth that increase in size posteriorly.

DISTRIBUTION.— Arizona and New Mexico to Durango; probably also in W Texas, since the host occurs there.

USA: **Arizona**: Carr Canyon, Huachuca Mts., 8-VIII-62; Miller Canyon, Huachuca Mts., 27-VIII-07, H. A. Kaeber, and 8-VIII-62. **New Mexico**: Ruidoso, 8-X-40, R. L. Furniss. MEXICO: **Chihuahua**: 37 km S Creel, 18-VII-60; 37 km E Maguarichic, 13-VII-62. **Durango**: 37 km W Durango, 4-VI-65, 2000 m, No. 19; 5 km W El Salto, 7-VI-65, No. 40. All taken by me from Alligator juniper except as noted.

HOST.— *Juniperus deppeana*.

BIOLOGY.— This beetle usually selects for attack dying branches less than 3 cm in diameter on living trees, particularly branches girdled by Cerambycidae. The beetles are monogamous, and they construct a longitudinal, monoramous gallery with nuptial chambers and egg niches essentially as in most *Phloeosinus* species. The egg gallery engraves the wood rather deeply and the larval mines do so moderately, due to the thin bark on small branches. Larval mines of moderate length wander in the general direction away from the parental tunnel.

NOTES.— The above treatment was based on the holotype, allotype, 3 paratypes, and 56 other specimens.

### 2. *Carphobius cupressi* Wood

*Carphobius cupressi* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):12 (Holotype, male; 11 km N San Marcos, San Marcos, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *arizonicus* Blackman by the larger size, by the more finely punctured frons, by the convex elytral declivity, by the absence of denticles on the declivity, by the brightly polished appearance, by the finer vestiture, and by many other characters.

MALE.— Length 2.2–3.2 mm, 2.3 times as long as wide; color very dark brown, almost black, elytra dark reddish brown.

Frons strongly, transversely impressed just below middle, impression extending to upper level of eyes, epistoma strongly raised and bearing a broad premandibular lobe, a small

median tubercle at base of lobe; surface of impressed area very smooth, brightly shining, very finely punctured on lower third, punctures slightly larger above; vertex reticulate, dull. Eye shallowly emarginate, finely granulate. Antennal scape elongate; funicle 6-segmented, longer than scape; club as long as scape, 1.5 times as long as wide, with three straight, transverse sutures.

Pronotum 0.90 times as long as wide; widest near base, sides rather weakly arcuate and converging slightly on basal half, rather strongly constricted laterally just before broadly rounded anterior margin; surface smooth, brightly shining, punctures coarse, deep, close. Vestiture of fine, moderately long, rather abundant hair.

Elytra 1.6 times as long as wide, 2.1 times as long as pronotum; scutellum not exposed; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; each basal margin strongly arcuate and armed by about 16 crenulations, submarginal crenulations poorly developed; striae not impressed, punctures coarse, deep; interstriae smooth, shining, as wide as striae, punctures fine, deep, confused, rather numerous. Declivity rather steep, convex; sculpture about as on disc except strial punctures slightly smaller; interstrial punctures devoid of granules. Vestiture of fine, rather short, abundant strial and interstrial hair, and interstrial rows of similar but slightly longer hair. Third tarsal segments broad, bilobed.

FEMALE.— Similar to male except frons convex, with a slight central impression.

DISTRIBUTION.— Guatemala.

GUATEMALA: 11 km N San Marcos, San Marcos, 23-II-72, *Cupressus lucitanica*, E. W. Clark.

HOST.— *Cupressus lucitanica*.

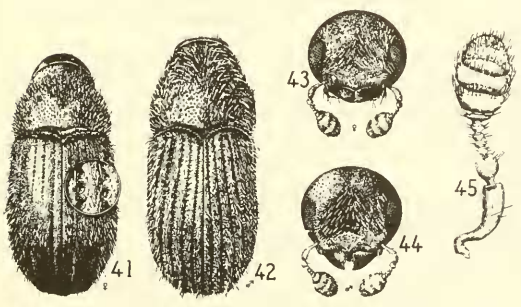



Fig. 105. *Carphobius arizonicus*: 41, female; 42, male; 43, female head; 44, male head; 45, antenna. (After Blackman 1943:pl. 17.)

BIOLOGY.— Specimens were taken from the bark of recently cut branches.

NOTES.— The above treatment was based on the type series of 19 specimens.

## GENUS *CARPHOBORUS* EICHHOFF

*Carphoborus* Eichhoff, 1864, Berliner Ent. Zeitschr. 8:27 (Type-species: *Hylesinus minimus* Fabricius, monobasic)

*Estenoborus* Reitter, 1913, Wiener Ent. Zeit. 32(Beiheft):58 (Type-species: *Hylesinus perrisi* Chapuis, monobasic)

DIAGNOSIS.— This species is distinguished from *Polygraphus* Erichson by the 5-segmented antennal funicle, by the presence of two sutures on the antennal club, and by the deeply emarginate eye.

DESCRIPTION.— Length 1.4–2.6 mm, 2.2–2.6 times as long as wide; color almost black. Frons dimorphic, females shallowly concave to moderately convex, ornamented by abundant setae, males impressed above eyes, a conspicuous, transverse, usually bituberculate elevation near upper level of eyes, vestiture sparse, inconspicuous. Eye elongate-oval, about 2.3 times as long as wide, deeply emarginate. Antennal scape elongate; funicle 5-segmented; club varying from narrow and symmetrical to broad and moderately asymmetrical, two definite sutures, and a third indefinite suture indicated. Pronotum about 0.83 times as long as wide; widest near base, a distinct lateral constriction just before anterior margin; sculpture simple; punctures moderately small, abundant; vestiture of small erect scales. Elytra about 1.7 times as long as wide; basal margins armed by about nine crenulations, submarginal crenulations also present; striate, strial punctures coarse; interstriae often subgranulate, dentate on declivity, alternate interstriae usually elevated. Vestiture of conspicuous, small, interstrial scales, and minute, inconspicuous strial hair. Third tarsal segments cylindrical.

DISTRIBUTION.— N North America, North Africa, Europe and N Asia; of the 34 species known, 20 occur in North America.

BIOLOGY.— The species of *Carphoborus* are polygynous and phoeophagus. They attack small, shaded-out branches of living trees or the boles of small, suppressed, unthrifty trees. Most species live in host tissues drier and more completely dead than those preferred by most bark beetles. An apparent exception

is *pinicolens* Wood, which may be capable of killing healthy seedlings in a desert scrub forest. The male constructs the entrance tunnel and a large nuptial chamber. Three to about eight females join him and construct straight or slightly sinuate egg galleries that radiate out from the nuptial chamber. These parental galleries engrave the wood deeply; about two-thirds of the diameter of the tunnel is in the wood. The large eggs are deposited individually in niches and packed with a brownish frass presumably derived from the phloem. The larval mines wander indiscriminately in the phloem; they are usually very short, but are not always so. The young adults may feed in the brood tunnels for long periods of time before emerging from the host. Three successive generations were reared in the laboratory from the same piece of wood; it is doubtful this habit would be repeated in nature except under unusual circumstances.

Key to the Species of *Carphoborus*
(Modified from Wood 1954)

1. Antennal club large, broad, less than 1.2 times as long as wide (except *simplex*); female frons impunctate and glabrous on a moderately large median area; transverse impression of male frons more conspicuous and extensive, median elevation large and prominent ..... 2

— Antennal club small, slender, 1.3 or more times as long as wide (also see *simplex*); female frons punctate or granulate, pubescent over entire surface; male frons usually less strongly impressed below, median elevation smaller, often absent ..... 9

2(1). Female frons flattened, frontal pubescence long, setae on or near vertex much more than half as long as scape. ..... 3

— Female frons convex, frontal pubescence short, setae on vertex less than one-fourth as long as scape ..... 8

3(2). Declivital interstriae 2 as wide as 1 and 3, usually convex; declivital interstriae 1, 3, 5, 7, and 9 less strongly elevated, more finely or not at all serrate; California; *Pseudotsuga macrocarpa*; 1.9–2.2 mm ..... 1. ***blaisdelli*** **Swaine**

— Declivital interstriae 2 distinctly narrower than one or three, flat, alternate declivital interstriae usually more strongly elevated, serrations larger ..... 4

4(3). Antennal club smaller, more slender, 1.2 times as long as wide; interstriae 2 becoming obsolete on upper half of declivity; declivital interstriae 3 more strongly elevated; California to Baja California; *Pinus lambertiana*, *P. sabiniana*; 1.8–2.4 mm ..... 6. ***simplex*** **Leconte**

— Antennal club larger, broad; declivital interstriae 2 narrow, continuing to near apex; declivital interstriae 3 only slightly elevated (except *mexicanus*) ..... 5

5(4). Sutures on antennal club more strongly oblique, 1 weakly, 2 more strongly procurved; declivital interstriae 3 and 9 weakly convex ..... 6

— Sutures of antennal club transverse, straight to weakly arcuate; declivital interstriae more conspicuously elevated ..... 7

6(5). Female frons almost flat, impunctate, glabrous area occupying central fourth, pubescence more abundant, slightly longer; tubercles on elytral declivity finer; British Columbia to California; *Pseudotsuga menziesii*; 1.8–2.6 mm ..... 2. ***vandykei*** **Bruck**

— Female frons moderately convex, impunctate, glabrous area occupying more than central half; declivital tubercles larger; S California to S Nevada; *Pinus edulis*, *P. monophylla*; 1.8–2.5 mm ..... 3. ***frontalis*** **Wood**

7(5). Declivital interstriae 1, 3, and 9 weakly elevated, all less than half as high as wide; discal interstriae very slightly wider than striae; Wyoming and New Mexico to Oregon and California; *Pinus*; 1.7–2.5 mm ..... 4. ***pinicolens*** **Wood**

— Declivital interstriae 1, 3, and 9 rather strongly elevated, 3 at least as high as wide; discal interstriae distinctly narrower than striae; Durango; *Pinus lumholzii*; 1.8 mm ..... 5. ***mexicanus*** **Bright**

8(2). Female frons feebly convex, central impunctate, glabrous area occupying median fourth; declivital interstriae 2 continuing to near apex; Wyoming and Utah; *Picea pungens*; 1.8–2.2 mm ..... 7. ***brevisetosus*** **Wood**

— Female frons more strongly convex, central impunctate, glabrous area occupying more than median half; interstriae 2 becoming obsolete on upper half of declivity; SE Arizona and SW New Mexico to Durango; *Pinus edulis, P. leiophylla*; 1.8–2.5 mm ..... 8. ***convexifrons*** **Wood**

9(1). Interstriae 9 not elevated or serrate posterior to base of declivity ..... 10

— Interstriae 9 elevated and serrate to junction with 3 ..... 12

10(9). Declivital interstriae 3 more strongly, broadly elevated, serrations small, confused, more abundant on sides of elevation than on its summit; Michigan to New Brunswick; *Picea rubens, Larix laricina*; 1.6–1.9 mm ..... 11. ***dunni*** **Swaine**

— Declivital interstriae 3 less strongly, more narrowly elevated, serrations larger, confined to summit ..... 11

11(10). Declivital interstriae 1 moderately elevated, serrate, 3 only slightly more strongly elevated than 1, of almost uniform height or highest near middle of declivity; Alberta to Utah and Colorado; *Picea engelmannii, P. pungens*; 1.8–2.1 mm ..... 9. ***sansoni*** **Swaine**

— Declivital interstriae 1 usually not elevated or serrate (occasional exceptions), 3 much more strongly elevated than 1, height of elevation increasing to its apex, declivital teeth usually more slender; Alaska to Northwest Territories; *Picea glauca*; 1.8–2.2 mm ..... 10. ***andersoni*** **Swaine**

12(11). Female frons flattened or concave, rather coarsely punctured; declivital teeth on interstriae 3 very coarse, longer than height of elevation of this interstriae; declivital interstriae 2, 4, 6, and 8 never serrate ..... 13

— Female frons flattened or convex, punctate or granulate; declivital teeth fine, those on interstriae 3 much shorter than height of this interstriae; even-numbered declivital interstriae sometimes serrate ..... 14

13(12). Female frons broadly concave, very coarsely punctured; male frons with a prominent, median, tuberculate elevation; declivital interstriae 1, 3, and 9 less strongly elevated, teeth less numerous and smaller; California; *Pinus radiata*; 1.8–2.4 mm ..... 12. ***radiatae*** **Swaine**

— Female frons flattened, often with a small, very narrow, deep, median groove, punctures not as coarse; male frons usually devoid of tuberculate elevation; declivital teeth more numerous, larger; British Columbia and Montana to California and Utah; *Pinus contorta, P. ponderosa*; 1.8–2.1 mm ..... 13. ***ponderosae*** **Swaine**

14(12). Declivital interstriae 4, 6, and 8 finely serrate; female frons at least weakly convex, finely granulate, never shining and punctured ..... 15

— Declivital interstriae 4, 6, and 8 never serrate (weakly serrate in *intermedius*); female frons flattened and punctured, or convex and granulate ..... 16

15(14). Declivital interstriae 2 rather broad, serrate; female frons evenly, weakly convex; California; *Pinus contorta*; 1.7–2.0 mm ..... 14. ***declivis*** **Wood**

— Declivital interstriae 2 very narrow, not serrate; female frons rather strongly convex; Arizona; *Pseudotsuga menziesii*; 2.1 mm ..... 15. ***pseudotsugae*** **Wood**

16(14). Discal interstriae as wide or wider than striae; pronotal and elytral scales distinctly larger, apparently less abundant ..... 17

— Discal interstriae narrower than striae; declivital teeth small to very small; pronotal and elytral scales smaller, apparently more abundant ..... 19

17(16). Female frons more strongly impressed, frontal vestiture finer, much longer in marginal areas than at center; declivital interstriae 3 as high as wide; Alaska to Oregon and Colorado; *Picea engelmannii* (*Pinus contorta*?); 1.9–2.1 mm ..... 16. ***intermedius*** **Wood**

— Female frons flattened, frontal vestiture coarse, rather short, of uniform length; declivital interstriae 3 wider than high ..... 18

18(17). Declivital interstriae 1 and 3 rather weakly elevated, their denticles coarse, much longer than height of interstriae; Utah; *Pinus ponderosa*; 1.8–2.2 mm ..... 17. ***perplexus*** **Wood**

— Declivital interstriae 1 and 3 slightly higher, their denticles small, not as long as height of interstriae; Oregon; *Picea engelmannii*; 1.7 mm ..... 18. ***piceae*** **Wood**

19(16). Female frons flattened, shining, rather finely, closely punctured, pubescence longer, fine, less abundant; declivital interstriae 3 moderately elevated; interstriae 5 and 7 fused apically; Alaska and Northwest Territories to Wyoming and New Brunswick; *Picea*; 1.4–2.1 mm ..... 19. ***carri*** **Swaine**

— Female frons convex, opaque, finely granulate, frontal vestiture short, abundant; declivital interstriae 3 very strongly elevated, elevation curving after junction with 9 and continuing to sutural apex; interstriae 5 and 7 ending separately; Missouri and New York to Mississippi and Florida; *Pinus*; 1.4–1.8 mm ..... 20. ***bifurcus*** **Eichhoff**

### 1. *Carphoborus blaisdelli* Swaine

Fig. 108

*Carphoborus blaisdelli* Swaine, 1924, Canadian Ent. 56:234 (Holotype, male; Camp Baldy, San Bernardino Co., California; Canadian Nat. Coll., 820)

*Carphoborus cressatyi* Bruck, 1936, Bull. California Acad. Sci. 35:36 (Holotype, male; Arroyo Seco, Los Angeles Co., California; California Acad. Sci. Coll.); Wood, 1954, Canadian Ent. 86:509. *Synonymy*

DIAGNOSIS.— This species is distinguished from *vandykei* Bruck by having declivital interstriae 2 as wide and as high as 1 or 3.

FEMALE.— Length 1.9–2.2 mm, 2.2 times as long as wide; color dark brown to black.

Frons flattened on central three-fourths from well above eyes to just above epistoma, epistomal margin elevated, with a moderately large premandibular lobe, surface of flattened area reticulate, with rather close, deep, small punctures except impunctate on median fourth, extreme lateral and dorsal areas more coarsely sculptured; vestiture confined to punctured area, rather long and abundant in peripheral areas, epistomal brush conspicuous. Antennal club moderately asymmetrical, sutures 1 and 2 suboblique, weakly to moderately arcuate.

Pronotum 0.83 times as long as wide; widest near base, sides on basal half almost straight, rather strongly constricted before broadly rounded anterior margin; surface very closely, deeply, rather coarsely punctured. Vestiture of abundant, small, erect scales.

Elytra 1.7 times as long as wide; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; each basal margin armed by nine crenulations and several smaller submarginal crenulations at bases of interstriae 2–5; striae weakly impressed, punctures rather coarse, close, deep; interstriae slightly wider than striae, weakly convex, punctures close, deep, rather coarse, confused. Declivity steep, convex; interstriae 1–3 moderately, equally convex, 3 slightly

higher on lower half in some specimens, 1, 3, 5, 7, and 9 armed by small, pointed teeth. Vestiture of abundant, small, erect scales.

MALE.— Similar to female except frons rather strongly, transversely impressed on lower half, with bituberculate, median elevation at upper level of eyes, surface rather coarsely, closely punctured; vestiture short, stout.

DISTRIBUTION.— S California.

USA: **California**: Arroyo Seco, Los Angeles Co., 25-XII-33, C. R. Bruck; Mt. Wilson, Los Angeles Co., 15-VII-24, W. Benedict; Pasadena, Los Angeles Co.; Camp Baldy, San Bernardino, 17-VII-14; Keen Camp, San Jacinto Mts.; Santa Paula, Ventura Co.; Sierra Madre Mts., 15-VIII-24; Switzers Camp, San Gabriel Mts.; all from the same host.

HOST.— *Pseudotsuga macrocarpa.*

BIOLOGY.— Apparently this species breeds only in unthrifty branches of living trees.

NOTES.— The above treatment was based on the holotype, 21 paratypes of *blaisdelli*, and 149 other specimens.

### 2. *Carphoborus vandykei* Bruck

Figs. 107, 108

*Carphoborus vandykei* Bruck, 1933, Canadian Ent. 65:104 (Holotype, male; Mount St. Helena, California; Ohio State Univ. Coll.)

DIAGNOSIS.— This species has the antennal sutures weakly procurved as in *blaisdelli* Swaine, but it is distinguished by having declivital interstriae 2 flat and narrower than 1 or 3. Declivital interstriae 3 and 9 are less strongly elevated than in *pinicolens* Wood, in addition to the antennal character mentioned in the above key.

FEMALE.— Length 1.8–2.6 mm, 2.3 times as long as wide; color dark brown to almost black.

Frons, pronotum, and elytral disc as in *blaisdelli* except frontal vestiture somewhat shorter. Elytral declivity differing from *blaisdelli* as indicated in above diagnosis.

MALE.— Similar to female except frons as in male *blaisdelli.*

DISTRIBUTION.— S British Columbia to central California.

CANADA: **British Columbia**: Qualicum, 18-II-23; Pender harbour, 8-V-28, G. R. Hopping. USA: **California**: Burney, Shasta Co., 11-VI-61, S. L. Wood; Calistoga, 5-X-47, S. L. Wood; Deadhorse Summit, Siskiyou Co., 15-VI-61, S. L. Wood; Del Norte Co., 22-V-37, R. L. Furniss; French Hill 22-V-37, R. L. Furniss; Mt. St. Helena 29-III-39, C. R. Bruck; Quincy; 6 mi (10 km) N Willets, 9-V-46, T. O. Thatcher; Yosemite N. P. All from Douglas fir. **Oregon**: Ashland; Oregon Caves; St. Helen; Waldo.

HOST.— *Pseudotsuga menziesii.*

BIOLOGY.— This species breeds in the lower, unthrifty branches of living trees.

NOTES.— The above treatment was based on the holotype, 41 paratypes, and 19 other specimens.

### 3. *Carphoborus frontalis* Wood

*Carphoborus frontalis* Wood, 1954, Canadian Ent. 86:515 (Holotype, female; Ventura County, California; U.S. Nat. Mus.)

DIAGNOSIS.— This species has the sutures on the antennal club weakly procurved as in *vandykei* Bruck, but it is distinguished by the moderately convex female frons, with a much larger, impunctate, central area, and by the very slightly larger strial punctures and declivital denticles.

FEMALE.— Length 1.8–2.5 mm, 2.5 times as long as wide; color dark brown to black.

Frons as in *blaisdelli* except broadly convex, central glabrous, impunctate area occupying more than central half, vestiture

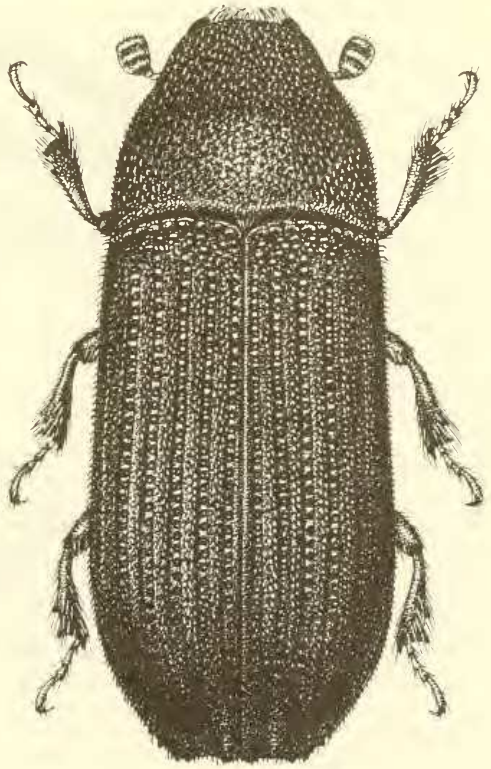


Fig. 106. *Carphoborus pinicolens*, female. (After Bright 1973:155.)

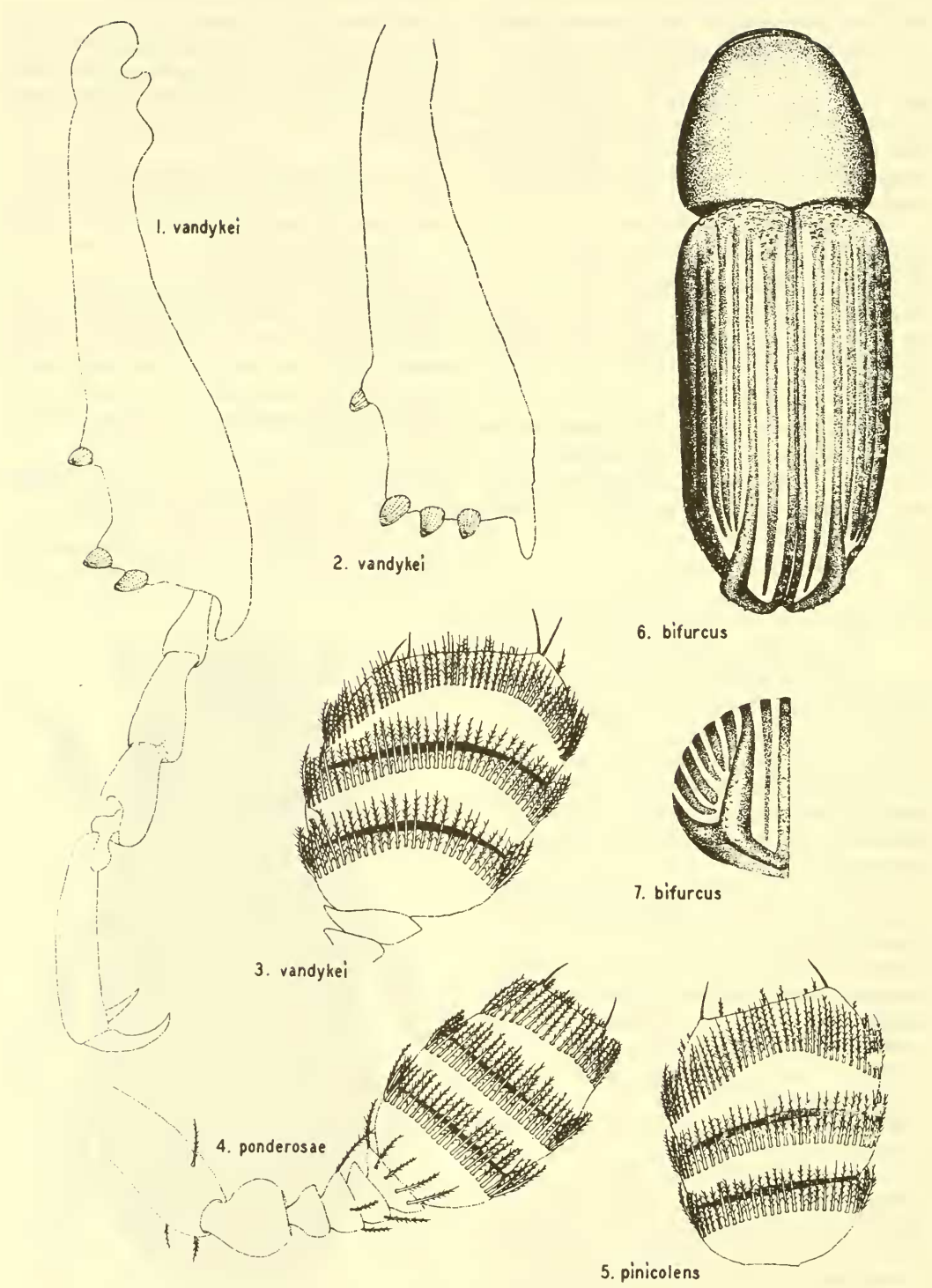



Fig. 107. *Carphoborus* spp.: 1, *vandykei*, protibia, 2, same, metatibia, 3, same, antennal club; 4, *ponderosae*, antenna; 5, *pinicolens*, antennal club; 6, *bifurcus* (setae and strial punctures omitted), 7, same, face of declivity. (After Wood 1954:503.)

coarser, slightly shorter. Pronotum and elytral disc as in *blaisdelli* except striae less distinctly impressed, punctures slightly larger, interstriae almost flat. Elytral declivity as in *vandykei* except denticles averaging slightly larger.

MALE.— Similar to female except frons differing as in *blaisdelli*.

DISTRIBUTION.— S California and S Nevada.

USA: California: Frazier Mt., 6-IX-40, A. T. McClay; Pasadena, 22-II-24; Valyermo, 17-I-36, 26-I-37, A. T. McClay; Ventura Co., 17-I-05, lot 277g, A. D. Hopkins; Wrightwood, San Bernardino Co. Nevada: 25 mi (40 km) NW Las Vegas, 10-VI-69, W. G. Harwood. All from the same host.

HOST.— *Pinus monophylla*.

BIOLOGY.— Presumably reared from branches.

NOTES.— The above treatment was based on the holotype, on 16 paratypes, and on 23 other specimens.

The series from which the type was selected was labeled *Pinus edulis*; however, the nearest native stand of that host occurs several hundred miles east of the type locality.

### 4. *Carphoborus pinicolens* Wood
Figs. 106, 107, 108

*Carphoborus pinicolens* Wood, 1954, Canadian Ent. 86:512 (Holotype, female; Logan Dry Canyon, Utah; U.S. Nat. Mus.)

*Carphoborus tuberculatus* Bright, 1964, Pan. Pacific Ent. 40:165 (Holotype, female; Crooked Creek, Mono Co., California; California Acad. Sci.); Wood, 1977, Great Basin Nat. 37:384. *Synonymy*

DIAGNOSIS.— This species is very closely related to *vandykei* Bruck, but it is distinguished by the straight suture 1 of the antennal club, by the more strongly elevated declivital interstriae 3 and 9, and by the larger, more numerous denticles on the elytral declivity.

FEMALE.— Length 1.7–2.5 mm, 2.3 times as long as wide; color dark brown to black.

Frons, pronotum, and elytra as in *vandykei* except frontal vestiture coarse, shorter, strial punctures very slightly larger, and declivital interstriae 1, 3, and 9 usually slightly higher with denticles averaging slightly larger; antennal club with sutures 1 and 2 almost straight.

MALE.— Similar to female except differing as in *blaisdelli*.

DISTRIBUTION.— Oregon and Wyoming to California and New Mexico.

USA: Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, Wyoming.

HOSTS.— *Pinus aristata, P. cembroides, P. edulis, P. flexilis, P. jeffreyi, P. lambertiana, P. leiophylla, P. monophylla, P. ponderosa.*

BIOLOGY.— This species breeds in unthrifty, cut, or broken branches or tops and unthrifty or injured seedlings. In several instances apparently healthy seedlings on poor sites were killed.

NOTES.— The above treatment was based on the holotype and 85 paratypes of *pinicolens*, on the holotype and a long series of paratypes of *tuberculatus*, and on 104 other specimens.

Seventy percent of the females taken at the type locality have a small tubercle in the center of the frons. This character also appeared in single females from Beaver and Long Hollow, Utah, as well as in the type series of *tuberculatus*.

### 5. *Carphoborus mexicanus* Bright

*Carphoborus mexicanus* Bright, 1972, Canadian Ent. 104:1491 (Holotype, female; 14 km or 9 miles E El Palmito, Durango, Mexico; Canadian Nat. Coll., 12605)

DIAGNOSIS.— This species is distinguished from *pinicolens* Wood by the smaller size, by the strongly elevated declivital interstriae 1, 3, and 9, and by the larger, deeper strial punctures.

FEMALE.— Length 1.8 mm, 2.2 times as long as wide; color almost black, vestiture pale.

Frons as in *frontalis* except vestiture longer, some setae as long as scape. Antennal club as in *pinicolens*.

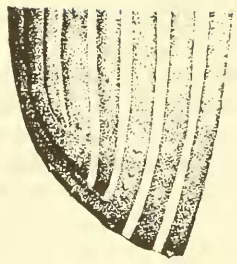
Pronotum and elytra as in *pinicolens*, except strial punctures much larger, deeper, striae distinctly wider than interstriae, interstriae 1, 5, 7, and 9 more strongly elevated, about half as high as wide, 3 much higher, as high as wide near its apex, 3 and 9 fused at their junction. Scales slightly smaller than in *pinicolens*.

DISTRIBUTION.— Durango.

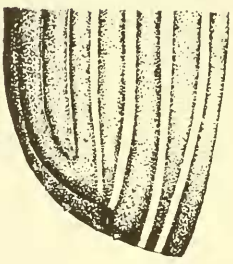
MEXICO: **Durango**: 9 miles or 14 km E El Palmito, 15-VI-71, 2500 m, *Pinus lumholzii*, D. E. Bright.

HOST.— *Pinus lumholzii*.

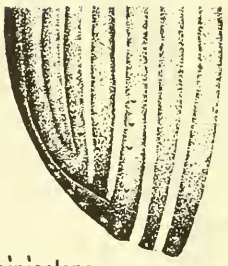
NOTES.— The above treatment was based on the holotype.



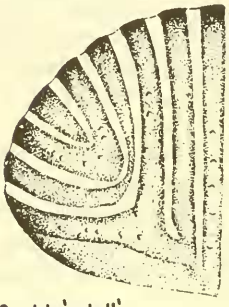
8. blaisdelli



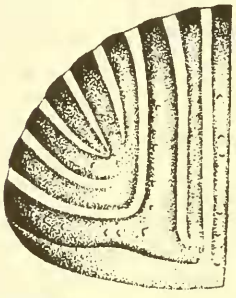
10. vandykei



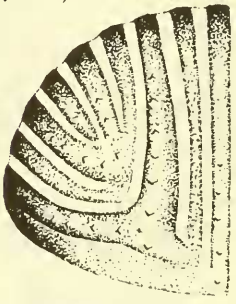
12. pinicolens



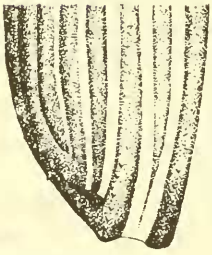
9. blaisdelli



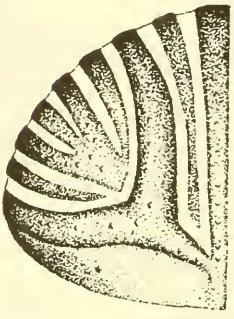
11. vandykei



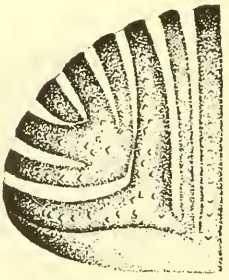
13. pinicolens



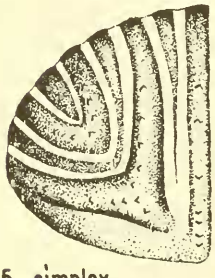
14. simplex



16. convexifrons



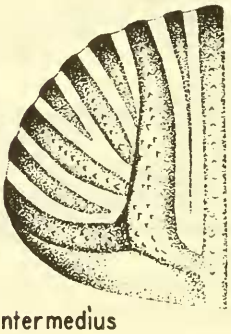
18. pseudotsugae



15. simplex



17. declivis



19. intermedius

Fig. 108. *Carphoborus* spp., elytral declivities, dorsal and caudal aspects: 8, 9, *blaisdelli*; 10, 11, *vandykei*; 12, 13, *pinicolens*; 14, 15, *simplex*; 16, *convexifrons*; 17, *declivis*; 18, *pseudotsugae*; 19, *intermedius*. (After Wood 1954:511.)

### 6. *Carphoborus simplex* LeConte
Fig. 108

*Carphoborus simplex* LeConte, 1876, Proc. Amer. Philos. Soc. 15:383 (Lectotype, female; Mojave Desert, California; Mus. Comp. Zool., 979, present designation)

*Carphoborus swainei* Bruck, 1933, Canadian Ent., 65:105 (Holotype, male; Mt. Diablo, California; Ohio State Univ. Coll.); Wood, 1954, Canadian Ent. 86:513. *Synonymy*

DIAGNOSIS.— This species has the frons essentially as in *pinicolens* Wood, the declivity as in *convexifrons* Wood, and the antennal club more slender than either of these.

FEMALE.— Length 1.8–2.4 mm, 2.3 times as long as wide; color dark brown to black.

Frons as in *pinicolens*, with central impunctate area occupying central half; vestiture less abundant, longer, slightly finer. Antennal club slender, 1.2 times as long as wide; sutures almost straight. Pronotum and elytral disc as in *pinicolens*; elytral declivity with interstriae 2 very narrow, obsolete on lower half; 1 moderately, 3 more strongly elevated, about half as high as wide, 1, 3, 5, 7, and 9 finely serrate.

MALE.— Similar to female except frons differing as in *blaisdelli*.

DISTRIBUTION.— California to Baja California.

USA: **California**: numerous localities southward from Shasta Co. MEXICO: **Baja California**: San Isidro, 1-XI-47.

HOSTS.— *Pinus sabiniana*, one record each from *P. jeffreyi*, and *P. ponderosa*.

BIOLOGY.— This species breeds in small, unthrifty branches of living trees.

NOTES.— LeConte's species was based on more than one specimen. I here designate the first, a female bearing the type label and type number 979 in the LeConte Collection at the Museum of Comparative Zoology, as the lectotype of *Carphoborus simplex* LeConte. The above treatment was based on the lectotype of *simplex*, on the holotype and 44 paratypes of *swainei*, and on 367 other specimens.

### 7. *Carphoborus brevisetosus* Wood

*Carphoborus brevisetosus* Wood, 1954, Canadian Ent. 86:514 (Holotype, female; Saratoga, Wyoming; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from *pinicolens* Wood by the slightly convex female frons, by the much shorter frontal vestiture on the female, and by the less strongly elevated declivital interstriae 3 and 9, with their tubercles finer.

FEMALE.— Length 1.8–2.1 mm, 2.3 times as long as wide; color dark brown to black.

Frons as in *pinicolens* except feebly convex, vestiture short, less abundant, longest setae about equal in length to width of scape; antennal club more slender, 1.2 times as long as wide. Pronotum and elytral disc as in *pinicolens*; declivity with interstriae 3 and 9 less strongly elevated, tubercles finer.

MALE.— Similar to female except frons differing as in *blaisdelli*.

DISTRIBUTION.— Wyoming to Utah.

USA: **Utah**: McKee Draw, Ashley N.F., 16-VI-60; Parowan Canyon, 20-VI-60; Sanford Canyon, Dixie N.F., 22-VI-60; all from *Picea pungens*, by S. L. Wood. **Wyoming**: Saratoga, 28-VII, lot 955-2, *Picea pungens*, D. DeLeon, 17-VII, Hopk. U.S. 31529e.

HOST.— *Picea pungens*.

BIOLOGY.— All specimens were taken from unthrifty, shaded-out branches of living trees.

NOTES.— The above treatment was based on the type series of 6 specimens and on 90 other specimens.

### 8. *Carphoborus convexifrons* Wood
Fig. 108

*Carphoborus convexifrons* Wood, 1954, Canadian Ent. 86:516 (Holotype, female; Chiricahua Nat. Mon., Arizona; U.S. Nat. Mus.)

DIAGNOSIS.— This species is closely allied to *frontalis* Wood, but it is distinguished by the more strongly convex female frons, with very short frontal vestiture, by the narrow, almost obsolete declivital interstriae 2, and by the more strongly elevated interstriae 3.

FEMALE.— Length 1.8–2.5 mm, 2.3 times as long as wide; color dark brown to black.

Frons moderately convex, a narrow, transverse impression immediately above epistoma; central half impunctate and glabrous, peripheral areas rather coarsely, deeply punctured; vestiture coarse, short, setae shorter than thickness of antennal scape, epistomal brush longer. Antennal club broad, sutures 1 and 2 very feebly arcuate.

Pronotum and elytral disc essentially as in *frontalis*; elytral declivity similar to that of *frontalis* except interstriae 2 very narrow, almost obsolete, interstriae 3 and 9 more strongly elevated, about half as high as wide;

declivital denticles on interstriae 1, 3, 5, 7, and 9 comparatively small.

MALE.— Similar to female except frons differing as in *blaisdelli*.

DISTRIBUTION.— SE Arizona and SW New Mexico to Durango and Coahuila.

USA: **Arizona**: Chiricahua Nat. Mon., 1-X-36, lot 838-2, *Pinus leiophylla*, D. DeLeon; Santa Catalina Mts., lots 7703, 7705, M. Chrisman. **New Mexico**: Peloncillo N.F., 12-XI-07 (bred 6-I-08), Hopk. U.S. 5593, *P. edulis*, J. L. Webb. MEXICO: **Chihuahua**: La Pinta, pinyon. **Coahuila**: 18 miles or 29 km SE Saltillo, 21-V-71, *P. cembroides*, D. E. Bright. **Durango**: 30 km W Durango, 19-VI-71, *P. cembroides*, D. E. Bright.

HOSTS.— *Pinus edulis*, *P. cembroides*, and *P. leiophylla*.

NOTES.— The above treatment was based on the type series of 20 specimens and on 43 other specimens.

### 9. *Carphoborus sansoni* Swaine
Fig. 109

*Carphoborus sansoni* Swaine, 1924, Canadian Ent. 56:235 (Holotype, male; Banff, Alberta; Canadian Nat. Coll., 822)

*Carphoborus engelmanni* Wood, 1951, J. Ent. Soc. Kansas 23:31 (Holotype, female); Logan Dry Canyon, Utah; U.S. Nat. Mus.); Wood, 1954, Canadian Ent. 86:517. *Synonymy*

DIAGNOSIS.— This species is very closely allied to *andersoni* Swaine, but it is distinguished by the more strongly elevated and serrate declivital interstriae 1 and the less strongly elevated declivital interstriae 3, particularly on the apical half.

FEMALE.— Length 1.8–2.1 mm, 2.4 times as long as wide; color almost black.

Frons flattened on central half; surface closely, deeply, rather finely punctured over entire surface; vestiture coarse, uniformly rather short, uniformly distributed. Antennal club 1.3 times as long as wide; sutures straight, suboblique. Pronotum and elytral disc essentially as in *blaisdelli* Swaine except interstriae 1, 3, 5, and 7 each with a row of granules on posterior half; elytral declivity with interstriae 1 moderately elevated, rather coarsely serrate, 2 very narrow, flat, 3 more strongly elevated than 1, slightly more than half as wide, rather coarsely serrate, 5, 7, and 9 feebly or not at all elevated, 5 and 7 each with two or three denticles, 9 either unarmed or with one or two denticles at base of declivity only.

MALE.— Similar to female except frons differing as in *blaisdelli*.

DISTRIBUTION.— Alberta to Utah and Colorado.

CANADA: **Alberta**: Banff, IX-1916, white spruce, N. B. Sanson. USA: **Colorado**: 40 miles (64 km) SW Del Norte, 25-VI-61, 3100 m, *P. engelmannii*, W. G. Harwood; Gould, 12-VI-68, *P. engelmannii*, S. L. Wood. **Oregon**: Dixie Pass, 23-VI-61, *Picea engelmannii*, S. L. Wood. **Utah**: Beaver, 10-XI-49, *P. engelmannii*, S. L. Wood; Logan Dry Canyon, 24-VII-46, 30-V-47, 11-VI-49, *P. engelmannii*, S. L. Wood; Monte Cristo, 20-VII-49, *P. engelmannii*, S. L. Wood; McKee Draw, Ashley N.F., 16-VI-60, *P. pungens*, S. L. Wood. **Wyoming**: Yellowstone N.P.

HOSTS.— *Picea engelmannii*, *P. glauca*, and *P. pungens*.

BIOLOGY.— This species breeds in the bole of unthrifty, suppressed seedlings and in unthrifty shaded out branches of large, living, standing trees.

NOTES.— The above treatment was based on the holotypes of *sansoni* and *engelmanni*, on 31 paratypes of *engelmanni*, and on 16 other specimens.

### 10. *Carphoborus andersoni* Swaine
Fig. 109

*Carphoborus andersoni* Swaine, 1919, Rept. Canadian Arctic Exped. 3:6E (Holotype, female; Sandstone Rapids, Coppermine River, Northwest Territories; Canadian Nat. Coll., 9266)

DIAGNOSIS.— This species is distinguished from *sansoni* Swaine by the less strongly elevated, more sparsely serrate declivital interstriae 1, by the more strongly elevated lower half of declivital interstriae 3, and by the more slender declivital teeth.

FEMALE.— Length 1.8–2.2 mm, 2.4 times as long as wide; color dark brown to black.

Frons, pronotum, and elytral disc as in *sansoni* except frons often shallowly concave, and interstrial granules on interstriae 3, 5, and 7 extend to base; elytral declivity with interstriae 1 weakly elevated, feebly or not at all serrate, 2 very narrow, flat, 3 steadily increasing in height from base to junction with 9, as high as wide at highest point, armed by 6 to 10 coarse, rather slender teeth.

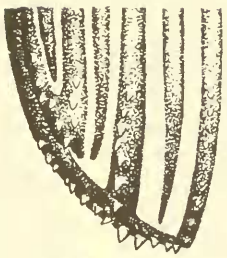
MALE.— Similar to female but sexes differing about as in *blaisdelli* Swaine.

DISTRIBUTION.— Alaska to Northwest Territories.

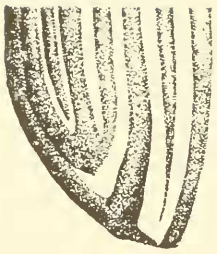
ALASKA: Ft. Yukon, Salmon River. CANADA: **Northwest Territories**: Aklavik, 20-IX-30, 10-V, 8-VI, 18-VI-31,



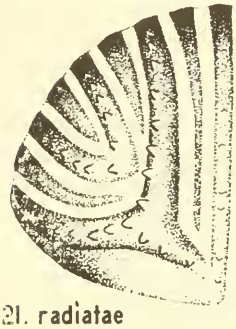
20. radiatae



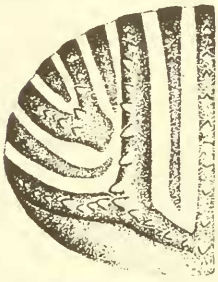
22. ponderosae



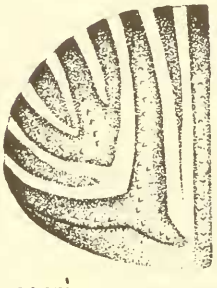
24. carri



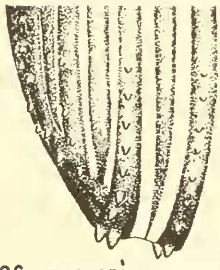
21. radiatae



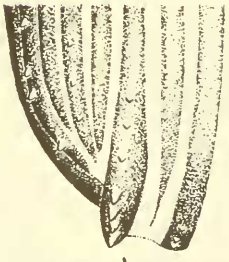
23. ponderosae



25. carri



26. sansoni



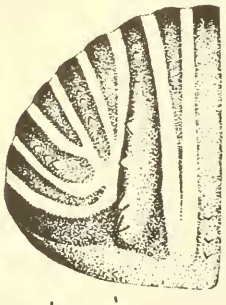
28. andersoni



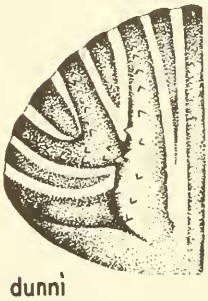
30. dunni



27. sansoni



29. andersoni



31. dunni

Fig. 109. *Carphoborus* spp., elytral declivities, dorsal and causal aspects: 20, 21, *radiatae*; 22, 23, *ponderosae*; 24, 25, *carri*; 26, 27, *sansoni*; 28, 29, *andersoni*; 30, 31, *dunni*. (After Wood 1954:519.)

28-VII-32, O. Bryant; Sandstone Rapids on Coppermine River, 15-II-15, *Picea canadensis*, F. Johansen. **Yukon**: Long. 142, Lat. 65, 21-VII-55, *Picea glauca*, W. McCambridge.

HOST.— *Picea glauca*.

BIOLOGY.— Specimens were reared from spruce branches.

NOTES.— The above treatment was based on the holotype and on 59 other specimens.

Fossilized remains of this species were taken in prehistoric lake deposits estimated to be 10,000 to 70,000 years of age in Ontario, Minnesota, and New York.

### 11. *Carphoborus dunni* Swaine
Fig. 109

*Carphoborus dunni* Swaine, 1924, Canadian Ent. 56:235 (Holotype, female, Nictor Lake, New Brunswick; Canadian Nat. Coll., 821)

DIAGNOSIS.— This species is allied to *andersoni* Swaine and *sansoni* Swaine, but it is distinguished by the granulate female frons, with shorter pubescence, by the higher, wider declivital interstriae 3, with denticles on 3 smaller, more abundant, and confused.

FEMALE.— Length 1.6–1.9 mm, 2.4 times as long as wide; color dark brown.

Frons convex, transversely impressed above epistoma; surface granulate-punctate; vestiture short, sparse. Antennal club 1.4 times as long as wide, sutures straight. Pronotum essentially as in *blaisdelli* Swaine, with scales more slender.

Elytral disc as in *sansoni*; declivital interstriae 1 weakly elevated, finely serrate, 2 very narrow, flat, 3 very strongly, rather broadly elevated, with denticles confused, not confined to summit, 5 and 7 finely serrate, weakly elevated, joining apically, this elevation usually continuing to 3, 9 weakly if at all convex, usually devoid of teeth posterior to declivital base.

MALE.— Similar to female except frons differing as in *blaisdelli*.

DISTRIBUTION.— Michigan to New Brunswick.

CANADA: **New Brunswick**: Nictor Lake, 8-VII-21, red spruce, M. B. Dunn. USA: **Michigan**: Peach Mt., Washtena Co., XI-1977, *Larix laricina*, L. Kirkendall.

HOSTS.— *Larix laricina, Picea rubens*.

NOTES.— The above treatment was based on the type series of 5 specimens and on 21 other specimens.

### 12. *Carphoborus radiatae* Swaine
Fig. 109

*Carphoborus radiatae* Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):57 (Holotype, female; Carmel, California; Canadian Nat. Coll., 9430)

DIAGNOSIS.— This species is distinguished from *ponderosae* Swaine by the shallowly concave female frons, by the less strongly elevated declivital interstriae, and by the slightly less numerous, smaller, declivital teeth.

FEMALE.— Length 1.8–2.4 mm, 2.4 times as long as wide; color dark brown to black.

Frons moderately concave on central three-fourths, surface closely, deeply, rather coarsely punctured; vestiture rather coarse, abundant, moderately long, uniformly distributed except glabrous on a small central area. Antennal club 1.5 times as long as wide; sutures straight.

Pronotum and elytral disc essentially as in *blaisdelli* Swaine; elytral declivity with interstriae 1, 5, and 7 moderately elevated toward their apices, 5 and 7 joining apically; 2 very narrow to almost obsolete on lower half, flat; 3 and 9 rather strongly elevated, almost as high as wide, joining apically, elevation and its denticles continuing to apex of 1, serrations moderately coarse, rather close.

MALE.— Similar to female except frons differing about as in *blaisdelli*, frontal impression stronger, elevation stronger and not bituberculate.

DISTRIBUTION.— Carmel, California.

Specimens were taken at the type locality on various dates from 6-II-13 to VII-19, *Pinus radiata*, mostly by E. C. Van Dyke and L. S. Slevin.

BIOLOGY.— Evidently they breed in unthrifty branches of living trees.

NOTES.— The above treatment was based on the holotype and on 49 other specimens.

### 13. *Carphoborus ponderosae* Swaine
Figs. 107, 109

*Carphoborus ponderosae* Swaine, 1924, Canadian Ent. 56:236 (Holotype, female; Midday Valley, Merritt, British Columbia; Canadian Nat. Coll., 823)

DIAGNOSIS.— This species is distinguished from *radiatae* Swaine by the flattened female frons, and by the much more strongly elevated, more coarsely, closely serrate declivital interstriae.

FEMALE.— Length 1.8–2.1 mm, 2.3 times as long as wide; color dark brown to black.

Frons flattened, elevated toward epistoma; surface finely, rather closely punctured; vestiture of long, rather abundant, uniformly distributed, coarse, subplumose setae.

Pronotum and elytral disc essentially as in *blaisdelli* Swaine, interstriae narrower than striae, odd-numbered interstriae tending to be uniseriately granulate toward declivity. Declivity not as steep as in other species; interstriae 1 weakly elevated, rather coarsely serrate, 2 very narrow to obsolete, flat, 3 very strongly elevated, higher than wide, coarsely, closely serrate, 5, 7, and 9 moderately elevated, coarsely serrate, 3 and 9 joining apically and continuing as a coarsely serrate, strongly elevated crest to apex of 1.

MALE.— Similar to female except frons differing as in *blaisdelli*; frontal impression and transverse frontal elevation much more poorly developed than in other species.

DISTRIBUTION.— British Columbia and Montana to California and Utah.

CANADA: **British Columbia**: Aspen Grove; Grand Forks, 2-VII-72, *Pinus ponderosa*, D. E. Bright; Merritt, Midday Valley, 24-VI-23, 17110 lot 1157, R. Hopping. USA: **California**: Hat Creek, 24-VI-61, *P. ponderosa*, S. L. Wood. **Montana**: Bozeman; Clinton, 27-IX-36, *P. ponderosa*, T. O. Thatcher; Rocky Boy Indian Reservation, Hill Co., 25-IX-67, *P. ponderosa*, D. E. Bright. **Oregon**: Ft. Rock. **Utah**: Elk Park, Ashley N.F., 16-VI-60, *P. ponderosa*, S. L. Wood; 10 miles (16 km) E Kamas, 9-IX-60, *P. ponderosa*, S. L. Wood; Logan Canyon, 13-VI-46, 14-VI-47, *P. contorta*, S. L. Wood; La Sal Mts., 5-VII-48, *P. ponderosa*, S. L. Wood; Pin Hollow, Fish Lake N.F., 9-VI-60, *P. ponderosa*, S. L. Wood.

HOSTS.— *Pinus contorta*, *P. ponderosa*.

BIOLOGY.— This species breeds in the unthrifty branches of living trees.

NOTES.— The above treatment was based on the holotype and on 239 other specimens.

### 14. *Carphoborus declivis* Wood
Fig. 108

*Carphoborus declivis* Wood, 1954, Canadian Ent. 86:522 (Holotype, female; Lake Tenaya, Yosemite N.P., California; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from all other American *Carphoborus* by the finely serrate declivital interstriae 2.

FEMALE.— Length 1.7–2.0 mm, 2.3 times as long as wide; color dark brown to black.

Frons weakly convex, a narrow, transverse impression above epistoma; surface rather coarsely, deeply, very closely punctured; vestiture of dense, very fine, moderately long hair. Antennal club 1.4 times as long as wide.

Pronotum and elytral disc essentially as in *blaisdelli* Swaine; elytral declivity with interstriae 1 feebly convex near apex, 1 and 2 equal in width and equally serrate, denticles on 2 less abundant, 3 moderately elevated, about half as high as wide, 5, 7, and 9 weakly elevated, 3–9 serrate, denticles on 4, 6, and 8 slightly smaller, less abundant.

MALE.— Similar to female except frons differing as in *blaisdelli*.

DISTRIBUTION.— California.

USA: **California**: Lake Tenaya, Yosemite N.P., 11-VIII-18, Hopk. U.S. 15740 a and b, *Pinus contorta*, J. E. Patterson; 10 miles (16 km) N Westgard Pass, Inyo Co., 6-IX-68, *P. aristata*, D. E. Bright.

HOST.— *Pinus contorta*.

NOTES.— The above treatment was based on the type series of six specimens and on seven other specimens.

### 15. *Carphoborus pseudotsugae* Wood
Fig. 108

*Carphoborus pseudotsugae* Wood, 1954, Canadian Ent. 86:522 (Holotype, male; Prescott N.F., Arizona; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from *declivis* Wood by the rather strongly protruding female frons and by the narrow declivital interstriae 2, which lacks denticles.

FEMALE.— Length 2.1 mm, 2.3 times as long as wide; color dark brown to black.

Frons rather strongly convex, narrowly, transversely impressed just above epistoma; surface rather finely granulate-punctate; vestiture evidently short, fine. Antennal club 1.3 times as long as wide.

Pronotum and elytral disc essentially as on *blaisdelli* Swaine; elytral declivity with interstriae 2 very narrow to obsolete, flat, 3 moderately elevated, 1 and 3 to 9 serrate, denticles on 3 slightly larger and more numerous.

MALE.— Similar to female except frons differing as in *blaisdelli*.

DISTRIBUTION.— N Arizona.

USA: **Arizona**: Prescott N.F., 29-VII-30, Hopk. U.S. 20412E, *Pseudotsuga taxifolia*, M. W. Blackman.

HOST.— *Pseudotsuga menziesii*.

NOTES.— The above treatment was based on the holotype and allotype.

### 16. *Carphoborus intermedius* Wood
Fig. 108

*Carphoborus intermedius* Wood, 1954, Canadian Ent. 86:523 (Holotype, male; New Castle, Colorado; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from *pseudotsugae* Wood by the more strongly elevated interstriae 3, and by the flattened to shallowly impressed female frons with much longer frontal vestiture.

FEMALE.— Length 1.9–2.1 mm, 2.3 times as long as wide; color dark brown to black.

Frons flattened to well above eyes, sometimes shallowly concave just above epistoma; surface smooth, densely, finely, deeply, uniformly punctured; vestiture of moderately abundant, fine, long hair, longest setae equal to more than two-thirds length of scape. Antennal club 1.3 times as long as wide.

Pronotum and elytral disc essentially as in *blaisdelli* Swaine, with striae slightly wider than interstriae, interstriae 1 and 3 with a few indistinct granules; elytral declivity not as steep as in most species, 1 weakly, 3 and 9 strongly elevated, almost as high as wide, 3 and 9 joining apically, 1 and 3 to 9 finely serrate, denticles on 3 and 9 slightly larger, more numerous.

MALE.— Similar to female except frons differing as in *blaisdelli*, though transverse impression not as deep or abrupt, and median elevation reduced, sometimes almost entirely absent.

DISTRIBUTION.— Alaska to Oregon and Colorado.

ALASKA: Bonanza Creek, 20 miles W Fairbanks, 12-VII-77, pheromone trap, T. Ward. USA: **Colorado**: New Castle, Hopk. U.S. 31408-2-4, *Picea engelmannii*, C. L. Massey; Grand Lake, 5-X-38, Hopk. U.S. 31542-J2, *Pinus contorta*. **Oregon**: Tolgate, 1 to 15-VII-50, on aluminum roof, E. S. McClusky. **Washington**: Metaline Falls, 15-VII-32, Hopk. U.S. 22366, flight, T. T. Terrell.

HOSTS.— *Picea engelmannii* and *Pinus contorta*.

NOTES.— The above treatment was based on eight paratypes and on five other specimens.

### 17. *Carphoborus perplexus* Wood

*Carphoborus perplexus* Wood, 1960, Great Basin Nat. 20:59 (Holotype, female; 10 miles or 16 km E Kamas, Utah; Wood Coll.)

DIAGNOSIS.— This species closely resembles *sansoni* Swaine, but it is distinguished by the more strongly elevated, serrate, declivital interstriae 9, by the higher declivital interstriae 3, which does not curve toward 1 at its apex as does *sansoni*, and by the more broadly flattened female frons.

FEMALE.— Length 1.8–2.2 mm, 2.4 times as long as wide; color dark brown to black.

Frons flattened on median two-thirds from epistoma to well above eyes, epistomal margin distinctly raised, premandibular lobe large; surface shining, finely, closely punctured; vestiture of rather short, moderately abundant, subplumose setae. Antennal club 1.3 times as long as wide.

Pronotum and elytral disc essentially as in *blaisdelli* Swaine, except interstriae 3 with a row of granules to base, 5 and 7 with granules on posterior third; elytral declivity with interstriae 1, 3, and 9 moderately elevated, 3 and 9 joining apically but not continuing toward apex of 1; interstriae 1, 3, 5, 7, and 9 serrate, denticles averaging smaller than in *sansoni*.

MALE.— Similar to female except frons differing essentially as in *blaisdelli* but contours less abrupt.

DISTRIBUTION.— Utah.

USA: Utah: 10 miles (16 km) E Kamas, 9-IX-60, 13-VII-62, *Pinus ponderosa*, S. L. Wood.

HOST.— *Pinus ponderosa*.

BIOLOGY.— This species breeds in the unthrifty lower branches of the living host.

NOTES.— The above treatment was based on the type series of 40 specimens and on 19 other specimens.

### 18. *Carphoborus piceae* Wood

*Carphoborus piceae* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):11 (Holotype, male; Dixie Pass, Oregon; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *perplexus* Wood by the absence of granules on discal interstriae 3, by the less strongly elevated alternate declivital interstriae, with smaller denticles, and by the more narrowly flattened female frons.

FEMALE.— Length 1.7 mm, 2.2 times as long as wide; color almost black.

Frons flattened on little more than median half from epistoma to very slightly above eyes, epistomal margin distinctly elevated; surface subrugulose, rather finely, closely

punctured; vestiture of rather abundant, moderately long, coarse, subplumose setae.

Pronotum and elytral disc as in *perplexus* except interstriae 3 devoid of granules; elytral declivity as in *perplexus* except interstriae 1, 3, and 9 less strongly elevated, with denticles smaller, 2 wider.

MALE.— Similar to female except frons differing as in *perplexus*.

DISTRIBUTION.— Oregon.

USA: Oregon: Dixie Pass, Malheur N.F., 23-VI-61, *Picea engelmannii*, S. L. Wood.

HOST.— *Picea engelmannii*.

BIOLOGY.— This species was taken from an unthrifty branch of a very recently fallen tree.

NOTES.— The above treatment was based on the type series of three specimens.

### 19. *Carphoborus carri* Swaine
Fig. 109

*Carphoborus carri* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):16 (Holotype, male; Edmonton, Alberta; Canadian Nat. Coll., 9267)

DIAGNOSIS.— This species is distinguished from *bifurcus* Eichhoff by the less strongly elevated declivital interstriae 3, by the fusion of declivital interstriae 3 and 5, and by the flattened, finely punctured female frons, with much longer vestiture.

FEMALE.— Length 1.4–2.1 mm, 2.3 times as long as wide; color dark brown to almost black.

Frons flattened on median two-thirds from epistoma to slightly above eyes; epistomal margin slightly elevated; surface shining, closely, deeply, finely punctured; vestiture of rather fine, long, moderately abundant, subplumose setae. Antennal club 1.3 times as long as wide.

Pronotum about as in *blaisdelli* Swaine except punctures much smaller. Elytra with striae distinctly impressed, punctures very coarse, moderately deep; interstriae narrower than striae, surface irregularly granulate-punctate. Declivity convex, rather steep; interstriae 1 moderately elevated, serrate, 2 flat, narrow above, obsolete below, 3 strongly elevated, as high as wide, serrate, 5, 7, and 9 moderately elevated and serrate; denticles on all armed interstriae very small; interstriae 3 and 9 fuse at apices, 5 and 7 also fuse at apices. Pronotal and elytral scales broader and apparently more abundant than in other species.

MALE.— Similar to female except frons much as in *blaisdelli*, with transverse impression shallow, transverse elevation obsolete.

DISTRIBUTION.— Alaska and Northwest Territories to Wyoming and New Brunswick.

ALASKA: Fairbanks. CANADA: Alberta, Manitoba, New Brunswick, Northwest Territories, Yukon. USA: Montana, South Dakota, Wyoming.

HOSTS.— *Picea engelmannii*, *P. glauca*, *P. rubens*.

BIOLOGY.—This species evidently prefers to breed in the bole of standing suppressed trees up to 8 inches (20 cm) in diameter, although it is commonly found in the unthrifty, lower branches of living trees.

NOTES.— The above treatment was based on the holotype and on 316 other specimens.

### 20. *Carphoborus bifurcus* Eichhoff
Fig. 107

*Carphoborus bifurcus* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:147 (Syntypes; "Am. bor."; presumably destroyed with Hamburg Mus.)

*Carphoborus bicristatus* Chapuis, 1869, Synopsis des Scolytides, p. 41 (Syntypes; Carolina; Brussels Mus.); Wood, 1954, Canadian Ent. 86:525. *Synonymy*

DIAGNOSIS.— This species is distinguished from *carri* Swaine by the convex, densely punctate to finely granulate female frons, with much shorter, finer vestiture, by the much more strongly elevated declivital interstriae 3, and by declivital interstriae 5 and 7 ending separately at their apices.

FEMALE.— Length 1.4–1.8 mm, 2.5 times as long as wide; color dark brown.

Frons convex, surface densely, minutely punctured to densely, finely granulate-punctate to well above eyes; vestiture very fine, moderately abundant, rather short. Antennal club 1.3 times as long as wide.

Pronotum much as in other species except lateral constriction near anterior margin almost obsolete, and surface coarsely, very closely, rather deeply punctured.

Elytral striae not impressed, punctures coarse, deep; interstriae narrower than striae, irregular, granulate-punctate. Declivital interstriae 1 weakly elevated, feebly serrate, 2

narrowed, almost flat, 3 very strongly elevated, much higher than wide, fusing with apex of 9 and continuing to apex of 1, 5 and 7 weakly elevated, each with two or three denticles, 9 moderately elevated toward apex, with a few, fine serrations. Vestiture much as in *carri*.

MALE.— Similar to female except frons more nearly granulate, a slight transverse impression above epistoma and a small, transverse, median elevation at upper level of eyes; vestiture coarse, short.

DISTRIBUTION.— Missouri and New York to Mississippi and Florida.

USA: District of Columbia, Florida, Georgia, Maryland, Mississippi, Missouri, New York, North Carolina, Tennessee, Virginia, West Virginia.

HOSTS.— *Pinus clausa*, *P. echinata*, *P. taeda*, and *P. virginiana*.

BIOLOGY.— Apparently only small branches are attacked in slash or unthrifty branches of living trees.

NOTES.— The above treatment was based on 191 specimens. The holotype of *bifurcus* evidently is lost, but this species is easily identified from Eichhoff's descriptions.

Three females from Fayette, Alabama, taken in pine in May 1959, exhibit a consistent, radical aberration of the frons; the one male is normal. These females have the frons much less convex than normal, the surface is finely rugose-reticulate, punctures are absent; just below the upper level of the eyes is a pair of widely spaced, strongly procurved, conical, hornlike spines, each twice as high as wide, equal in length to the width of the antennal club; except for a few fine scales, the frontal vestiture is absent. Except for the frons, these specimens are normal representatives of *bifurcus*. Because the locality from which they come is neither peripheral nor isolated from the distribution of this species, they probably are nothing more than mutant curiosities.

## GENUS *POLYGRAPHUS* ERICHSON

*Polygraphus* Erichson, 1836, Archiv Naturgesch. 2(1):57 (Type-species: *Hylesinus pubescens* Fabricius = *Dermestes poligraphus* Linnaeus, monobasic)

*Lepisomus* Kirby, 1837, *in* Richardson, Fauna Boreali-Americana 4:193 (Type-species: *Apate* (*Lepisomus*) *rufipennis* Kirby, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:124); Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):55. *Synonymy*

*Pseudopolygraphus* Seitner, 1911, Centralbl. Ges. Forstw. 37(3):105 (Type-species: *Polygraphus grandiclava* Thomson, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:128); Hopkins, 1915, U.S. Dept. Agric. Tech. Bull. 17(2):222. *Synonymy*

*Ozophagus* Eggers, 1919, Ent. Blätt. 15:234 (Type-species: *Ozophagus camerunus* Eggers, present designation); Schedl, 1950, Bull. Inst. Roy. Sci. Nat. Belg. 26(50):2. *Synonymy*

DIAGNOSIS.— The only closely allied American genus is *Carphoborus* Eichhoff. This genus is distinguished from *Carphoborus* by the completely divided eye (some African and Asian species have the eye very deeply emarginate), by the aseptate antennal club without indications of sutures, and by the much more conservative sculpture of the elytra.

DESCRIPTION.— Length 1.8–3.1 mm, 2.0–2.4 times as long as wide; mature color almost black, vestiture pale. Frons dimorphic; male impressed on lower half above epistoma and below summit, convex above, summit just above center usually armed by a pair of small tubercles; female convex, flat, or impressed, finely punctured and variously ornamented by fine hair. Eye completely divided by an emargination into dorsal and ventral halves, a few facets sometimes scattered between them along posterior margin. Antennal scape rather long, attaining posterior margin of eye; funicle either 5- or 6-segmented; club rather asymmetrical, moderately flattened, aseptate, very finely, uniformly pubescent, without indications of sutures. Pronotum unarmed, smooth, with close, fine punctures. Scutellum absent; basal margins of elytra armed by 11 or 12 rather coarse crenulations, submarginal crenulations sometimes present on interstriae 2 to 4; striae not impressed, punctures fine; interstriae densely punctured; declivity broadly convex, very conservatively sculptured. Third tarsal segments narrow. Vestiture of abundant small scales.

DISTRIBUTION.— Alaska, Canada, and the northern and mountainous parts of the United States where spruce forests grow; Europe, Asia, and Africa. About 60 species are known; three of these occur in North America.

BIOLOGY.— Recently broken, cut, or fallen trees are normally selected for attack, although these moderately aggressive beetles

readily attack unthrifty trees or those weakened by the primary invasion of other bark beetles. These prolific beetles are polygynous. Either the male or female may construct the entrance tunnel and nuptial chamber in the phloem tissues (Rudinsky, Oester, and Ryker 1978). Normally the female is joined by a male, he then admits three to five or more females, each of which constructs an egg gallery that radiates from the central nuptial chamber. In most areas the egg tunnels follow any direction or curve to avoid other galleries or obstacles. In eastern Canada the egg galleries of *rufipennis* (Kirby) have a definite tendency to curve transversely across the grain of the wood. Egg galleries usually reach the cambium, but normally do not score the wood; they may also be entirely in the phloem and do not show on peeled bark. These variations may occur in any one gallery system. Eggs are deposited in large, individual niches along the margins of the egg tunnels. The larval mines are usually entirely in the phloem and may or may not score the wood. When oviposition is complete, parent adults normally abandon their galleries and produce a second, third, or more broods elsewhere on the same or another host. Two or more overlapping generations can be produced each year where climatic factors are favorable.

NOTES.— In addition to the synonyms of this genus listed above, Schedl (1960:359) also considered *Spongotarsus* Hagedorn, from the East Indies, to be a synonym. *Ozophagus camerunus* Eggers is here designated as the type species of the genus *Ozophagus* because all type material of the other original species, *militaris*, is lost.

Key to the Species of *Polygraphus*

1. Body stouter, less than 2.2 times as long as wide; apex of antennal club more obtusely pointed; female frons less densely punctured in central area, interspaces there mostly equal in width to diameter of a puncture; Alaska and Arizona to Newfoundland and North Carolina; *Picea*; 1.8–3.1 mm ..... 1. **rufipennis (Kirby)**

— Body more slender, at least 2.3 times as long as wide; antennal club strongly acuminate at apex; female frons densely punctured in central area, interspaces there rarely half as wide as diameter of a puncture ..... 2

2(1). Female frons shallowly concave, at least longitudinally, from epistoma to vertex; female frontal vestiture rather abundant, moderately long, longest setae above upper level of eyes longer than distance equal to greatest width of eye; N Arizona; *Picea engelmannii*; 2.3–2.9 mm ..... 2. ***hoppingi* Swaine**

— Female frons convex or rarely flattened on lower half; female frons commonly glabrous, longest setae rarely as much as half as long as greatest width of eye; Alaska to Utah and New Mexico; *Picea engelmannii, P. glauca*; 2.4–2.9 mm ..... 3. ***convexifrons* Wood**

### 1. *Polygraphus rufipennis* (Kirby)

Figs. 110, 111

*Apate* (*Lepisomus*) *rufipennis* Kirby, 1837, *in* Richardson, Fauna Boreali-Americana 4:193 (Syntypes; Boreal America. Lat. 65°; British Mus. Nat. Hist.)

*Apate* (*Lepisomus*) *nigriceps* Kirby, 1837, *in* Richardson, Fauna Boreali-Americana 4:194 (Holotype, male; Boreal America, Lat. 65°; British Mus. Nat. Hist.); LeConte, 1868, Trans. Amer. Ent. Soc. 2:169. *Synonymy*

*Apate* (*Lepisomus*) *brevicornis* Kirby, 1837, *in* Richardson, Fauna Boreali-Americana 4:194 (Holotype, female; Boreal America, Lat. 65°; British Mus. Nat. Hist.); LeConte, 1868, Trans. Amer. Ent. Soc. 2:169. *Synonymy*

*Polygraphus saginatus* Mannerheim, 1853, Bull. Soc. Imp. Nat. Moscou 26 (pt. 2, no. 3):237 (Holotype, female; Kenai Peninsula, Alaska; Helsinki Mus.); LeConte, 1868, Trans. Amer. Ent. Soc. 2:169. *Synonymy*

DIAGNOSIS.— This species has been treated as a synonym of *poligraphus* (Linnaeus), of Europe and northern Asia, by Schedl (1957:150). Although occasional specimens are indistinguishable, the overwhelming majority are clearly separable. This species is

distinguished from *poligraphus* by the more coarsely punctured frons, pronotum, and elytra, by the more clearly, coarsely granulose punctures near the lateral margins of the pronotum, and by the more numerous, coarser elytral tubercles, particularly toward the base.

FEMALE.— Length 1.8–3.1 mm, 2.0–2.2 times as long as wide; color very dark brown to black, vestiture usually pale.

Frons transversely impressed above epistoma, somewhat flattened to upper level of eyes, convex above; epistoma slightly elevated, shining; surface deeply, rather coarsely punctured, punctures very close except in central area, interspaces mostly as wide as punctures; vestiture of fine, rather short hair, longest about equal to half greatest width of eye. Apex of antennal club blunt, about equal to a 90 degree angle.

Pronotum 0.70 times as long as wide; widest at base, sides almost straight and converging anteriorly on basal two-thirds, rather strongly constricted just before anterior margin; surface shining, indications of reticulation evident particularly on anterior third, punctures deep, close, fine to moderately coarse intermixed, their lateral margins

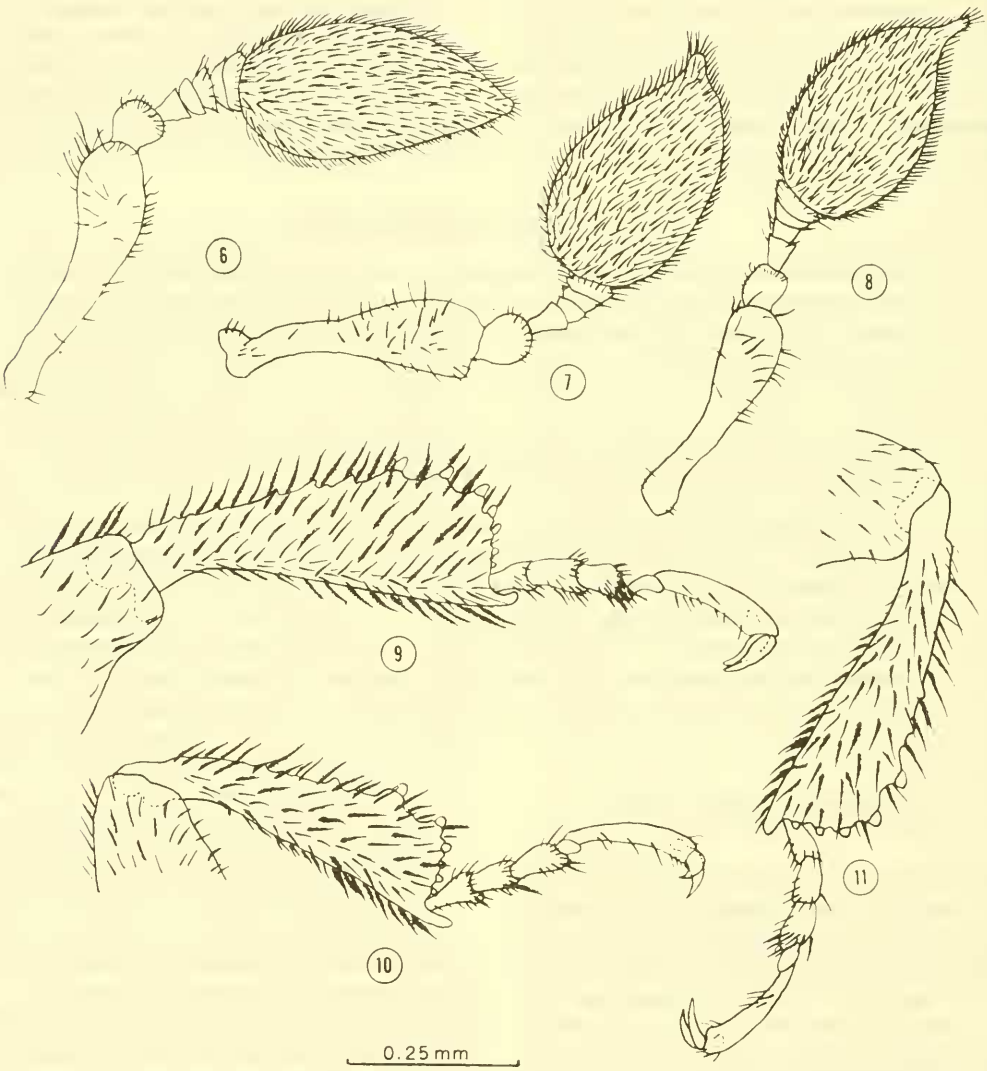



Fig. 110. *Polygraphus* spp., antennae and tibiae: 6, 9, *rufipennis*; 7, 10, *hoppingi*; 8, 11, *convexifrons*. (After Hilton 1968:27.)

elevated and sometimes granulate in lateral areas; vestiture of rather abundant, suberect scales, each scale about six times as long as wide.

Elytra 1.5 times as long as wide, 2.2 times as long as pronotum; basal margins each armed by 12 rather coarse crenulations from suture to humeral angles, submarginal crenulations rather abundant medially, a few extending to humeral angles; sides almost straight and parallel on basal three-fourths, broadly rounded behind; strial and interstrial punctures confused, moderately small, rather shallow, close; interstriae indicated by rows of granules, uniseriate on and near declivity, moderately confused on central part of disc, strongly confused and crenulate toward base in median area. Declivity rather steep, convex; about as on disc. Vestiture of abundant small scales in ground cover, each scale about two to three times as long as wide; and interstrial rows of slightly longer scales often visible only on declivity.

MALE.— Similar to female except frons with a bituberculate, median elevation at upper level of eyes, more strongly impressed below and more convex above this point, vestiture largely obsolete; elytral tubercles perhaps very slightly larger.

DISTRIBUTION.— Alaska and New Mexico to Newfoundland and North Carolina.

ALASKA: Numerous localities. CANADA: All provinces. USA: Arizona, Colorado, District of Columbia, Idaho, Maine, Massachusetts, Michigan, Minnesota, Montana, New Hampshire, New Mexico, New York, North Carolina, North Dakota, Oregon, Pennsylvania, South Dakota, Tennessee, Utah, Vermont, West Virginia, Wisconsin, Wyoming.

HOSTS.— *Picea engelmannii, P. glauca, P. pungens, P. rubra, Abies fraseri, Pinus strobus.*

BIOLOGY.— The winter is passed in any stage except the egg. According to Simpson (1929:146–151), the female constructs an entrance tunnel and nuptial chamber; she is then joined by a male; later he admits two or more additional females. I suspect Simpson observed previously mated adults and I would expect newly emerged, unmated males to initiate the attack. (This supposition was confirmed by Rudinsky et al. 1978.) Previously mated females under stress may excavate galleries and develop a brood without a male. Simpson stated that adults may produce as many as four sets of tunnels with brood in a season. Brood from the first tunnels complete development but hibernate as young adults in the brood chambers; from the second tunnels they hibernate as young adults and mature larvae; from the third and fourth tunnels they hibernate as larvae in various stages of growth. The successive sets of galleries are formed at about monthly intervals beginning in mid-June.

NOTES.— The types of *rufipennis, nigriceps,* and *brevicornis* were all examined. Only one female specimen of *saginatus,* without a locality label, is in the Mannerheim Collection at the present time, but it is considered to be sufficiently authentic to remove doubt as to the identity of Mannerheim's species; it could actually be the type of *saginatus.* All these specimens clearly belong to the same species and are consistent with my North American material, although direct comparisons were not made. The above treatment was based primarily on my series from Patagonia Springs, Colorado, and on more than 3000 other specimens.

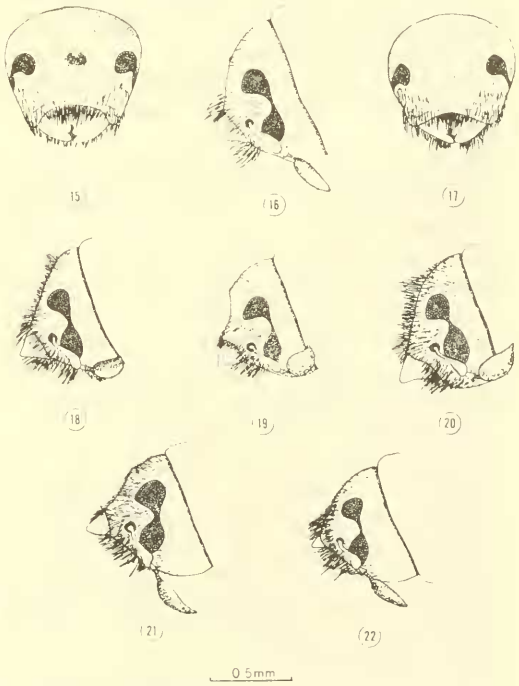



Fig. 111. *Polygraphus* spp., heads: 15, 16, *rufipennis,* male; 17, 18, *rufipennis,* female; 19, *hoppingi,* male; 20, *hoppingi,* female; 21, *convexifrons,* male; 22, *convexifrons,* female. (After Hilton 1968:27.)

As indicated in the above diagnosis, the status of this species was questioned by Schedl without citing either characters or the origin or extent of material he studied. It is abundantly clear to me that this species is separable from *poligraphus* on a statistical base involving a comparison of the pronotal punctures (twice or more as large in most *rufipennis*) or of tubercles at the bases of the elytra (larger, more numerous, and extending to or lateral to the humeral bulla in *rufipennis*). Of the material used in this comparison, 144 of the 201 *rufipennis* were from Alaska and the Northwest Territories and 16 of the 60 *poligraphus* were from Japan and Siberia.

### 2. *Polygraphus hoppingi* Swaine
Figs. 110, 111

*Polygraphus hoppingi* Swaine, 1925, Canadian Ent. 57:51 (Holotype, female; San Francisco Peak, Coconino Co., Arizona; Canadian Nat. Coll., 1329)

DIAGNOSIS.— This species is distinguished from the very closely related *convexifrons* Wood by the shallowly concave female frons, which is ornamented by rather long, yellow hair, and by the distribution.

FEMALE.— Length 2.3–2.9 mm, 2.4 times as long as wide; color almost black, vestiture lighter.

Frons impressed above epistoma, becoming shallowly concave between eyes in most specimens (flat in some), some impression usually extending to vertex; surface shining, densely, finely, deeply punctured, interspaces averaging much less than half width of a puncture; vestiture very fine, rather abundant, long, longest setae equal to one and one-half times greatest width of eye. Tip of antennal club narrowly acuminate.

Pronotum 0.76 times as long as wide; outline as in *rufipennis* except sides weakly arcuate; surface brightly shining, smooth, punctures fine, moderately deep, interspaces averaging slightly larger to twice diameter of a puncture, not granulate laterally; vestiture of small, erect, scales, each scale four to six times as long as wide.

Elytra 1.7 times as long as wide, 2.1 times as long as pronotum; basal margins each armed by 11 crenulations, fewer submarginal crenulations than in *rufipennis*; outline as in *rufipennis*; strial and interstrial punctures confused, small, shallow, close; interstriae indicated by uniseriate rows of fine granules. Declivity rather steep, broadly convex; sutural interstriae weakly elevated, 2 slightly impressed, sculpture as on disc.

MALE.— Similar to female except frons as in male *rufipennis*, but more finely, closely punctured; declivity slightly more strongly impressed, granules on interstriae almost obsolete; body very slightly stouter.

DISTRIBUTION.— N Arizona.

USA: Arizona: North Rim Grand Canyon, 24-IX-49, *Picea engelmannii*, S. L. Wood; San Francisco Peak; 20-VI-18, *Picea engelmannii*, R. Hopping.

HOST.— *Picea engelmannii*.

BIOLOGY.— The habits evidently are about as in *rufipennis*.

NOTES.— The above treatment was based on the holotype, on 6 topotypes, and on 49 specimens from the north rim of the Grand Canyon.

Although intermediates in the usual sense have not been seen, I suspect that *hoppingi* and *convexifrons* are subspecies of one another. However, available specimens from adjacent parts of their known distributions are distinct, with no suggestion of intergradation.

### 3. *Polygraphus convexifrons* Wood
Figs. 110, 111

*Polygraphus convexifrons* Wood, 1951, J. Kansas Ent. Soc. 24:32 (Holotype, female; Logan Dry Canyon, Cache Co., Utah; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from the very closely related *hoppingi* Swaine by the rather strongly convex female frons, by the shorter or even totally obsolete female frontal pubescence, and by the more distinctly impressed male elytral declivity, with granules on interstriae 2 smaller or obsolete.

FEMALE.— Length 2.4–2.9 mm, 2.5 times as long as wide; color very dark brown, almost black, vestiture lighter.

Frons slightly protuberant above epistoma, moderately to strongly convex to vertex; surface shining, densely, finely, deeply punctured, interspaces less than half as wide as a puncture; vestiture very fine, varying in specimens from absent to very finely pubescent, longest hairs equal to about half greatest width of eye. Antennal club as in *hoppingi*.

Pronotum 0.76 times as long as wide; as in *hoppingi* except punctures averaging very slightly larger in southern parts of range.

Elytra 1.7 times as long as wide, 2.0 times as long as pronotum; essentially as in *hoppingi*.

MALE.— As in male of *hoppingi* except elytral declivity slightly more strongly impressed; granules on interstriae reduced in size, partly or entirely obsolete.

DISTRIBUTION.— Alaska to Utah and New Mexico.

ALASKA: Matanuska, 27-VIII-45, flight, J. C. Chamberlin; McKinley N.P., 6-III-42, Hopk. U.S. 33676, *Picea canadensis*, F. Bean, 6-VI-48, *P. canadensis*, J. S. Stanford. CANADA: **Alberta**: Highwood Pass 40 miles S Exshaw, 8-IX-67, *P. engelmannii*, D. E. Bright. **Yukon**: Dawson City, 10-VII-68, Campbell and Smitana; 21 mile carmark, Mayo Road, 7-VII-60, *P. glauca*. USA: **Colorado**: Del Norte, 25-VI-68, *P. engelmannii*, W. G. Harwood; Gould, 12-VI-68, *P. engelmannii*, S. L. Wood; Mt. Evans, 11-VII-61, J. R. Stainer; Los Pinos Pass, Saguache Co., 24-VI-68, *P. engelmannii*, W. G. Harwood; Pitkin, 16-X-15. **New Mexico**: New Mexico, F. H. Snow. **South Dakota**: Harney. **Utah**: Beaver Canyon, Beaver Co., 15-IX-49, *P. engelmannii*, S. L. Wood; Escalante, Dixie N.F., 26-VIII-56, *P. engelmannii*, M. D. McGregor; La Sal Mts., 5-VII-58, *P. engelmannii*, S. L. Wood; Logan Dry Canyon, 6-VII-48, *P. engelmannii*, S. L. Wood; Puffer Lake, Beaver Co., 17-IX-49, *P. engelmannii*, S. L. Wood.

HOSTS.— *Picea engelmannii*, and *P. glauca*.

BIOLOGY.— The habits evidently are very similar to *rufipennis*. When this species was taken in competition with *rufipennis*, the egg galleries always passed above (toward the outer bark) those of *rufipennis*, and the brood almost never completed development. The egg galleries normally are at or near the cambium. This is a rare species that is seldom found in disturbed areas.

NOTES.— The above treatment was based on the holotype, on 6 paratypes, and on 62 other specimens.

## Subfamily SCOLYTINAE

Scolytarii Latreille, 1807, Genera Crustaceorum et Insectorum 2:273.

Previous classifications have recognized the tribe Scolytini as a subfamily distinct from the previously recognized Ipinae on the basis of the *Scolytus*-like tibiae that lack supernumerary serrations or socketed teeth and the ascending venter of the abdomen, which rises to meet the elytral apex. In the *Cnemonyx* the tibial character applies only to the protoracic leg, and the abdominal character is of dubious value because it occurs in various genera of several tribes. The protibia of the Ctenophorini approaches that of the Scolytini so closely that I find it impossible to continue the recognition of separate subfamilies for these taxa.

Anatomical features.— The subfamily Scolytinae is distinguished from the Hylesininae by the absence of crenulations on the elytral bases and by having the elytral bases form an almost straight transverse or slightly recurved line, without a noticeable scutellar notch. In addition, most of the more highly evolved genera have the head concealed by the pronotum when viewed from the dorsal aspect and the anterior slope of the pronotum asperate. The Scolytini and some of the Ctenophorini usually lack these two characters. A few South American *Cnemonyx* have primitive crenulations on the basal margins of the elytra, as in the Hylesininae, but this feature in no sense removes them from the tribe Ctenophorini or from the genus *Cnemonyx*.

Biological features.— Of the 79 genera treated here, 40 are phloeophagus, 4 are xylophagus, 23 xylomycetophagous, 1 is in a transitional stage, and one breeds in cucurbit vines. Some of the genera include species that breed in pith of twigs or other small stems or in seeds.

Taxonomy.— The Scolytinae apparently arose from a primitive curculionoid stock that gave rise to the Platypodidae and to primitive Scolytidae. The Hylesininae evidently arose much later from the Scolytinae.

The North and Central American Scolytinae are here divided into 11 rather distinct tribal groups, the Scolytini, Ctenophorini, Micracini, Cactopinini, Cryphalini, Dryocoetini, Ctenophorini, Ipini, Xyloterini, Xyleborini, and Corthylini, with a majority of the species placed in the last two tribes.

## Tribe SCOLYTINI

Scolytarii Latreille, 1807, Genera Crustaceorum et Insectorum 2:273 (Type-genus: *Scolytus* Geoffroy, 1762)
Camptoceridae Chapuis, 1869, Synopsis des Scolytides, p. 49 (Type-genus: *Camptocerus* Latreille, 1829)
Eccoptogasteridae Trèdl, 1970, Ent. Blätt. 3:4 (Type-genus: *Scolytus* Geoffroy, 1762 = *Eccoptogaster* Herbst, 1793)

Anatomical features.— The frons is strongly, sexually dimorphic, with the male variously impressed, the female flat to convex, one or both often ornamented by hair; the posterior area of the head is subtruncate, the eye is entire, the funicle is 7-segmented, the pronotum is unarmed, its lateral margins costate, the protibia (usually all three tibiae) is unarmed on the lateral margin with the outer apical angle extended into a spine that curves toward and exceeds the inner apical angle, socketed denticles are never present, and the metpleural suture descends subvertically to the groove, receiving the groove on the costal margin of the elytra, then turns abruptly and parallels the groove to near the metacoxal process. In most species the venter of the abdomen ascends conspicuously to meet the elytra.

Biological features.— All except a few bigamous Neotropical *Scolytus* are monogamous; all are phloeophagous except *Camptocerus*, which is xylomycetophagous. The parental galleries are mostly biramous, a few are monoramous, and *Camptocerus* has a unique extension into the xylem from a biramous tunnel in the cambium. Eggs are deposited in niches. Larval mines of phloeophagous species follow a definite course and rarely cross one another. *Camptocerus* larvae are reared in short cradles that are somewhat similar to those of other ambrosia beetles.

Taxonomy.— Except for *Scolytus*, some species of which occur in Eurasia, this tribe is exclusively American. This tribe probably is more nearly like the ancestral group that gave rise to the Hylesininae than any other living representatives of that family. They also appear closely allied to the ancestral line from which the Platypodidae diverged. The four genera assigned to this tribe represent a compact group in which the genera are not always clearly recognizable, largely because characters of the large, diverse genus *Cnemonyx* tend to overlap those of the other three.

### Genus *CNEMONYX* Eichhoff

*Cnemonyx* Eichhoff, 1868 (May), Berliner Ent. Zeitschr. 12:150 (Type-species: *Cnemonyx glaeritus* Eichhoff, monobasic)
*Ceratolepis* Chapuis, 1869, Synopsis des Scolytides, p. 52) Type-species: *Ceratolepis jucundus* Chapuis, monobasic); Wood, 1971, Great Basin Nat. 31:140. *Synonymy*
*Loganius* Chapuis, 1869, Synopsis des Scolytides, p. 52 (Type-species: *Loganius flavicornis* Chapuis, monobasic); Wood, 1971, Great Basin Nat. 31:140. *Synonymy*
*Minulus* Eggers, 1912, Ent. Blätt. 8:206 (Type-species: *Minulus barbatus* Eggers, monobasic); Eggers, 1923, Ent. Blätt. 19:138. *Synonymy*

Diagnosis.— This genus is distinguished from *Camptocerus* Latreille and *Scolytus* Geoffroy by the small, rounded scutellum, by the antennal club that normally has up to three sutures indicated, by the more nearly asymmetrical antennal club, and by other characters mentioned in the key to genera.

Description.— Length 1.0–3.9 mm, 2.0–2.7 times as long as wide. Color dark brown to black; vestiture sparse, short, of scales and/or hair.

Frons variable, shallowly concave to convex in female, usually more strongly impressed in male; vestiture varying from absent to an elaborate brush of hair, usually longer or more abundant in male. Antennal funicle 7-segmented, ventral margin of flagellar segments usually ornamented by small tufts of long setae, more elaborately ornamented in male. Pronotum large, broad, unarmed, lateral margins acutely marked by an elevated line. Scutellum small, flattened to convex, usually longer than wide, its surface

equal in height to elytral surface (not depressed). Elytral bases with a fine, raised line on margin (broken into obscure marginal crenulations in a few species), not emarginate toward scutellum; sculpture fine to moderate; declivity gradual, armature feebly developed if present. Abdomen rather strongly ascending to meet elytra at apex. Tibiae as in *Camptocerus* and *Scolytus* except meso- and metathoracic anterior edge of apical margin armed by small teeth in most species.

DISTRIBUTION.— S Florida and Baja California to Argentina; about 35 species have been named, 20 occur in North and Central America.

BIOLOGY.— All species are phloeophagous. They construct simple or biramous parental galleries that normally engrave both bark and wood. Eggs are deposited individually in separate niches along the margins of the egg tunnels. The larvae construct irregular mines mostly in the phloem tissues.

Key to the Species of *Cnemonyx*

1. Antennal club without distinct rows of hair marking sutures (two obscure rows in *exiguus*), hair usually short, often intermixed with scales; anterior edge of apical margin of hind tibia an acute, continuous, unarmed costa ..... 2

— Antennal club with three sutures clearly marked by rows of long, hairlike setae; hind tibiae armed on anterior edge of apical margin by two or three distinct teeth ..... 9

2(1). Declivital interstriae narrowly convex, subcarinate; interstriae subglabrous, minute scales when present scarcely project above punctures producing them; male frons broadly, rather deeply concave, uniformly ornamented by rather long, dark hair; male epistomal margin armed on median third by a strongly elevated, slightly procurved, transverse carina; Costa Rica to Columbia and Venezuela; 3.5–3.9 mm ..... 1. ***insignis* Wood**

— Declivital interstriae moderately if at all convex, vestiture if present usually longer; male frons variously ornamented; male carina, if present, very weakly developed or else located at or above level of antennal insertion; smaller species ..... 3

3(2). Frons slightly if at all dimorphic, moderately concave in both sexes (except *maculicornis*); frontal carina, if present, feebly developed and on epistomal margin; elytral vestiture, if present, sparse and short, usually not longer than distance equal to diameter of a strial puncture ..... 4

— Frons strongly dimorphic, females weakly to moderately convex, males concave and with a conspicuous transverse carina at level of antennal insertion or slightly above; elytral vestiture more abundant and much longer ..... 7

4(3). Striae weakly impressed, punctures moderately large; interstriae almost smooth, punctures small to rather large, confused; frons shallowly concave, punctures small, ornamented by fine, moderately long hair; epistomal margin distinctly elevated throughout its length ..... 5

— Striae strongly impressed, interstriae moderately to rather strongly convex and at least partly subcrenulate ..... 6

5(4). Strial and interstrial punctures larger, confused on at least anterior half of interstriae; female frons with punctures finer, closer, vestiture continued to upper limits of impressed area, this upper area punctured; Costa Rica to Panama; 2.0–2.5 mm ..... 2. ***atratus* (Blandford)**

— Strial punctures fine, interstrial punctures very fine, uniseriate; female frons with punctures larger, not as close, vestiture in a pair of lateral tufts, obsolete on rugose area at upper part of impressed area; Chiapas; 2.4 mm ..... 3. ***glabratus*** **(Schedl)**

6(4). Epistoma not separated from margin, epistomal brush below margin, median third above epistoma smooth, impunctate, frontal concavity finely punctured, ornamented by dense, coarse yellow hair; pronotum coarsely, closely punctured on disc, lateral punctures indistinctly larger; interstrial crenulations at base as wide as interstriae on 1–3, narrower behind, continuing to declivity; interstrial setae uniseriate, of short slender bristles; Brazil (not Mexico); 1.7–1.9 mm ..... 4. ***errans*** **(Blandford)**

— Epistoma distinctly elevated above and separate from margin, epistomal brush arising above margin and below epistoma, median third of frons above epistoma subinflated, transversely subrugose and coarsely punctured, frontal concavity reticulate to reticulate-granulate, rather finely (but sometimes appearing coarsely) punctured, vestiture of very fine, moderately long hair; pronotal disc much more finely punctured than in lateral areas; interstrial crenulations small, confused, small and poorly developed on declivity; interstrial setae confused, recumbent, somewhat scalelike; Honduras to Colombia; 1.8–2.3 mm ..... 5. ***maculicornis*** **(Blandford)**

7(3). Elytral scales confused or indistinctly three-ranked; interstrial punctures fine, confused, many subcrenulate on basal half; female frons feebly convex above, slightly impressed below, minutely granulate; male frons shallowly concave, ornamented above by tufts of yellow hair on each side, a strong, transverse carina at level of antennal insertion on more than median three-fourths, a median tubercle on epistomal margin; Costa Rica to Panama and Venezuela; *Vismia*; 1.8–2.3 mm ..... 6. ***panamensis*** **(Blandford)**

— Elytral scales in uniseriate interstrial rows, interstrial punctures uniseriate, more or less subvulcanate from base to apex at least in female; transverse frontal carina of male slightly above level of antennal insertion, less acute, median epistomal tubercle absent ..... 8

8(7). Pronotal surface longitudinally strigose without any indication of reticulation on posterior half, punctures larger, deeper; interstrial punctures much larger, deeper on disc; declivital surface minutely rugulose-punctate; transverse frontal carina of male rather poorly developed, occupying median half, area above carina very shallowly impressed and ornamented by a small, conspicuous pubescent area; Veracruz to Panama; *Vismia*; 1.6–1.7 mm ..... 7. ***minusculus*** **(Blandford)**

— Pronotal surface reticulate to base, punctures smaller, shallow; interstrial punctures finer and more widely spaced on disc; declivital surface reticulate; transverse frontal carina of male more strongly developed, much wider, area above carina strongly, broadly impressed, with sparse vestiture more widely distributed; Costa Rica to Panama; 1.5–1.9 mm ..... 8. ***exiguus*** **(Blandford)**

9(1). Frons rather conspicuously dimorphic, devoid of a transverse carina in both sexes, upper area more strongly impressed in males; declivital interstriae tend to be equally convex ..... 10

— Frons indistinctly dimorphic, both sexes with a transverse carina just above epistoma; most species with one or more interstriae elevated or depressed ..... 17

10(9). Epistomal margin very broadly, rather deeply emarginate; mandibles conspicuously, transversely strigose on median half of visible surface; costal margin near elytral apex entire, not subserrate or tuberculate; S Florida to Virgin Islands; *Ficus*; 2.2–2.4 mm ..... 9. ***ficus*** **(Schwarz)**

— Epistomal margin straight or procurved; costal margin of elytra subserrate to tuberculate near apex; mostly smaller species ..... 11

11(10). Striae not at all impressed, their punctures fine, spaced by distances at least equal to twice diameter of a puncture; interstrial punctures equal in size and spacing to those of striae ..... 12

— Striae weakly to rather strongly impressed, punctures spaced by distances not greater than diameter of a puncture ..... 13

12(11). Frons rather broadly, moderately concave, ornamented by a dense brush of erect, dark yellow hair; declivital interstriae four or more times as wide as striae; interstrial granules minute; color reddish brown; Baja California; *Sapium biloculare*; 1.5–1.9 mm ..... 10. ***confinis*** **(Wood)**

— Frons feebly impressed, indistinctly concave, ornamented by a small brush of pale yellow hair; declivital interstriae twice as wide as striae; interstrial granules moderately fine; color black; Oaxaca; 1.2–1.8 mm ..... 11. ***nigrellus*** **Wood**

13(11). Interstrial punctures close, spaced by distance equal to diameter of a strial puncture, their anterior margins finely crenulate; striae rather deeply impressed, interstriae slightly convex; frons broadly concave, entire concavity filled by a dense brush of hair; Puebla to Oaxaca; 1.5–1.8 mm ..... 12. ***recavus*** **Wood**

— Interstrial punctures simple ..... 14

14(13). Interstriae distinctly less than twice as wide as striae; female frons convex, male frons concave ..... 15

— Interstriae distinctly more than twice as wide as striae; male and female frons similar ..... 16

15(14). Striae moderately impressed, punctures deep, coarse; interstrial punctures fine, deep, close, spaced by distances equal to less than diameter of a puncture; declivital interstriae rather narrowly convex, armed by uniseriate rows of rather coarse tubercles; "Mexico"; *Cybistax donnell-smithii*; 1.7–2.2 mm (see also 14. ***squamifer*** **Wood**) ..... 13. ***splendens*** **(Wood)**

— Striae indistinctly impressed, punctures moderately large; interstrial punctures widely spaced, spacing equal to two to four diameters of a strial puncture; declivital interstriae moderately convex, sparsely armed by fine tubercles; S Florida, Puerto Rico, and Panama; *Pisidia piscipala*; 1.2–1.7 mm ..... 15. ***vagabundus*** **(Wood)**

16(14). Frons broadly concave; frontal pubescence dense, rather long; strial punctures fine, discal interstriae almost twice as wide as striae; declivital striae moderately deep, interstrial tubercles fine; Guerrero; 1.3–1.5 mm .... 16. ***impressus*** **(Wood)**

— Frons shallowly, more narrowly concave, frontal pubescence dense, erect, short; interstriae about as wide as striae, strial punctures coarse; declivital striae narrower, deep, interstrial tubercles rather coarse; Veracruz to Honduras; 1.4–1.5 mm ..... 17. ***prociduus*** **(Wood)**

17(9). Elytral surface minutely reticulate-granulate from apex almost to base; carina transverse, very strongly elevated, narrow, one-fifth as wide as distance between eyes; Costa Rica; *Hippomane mancinella*; 2.0–2.5 mm ..... 18. ***opacus*** **Wood**

— Elytral surface smooth, shining; frontal carina less strongly elevated, wider ..... 18

18(17). Transverse frontal carina at level of antennal insertion straight, length equal to slightly more than half distance between eyes; epistomal brush broad, dense; declivital interstriae equally, weakly convex; Puebla; 1.4–1.7 mm ..... 19. ***fastigius*** **(Wood)**

— Transverse frontal carina on epistomal margin weakly procurved, about one-third as long as distance between eyes; interstriae 9 and usually 1 and 3 slightly elevated ..... 19

19(18). Frontal pubescence in both sexes occupying an area not wider than length of epistomal carina, extending from carina half to two-thirds distance to a point slightly below upper level of eyes; declivital interstriae 1 to 3 equally, very feebly convex, granules of equal size; vestiture on elytral declivity short, stout, almost hairlike; Puebla; 1.3–1.5 mm ..... 20. ***liratus*** **(Wood)**

— Frontal pubescence occupying a much wider area, extending to upper level of eyes; declivital interstriae 1, 3, and 9 weakly elevated, lower half of 2 usually impressed, granules on 2 reduced or absent on lower half ..... 20

20(19). Interstrial punctures very small, about half as large as those of striae; interstrial bristles on declivity short, slender, their length equal to half width of one interstriae; Oaxaca; 1.2–1.4 mm ..... 21. ***gracilens*** **Wood**

— Interstrial punctures moderately large, at least two-thirds as large as those of striae; interstrial bristles on declivity longer, stout, their length equal to width of one interstriae; Guatemala; 1.3–1.6 mm ..... 22. ***exilis*** **(Wood)**

### 1. *Cnemonyx insignis* Wood

*Cnemonyx insignis* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):9 (Holotype, male; Moravia, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species evidently is allied to *panamensis* (Blandford), but it is distinguished by the larger size, by the procurved epistomal carina, and by other characters.

MALE.— Length 3.5–3.9 mm, 2.0 times as long as wide; color dark brown.

Frons broadly, rather deeply concave on median two-thirds from upper level of eyes to epistoma; surface reticulate-granulate, closely, deeply, rather coarsely punctured in concave area, shallowly, less closely punctured above; slightly less than median half of epistoma armed by an elevated, procurved, transverse carina; vestiture confined to concavity, consisting of rather long, erect, rather abundant, dark hair.

Pronotum 0.9 times as long as wide; widest at base, sides weakly arcuate and converging toward rather broadly rounded anterior margin; surface smooth and shining on posterior three-fourths, with minute points and fine punctures, anterior fourth rather coarsely subreticulate, dull, faintly, longitudinally etched in lateral areas, punctures very slightly larger in anterior area, much larger laterally. Glabrous.

Elytra 1.1 times as long as wide, 1.2 times as long as pronotum; scutellum as wide as long, not depressed; basal margins of elytra with an irregular raised line; outline as for *atratus* Blandford; striae rather strongly impressed, punctures fine, shallow, distinct; interstriae smooth, shining, at least twice as wide as striae, moderately convex at base, becoming rather narrowly costiform by declivital base, punctures fine and uniseriate behind, confused toward base. Declivity moderately steep, convex; striae broadly impressed, fine shallow punctures evident; interstriae narrowly, acutely, subserrately elevated; striae and interstriae minutely

reticulate-granulate; costal margin rather coarsely serrate. Rows of very minute interstrial scales evident on declivity.

FEMALE.— Presumably female represented by specimens having frons less strongly impressed, but otherwise similar to male.

DISTRIBUTION.— Costa Rica to Colombia and Venezuela.

COSTA RICA: Moravia, Cartago, 11-III-64, 500 m, No. 471, 40 cm cut log, S. L. Wood. OTHER COUNTRIES: Colombia, Venezuela.

HOST.— Presumably *Virola* sp.

BIOLOGY.— Dead parent adult specimens were removed from longitudinal galleries in the dry peeling bark of an old log of an unidentified tree in Costa Rica. In Colombia and Venezuela they occurred in *Virola* sp. larger than 10 cm in diameter.

NOTES.— The above treatment was based on the type series of 7 specimens and on 113 other specimens from Colombia and Venezuela.

### 2. *Cnemonyx atratus* (Blandford)

*Loganius atratus* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):129 (Lectotype, female; Bugaba, Chiriquí, Panama; British Mus. Nat. Hist., present designation)

*Cnemonyx nitens* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):9 (Holotype, male; Puerto Viejo, Heredia, Costa Rica; Wood Coll.); Wood, 1972, Bull. Ent. Res. 62:244. *Synonymy*

DIAGNOSIS.— This species is allied to *maculicornis* (Blandford), but may be distinguished by characters included in the above key.

MALE.— Length 2.0–2.5 mm, 2.1 times as long a wide; color almost black.

Frons moderately to rather shallowly concave on median half from upper level of eyes to epistoma; surface reticulate above, punctures rather coarse, deep, close, becoming finer and closer below in concave area; vestiture short and rather abundant in concave area, longer at sides of this area, evidently glabrous elsewhere. Antennal club subtriangular, finely, closely covered by hairlike pubescence; sutures not evident.

Pronotum 1.0 times as long as wide; widest at base, sides weakly arcuate and converging slightly to slight constriction just behind broadly rounded anterior margin; surface shining, shallowly etched by minute, longitudinally strigose lines, becoming reticulate anteriorly, punctures fine and elongate posteriorly, almost round and larger anteriorly and laterally. Glabrous.

Elytra 1.2 times as long as wide, 1.3 times as long as pronotum; sides straight and parallel on basal half, then arcuately converging to rather narrowly rounded, suturally subemarginate, posterior margin; striae 1 weakly, others feebly impressed, punctures rather small, deep, close; interstriae smooth, shining, about twice as wide as striae, punctures about half as large as those of striae, uniseriate behind, moderately confused on anterior half of disc; elytral bases with fine raised line; base of interstriae 1 not impressed; scutellum small, as wide as long, almost flush with elytral surface. Declivity moderately steep, convex; striae and interstriae narrower than on disc, striae narrowly impressed; interstriae moderately, broadly convex, shining except sutural half of 1 dull, punctures uniseriate. Vestiture confined to declivity, consisting of sparse minute, short, suberect scales arising from interstrial punctures.

FEMALE.— Similar to male except frons flattened, vestiture reduced; strigose lines on pronotum rather obscure; interstrial punctures on elytral disc not as confused; surface of declivity less brightly shining.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Puerto Viejo, Heredia, 12-III-64, 70 m, No. 485, S. L. Wood. PANAMA: Bugaba.

BIOLOGY.— Transverse biramous parental galleries were cut in the cambium region of a fallen limb 10 cm in diameter. The eggs had not hatched; consequently, larval mines were not evident.

NOTES.— The above treatment was based on two syntypes of *atratus* and on the type series of 36 specimens of *nitens*.

Of the three syntypes of *atratus* mentioned by Blandford, one is missing from its pin. The other two are females. The first female syntype in Blandford's series is here designated as the lectotype of *Loganius atratus*; it has borne a type label and has been regarded as the type for many years.

### 3. *Cnemonyx glabratus* (Schedl)

*Loganius glabratus* Schedl, 1940, An. Esc. Nac. Cienc. Biol. (Mexico) 1:329 (Holotype, female; Tumbalá, Chiapas, Mexico; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *atratus* (Blandford) by the female frons, by the slightly smoother, more brightly shining pronotum, and by the sculpture of the elytra as noted below.

FEMALE.— Length 2.4 mm, 2.1 times as long as wide; color very dark brown.

Frons as in *atratus* except punctures slightly larger, not quite as close; vestiture coarser, slightly longer, concentrated in a pair of submarginal tufts on upper two-thirds except obsolete on upper margin, area between tufts of hair at upper margin rugulose, obscurely, transversely strigose; epistomal process distinctly elevated near but separate from epistomal margin on median third, this transverse carina low, rounded, of about uniform height, smooth.

Pronotum as in *atratus* except smoother, minute longitudinal striations much more weakly developed.

Elytra about as in *atratus* except striae rather narrowly, distinctly impressed, punctures rather small, less distinctly impressed; interstriae rather weakly convex, slightly more than twice as wide as striae, smooth, shining, punctures uniseriate, rather close, very fine except about twice as large at base; declivity similar to disc except punctures replaced by fine granules. Very obscure declivital vestiture about as in *atratus*.

DISTRIBUTION.— Chiapas.

MEXICO: Chiapas: Tumbalá.

NOTES.— The above treatment was based on the unique female holotype.

### 4. *Cnemonyx errans* (Blandford)

*Ceratolepis errans* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):127 (Lectotype, male; in "Mexican" tobacco refuse intercepted at Paris; British Mus. Nat. Hist., designated by Wood, 1972, Great Basin Nat. 32:192)

*Ceratolepis brasiliensis* Schedl, 1936, Archiv. Inst. Biol. Veg. Río de Janeiro 3:104 (Syntypes; Río Grande do Sul, Brazil; Schedl Coll. and Vienna Mus.); Wood, 1972, Great Basin Nat. 32:192. *Synonymy*

Blandford described this species from several examples intercepted at Paris in tobacco refuse that supposedly came from Mexico. However, except for his series all known specimens are from southern Brazil or northern Argentina. Because there are no authentic records of this species from North or Central America, it should not be included in any consideration of the fauna of this area.

### 5. *Cnemonyx maculicornis* (Blandford)

*Ceratolepis maculicornis* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):127 (Lectotype, female; Tolé, Panama; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— In addition to characters summarized in the above key, this species has most of the posterior half of the elytra reticulate-granulate.

MALE.— Length 1.8–2.3 mm, 2.1 times as long as wide; color very dark brown.

Frons moderately, broadly concave from epistoma to vertex; surface reticulate-granulate except on median area of lower third, punctures small, deep, moderately close; median third of lower fourth transversely rugose; median third of epistoma weakly carinate, carina smooth, shining; vestiture very fine, moderately abundant, rather short to moderately long, erect, epistomal brush sparse. Antennal club 1.3 times as long as wide, with abundant, minute hair and sparse scales, sutures not indicated.

Pronotum 0.91 times as long as wide; sides almost straight and parallel on basal fourth, then arcuately converging to moderately rounded anterior margin; surface shining, minutely, longitudinally etched, punctures moderately large, deep, those in lateral areas larger, those in lateral and extreme basal areas tending to be in rows of perhaps three to six punctures each, spaced by distances not greater than diameter of a puncture except more widely spaced near center of disc.

Elytra 1.2 times as long as wide; sides almost straight and parallel on less than basal half, rather narrowly rounded behind; raised line on basal margins indefinite, broken; striae narrowly, rather strongly impressed, punctures small, shallow, distinct; interstriae moderately convex, twice as wide as striae, rather closely, transversely, finely crenulate. Declivity moderately steep, convex; striae slightly deeper than on disc, punctures obscure to obsolete; interstriae as wide as striae, granules minute to obsolete; entire surface finely reticulate-granulate. Vestiture very

short, seen with difficulty, consisting of recumbent interstrial bristles in rows on declivity, confused on disc (usually abraded), each slightly longer than distance equal to diameter of a strial puncture.

FEMALE.— Similar to male except frons flattened below, weakly convex above, pronotal surface not etched posteriorly, with minute impressed points.

DISTRIBUTION.— Honduras to Colombia.

HONDURAS: La Ceiba, 26-VIII-49, at light, E. C. Becker. COSTA RICA: Osa Peninsula, Puntarenas, 1-III-67, in a Lauraceae. PANAMA: Tolé, Chiriquí, G. C. Champion; Bugaba, 275–500 m, Champion. COLOMBIA: 27 km NE Montoya, 2-VII-70, 150 m, No. 594, *Virola*, S. L. Wood.

HOST.— *Virola* sp.

BIOLOGY.— Colombian specimens made transverse, biramous parental galleries in a recently cut limb 10 cm in diameter.

NOTES.— The above treatment was based on the 16 syntypes in Blandford's series and on 51 other specimens.

Because a type has not been selected from the syntypic series, I here designate the remaining female syntype from Tolé in the British Museum (Natural History) as the lectotype of *Ceratolepis maculicornis* Blandford. This specimen has been labeled type and considered to be the type for many years.

The series from Colombia tends to have the pronotal punctures slightly larger than specimens from Costa Rica and Panama, but the difference does not warrant special recognition.

### 6. *Cnemonyx panamensis* (Blandford)

Fig. 112

*Loganius panamensis* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):129 (Lectotype, male; Tolé, Chiriquí, Panama; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished from *minusculus* (Blandford) by the larger average size, by the confused interstrial punctures and setae, by the different frontal carina of the male, and by other characters mentioned in the above key.

MALE.— Length 1.8–2.3 mm, 2.2 times as long as wide; color very dark brown, almost black.

Frons moderately concave from level of antennal insertion to above upper level of eyes, a strong, long, transverse carina at level of antennal insertion on more than median three-fourths; epistoma subacutely elevated, with a small, median tubercle; surface above carina rugose-reticulate, punctures obscure; a rather small tuft of long yellow hair on upper two-thirds of each half of concavity, other scattered setae on lower half. Antennal club with suture 1 partly septate, other sutures not indicated.

Pronotum about as in *maculicornis* except punctures larger, very slightly substrigose.

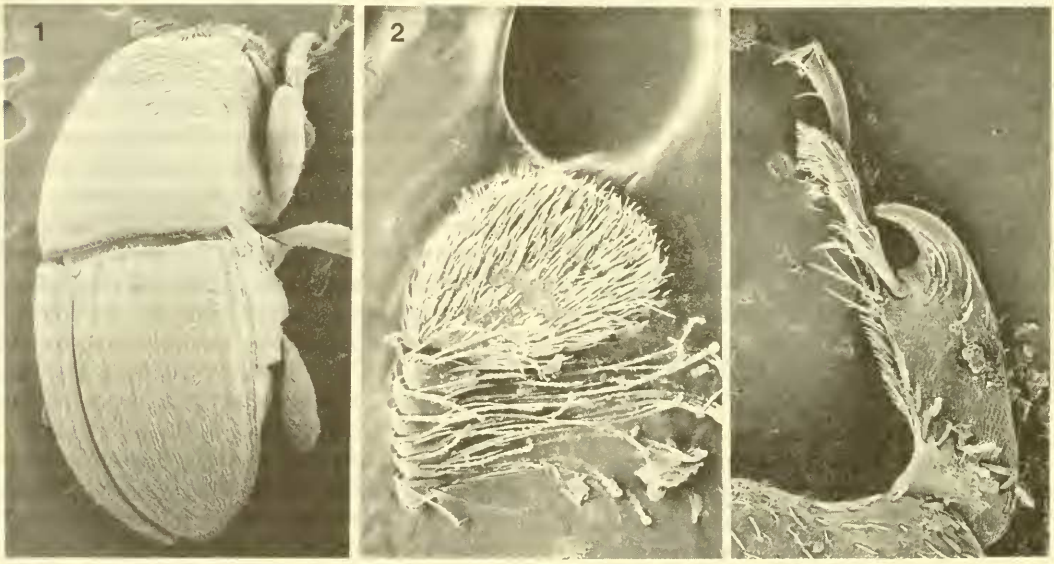



Fig. 112. *Cnemonyx panamensis*: 1, female; 2, antenna; 3, protibia.

Vestiture confined to margins and anterior third, of coarse, semirecumbent setae.

Elytra 1.1 times as long as wide, 1.1 times as long as pronotum; sides feebly arcuate from base, arcuately converging on posterior half, rather narrowly rounded behind, striae narrowly impressed, punctures small, shallow, distinct; interstriae three to four times as wide as striae, finely subrugulose, punctures confused, subcrenulate, rather fine to moderately coarse on basal half of disc, smaller behind. Declivity convex, rather gradual; interstriae narrower and more finely sculptured than on disc. Vestiture of short, acuminate, almost scalelike setae of uniformly short length, rather abundant, confused to indistinctly 3-ranked.

FEMALE.— Similar to male except frons planoconvex, frontal carina absent, epistomal sculpture and tubercle as in male, frontal vestiture of rather short, coarse setae uniformly distributed.

DISTRIBUTION.— Costa Rica to Panama and Venezuela.

COSTA RICA: Puerto Viejo, Heredia, 12-III-64, 70 m, No. 476, log, S. L. Wood; Río Damitas in Dota Mts., San José, 22-VIII-63, 250 m, No. 127, *Vismia guianensis*, S. L. Wood: San Isidro del General, San José, 13-XII-63, 1000 m, No. 310, tree branch, S. L. Wood; Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 75, tree limb, S. L. Wood. PANAMA: Tolé, Chiriquí, G. C. Champion; David, Chiriquí, G. C. Champion. VENEZUELA: Rancho Grande, Aragua, 9-IV-70, 1100 m, No. 440, tree seedling, S. L. Wood.

HOST.— *Vismia guianensis*.

BIOLOGY.— The transverse, biramous egg galleries engrave the cambium area from small branches to large boles.

NOTES.— The above treatment was based on 11 of Blandford's syntypic series of 16 specimens and on 105 other specimens. Although it has been traditional to regard the first specimen in Blandford's series as the type, I here designate a male from Tolé, the seventh specimen on the sixth pin of those specimens now in the British Museum (Natural History), as the lectotype of *Loganius panamensis* Blandford. The first syntype is a female bearing a type label; it is considered to be the lectoallotype of this species.

### 7. *Cnemonyx minusculus* (Blandford)

*Loganius minusculus* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):130 (Holotype, male; Volcán de Chiriquí, Panama; British Mus. Nat. Hist.)

*Loganius vismiae* Eggers, 1929, Wiener Ent. Zeit. 46:63 (Holotype,male; La Caja, 8 km W San José, San José, Costa Rica; Deutschen Ent. Mus.); Wood, 1972, Great Basin Nat. 32:193. *Synonymy*

DIAGNOSIS.— This species is distinguished from *exiguus* (Blandford) by numerous characters that are summarized in the above key.

MALE.— Length 1.6–1.7 mm, 2.2 times as long as wide; color almost black.

Frons flattened from epistoma almost to upper level of eyes, very shallowly impressed near center, an elevated, rounded, transverse carina rather poorly developed on median half just above upper level of eyes; surface rather finely punctate-granulate, punctures rather coarse, close; a conspicuous tuft of coarse, dark, rather short setae on median half between carina and upper level of eyes, setae evidently always absent along median line. Antennal club subcircular, sutures 1 and 2 rather strongly procurved, 2 reaching middle.

Pronotum as in *exiguus* except surface longitudinally strigose, becoming reticulate-granulate near anterior margin, punctures rather fine, deep, moderately close. Subglabrous except near margins.

Elytra with outline as in *exiguus*; striae feebly impressed, punctures fine, shallow, not always clearly defined on disc, obsolete on declivity; interstriae about three times as wide as striae, somewhat rugulose on disc, punctures uniseriate, coarse, almost as large as those of striae, very slightly subvulcanate near base. Declivity gradual, convex; interstrial punctures smaller and almost entirely replaced by granules; strial punctures largely obsolete, surface very minutely rugulose-reticulate to punctured by impressed points. Vestiture of very minute, short, recumbent, strial hair, and suberect, uniseriate, interstrial scales; scales on disc very slender, stouter on declivity, about four to six times as long as wide.

FEMALE.— Similar to male except frontal callus slightly smaller and frontal vestiture somewhat shorter.

DISTRIBUTION.— Veracruz to Panama.

MEXICO: Veracruz: 14 km E Huatusco, 7-VII-67, 250 m, No. 174, *vismia*, S. L. Wood. GUATEMALA: San Juan, Alta Verapaz, G. C. Champion. COSTA RICA: La Caja, San José, 20-XII-29, *Vismia ferruginosa*, F. Nevermann. PANAMA: Volcán de Chiriquí, below 4000 ft (1300 m), G. C. Champion; Cerro Campana, Coclé, 30-VII-70, 1000 m, H. Howden.

HOSTS.— Probably *Vismia guianensis*.

NOTES.— The above treatment was based on the holotype of *minusculus*, on two cotypes and several topotypes of *vismiae*, and on six other specimens.

### 8. *Cnemonyx exiguus* (Blandford)

*Loganius exiguus* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):130 (Lectotype, male; Bugaba, Chiriquí, Panama; British Mus. Nat. Hist.)

*Loganius pumilus* Eggers, 1929, Wiener Ent. Zeit. 46:65 (Holotype, male; Turrialba, Costa Rica; U.S. Nat. Mus., 60,392); Wood, 1972, Great Basin Nat. 32:193. *Synonymy*

DIAGNOSIS.— This species is rather closely allied to *panamensis* (Blandford), but it is distinguished by characters summarized in the above key.

MALE.— Length 1.5–1.9 mm, 2.3 times as long as wide; color black, with whitish elytral setae.

Frons concavely impressed from carina to well above eyes, deepest point immediately above carina, median area above in concavity very feebly elevated; transverse carina thick, broad as concavity, its summit narrow but not acute, located slightly above level of antennal insertion; transversely impressed at level of antennal insertion; surface coarsely reticulate above, finer below; punctures small, indistinct, moderately close; vestiture of sparse, coarse, moderately long subplumose hair. Antennal club 1.3 times as long as wide, sutures 1 and 2 obscurely indicated by long hair; funicular tuft of dark hair rather well developed.

Pronotum 1.05 times as long as wide; outline as in *ficus* (Schwarz); surface reticulate anteriorly, almost smooth behind, punctures rather small, deep, spaced by one to two diameters of a puncture. Glabrous except for a few stout bristles on anterior fourth.

Elytra 1.2 times as long as wide; sides almost straight and parallel on basal half, rather broadly rounded behind; striae weakly impressed, punctures coarse, deep, rather close; interstriae indistinctly wider than striae, subreticulate, punctures uniseriate, rather coarse, deep, rather close. Declivity convex, rather steep; striae narrower, distinctly impressed; interstrial punctures small. Vestiture confined to posterior two-thirds, consisting of interstrial, uniseriate rows of erect scales; each scale about equal in length to width of an interstriae, about six times as long as wide.

FEMALE.— Similar to male except frons moderately convex from epistoma to vertex; funicular tuft of hair absent; interstrial punctures on disc subvulcanate, weakly granulate on disc.

DISTRIBUTION.— Costa Rica and Panama.

COSTA RICA: Turrialba. PANAMA: Bugaba, Chiriquí, G. C. Champion; Madden Forest, Canal Zone, 2-I-64, 70 m, No. 367, S. L. Wood.

BIOLOGY.— Transverse, biramous, parental tunnels were constructed in the cambium region of a fallen limb 10–20 cm in diameter. *Camptocerus auricomus* shared the same limb.

NOTES.— The above treatment was based on Blandford's series of 2 males and one female and on 20 other specimens.

Because a type has not previously been selected from the three syntypes, I here designate a male syntype from Bugaba as the lectotype of *Loganius exiguus* Blandford.

### 9. *Cnemonyx ficus* (Schwarz)

*Loganius ficus* Schwarz, 1894, Proc. Ent. Soc. Washington 3:44 (Lectotype, male; Key West, Florida; U.S. Nat. Mus., 4538, present designation)

*Ceratolepis nubilus* Blackman, 1943, Proc. U.S. Nat. Mus. 94(3174):380 (Holotype, male; St. Croix, Virgin Islands; U.S. Nat. Mus., 56558); Wood, 1962, Great Basin Nat. 22:78. *Synonymy*

DIAGNOSIS.— This distinctive species has the epistomal margin broadly, rather deeply emarginate for this genus; the mandibles are transversely etched on the median half of the visible area; and the costal margin near the elytral apex is smooth, not serrate.

MALE.— Length 2.2–2.4 mm, 2.3 times as long as wide; color reddish brown.

Frons broadly, moderately concave from upper level of eyes to epistoma; surface subreticulate, finely, rather closely punctured over entire surface; epistomal margin elevated, smooth, shining; epistomal brush broad, rather conspicuous. Antennal club 1.4 times as long as wide, with three strongly procurved sutures conspicuously marked by rows of pale setae; flagellar tuft of hair well developed.

Pronotum 1.0 times as long as wide; widest one-third length from base, sides rather

strongly arcuate from base, converging slightly on anterior half, rather broadly rounded on anterior margin; surface smooth, shining, with rather numerous minute points posteriorly becoming reticulate toward anterior margin, punctures moderately coarse, rather deep, separated by distances up to twice diameter of a puncture. Glabrous.

Elytra 1.3 times as long as wide; sides almost straight and parallel on slightly less than basal two-thirds, rather narrowly rounded behind; basal margins with a distinctly elevated, irregular line; striae feebly if at all impressed, punctures rather small, deep; interstriae more than twice as wide as striae, smooth, shining, punctures uniseriate, close, only slightly smaller than those of striae. Declivity rather steep, convex; striae narrower, slightly impressed; interstriae feebly convex, surface shagreened, punctures weakly granulate. Vestiture largely confined to declivity, consisting of interstrial rows of short, stout bristles.

FEMALE.— Similar to male except frons very slightly less strongly impressed; funicular tuft of hair shorter.

DISTRIBUTION.— S Florida to the Virgin Islands.

USA: Florida: Key West, 13-III-12, *Ficus aurea*, E. A. Schwarz. VIRGIN ISLANDS: St. Croix, X–XI-63, at light, L. I. Sanders.

HOST.— *Ficus aurea*.

BIOLOGY.— Except for the very brief notes of Schwarz, nothing is known of the habits of this species. It was reared from fig branches.

NOTES.— This species was named from a long series of syntypes, of which 185 were examined for the above treatment. The male holotype of *Ceratolepis nubilus* was also examined and compared directly to my specimens.

Because a type has not yet been assigned, I here designate the male specimen in the U.S. National Museum, which for years has been considered to be the type, as the lectotype of *Loganius ficus* Schwarz.

### 10. *Cnemonyx confinis* (Wood)

*Loganius confinis* Wood, 1961, Great Basin Nat. 21:94 (Holotype, female; 4 miles E La Paz, Baja California; California Acad. Sci.)

DIAGNOSIS.— This species is somewhat similar to *nigrellus* Wood, but it may be distinguished by characters presented in the above key.

MALE.— Length 1.4–1.9 mm, 2.3 times as long as wide; body color rather dark reddish brown.

Frons broadly, rather deeply concave, from epistomal carina to upper margin of eyes; a smooth, shining, transverse band immediately above epistomal margin elevated and subcarinate, less well developed but similar to that of *fastigius*, extending almost from lateral margin to lateral margin; reticulate-granulate above and at sides, finely punctured in lower part of concave area; vestiture confined to concave area, fine, rather long, more abundant below and laterally, fine, sparse epistomal brush apparently rising from beneath lower margin of lower slope of transverse carina. Eye and antenna as in *prociduus* (Wood).

Pronotum 0.95 times as long as wide, widest on basal third, sides converging somewhat toward constriction just behind rather narrowly rounded anterior margin; basal and lateral margins marked by a fine raised line; surface rather dull, indistinctly, minutely, longitudinally strigose, punctures moderately small, narrowly oval, rather close. Glabrous.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides straight and subparallel on basal two-thirds, rather narrowly rounded behind; humeral angles rounded; striae not impressed except first, punctures very fine, rather close; interstriae at least three times as wide as striae, punctures slightly if at all smaller than those of striae, rather close, in uniseriate rows, surface smooth, dull; elytral bases subcrenulately raised, except impressed near scutellum, several low crenulations on interstriae 2 to 6; scutellum small, oval in outline, rather strongly depressed. Declivity evenly convex, rather steep; striae feebly impressed, interstriae 1, 2, 3, 4, 7, 9, and 10 very weakly convex with exceedingly minute tubercles in uniseriate rows; interstriae 1 meets costal margin, 2 meets 10, 3 meets fused 7 and 9; weakly elevated costal margin with setose punctures, not at all granulate. Vestiture almost obsolete, a few minute interstrial bristles on declivity, none longer than distance equivalent to one-third distance separating rows of bristles.

FEMALE.— Similar to male in all respects.

DISTRIBUTION.— Baja California.

MEXICO: Baja California: 4 miles (7 km) E La Paz, 23-XII-58, *Sapium biloculare*, H. B. Leech.

BIOLOGY.— The type series was reared from tunnels in the bark of branches of the above host.

NOTES.— The above treatment was based on the type series of 90 specimens.

### 11. *Cnemonyx nigrellus* Wood

*Loganius niger* Wood, 1961 (nec. Eggers, 1933), Great Basin Nat. 21:95 (Holotype, female; 26 km W Tehuantepec, Oaxaca, Mexico; Wood Coll.)

*Cnemonyx nigrellus* Wood, 1974, Great Basin Nat. 34:278 (Replacement name)

DIAGNOSIS.— This minute species is distinguished from the foregoing species by the black color, by the sexually dimorphic frons, by the simple structure of the elytral declivity, and by the small size. It is more closely allied to *gracilens* (Wood).

FEMALE.— Length 1.2–1.8 mm, 2.6 times as long as wide; body color black, vestiture white.

Frons broadly flattened, indistinctly concave from epistomal margin to upper level of eyes, transversely impressed on lower third; surface minutely granulose, very finely, closely punctured in impressed area and densely pubescent from epistomal margin to upper level of eyes, setae subplumose, moderately long, pale yellow to almost white, epistomal brush not separated from other setae. Eye rather finely faceted, deeply sinuate on anterior margin. Antennal club about three-fourths as long as combined length of scape and funicle; suture 1 reaching only one-third club length from base, all sutures rather broadly procurved.

Pronotum 0.72 times as long as wide, widest on basal third, sides arcuately converging slightly toward narrowly rounded anterior margin; basal and lateral margins marked by a fine, raised line; surface subshining, punctures fine, elongate, rather sparse. Glabrous.

Elytra 1.7 times as long as wide, sides straight and subparallel on slightly more than basal half, rather narrowly rounded behind; humeral angles rather narrowly rounded; striae not impressed, punctures small, distinct, separated by almost twice their own diameters, in regular rows; interstriae one to three times wider than striae, 1 and 3 wider than 2 and 4, smooth, subshining, punctures sparse, fine, minutely subgranulate on 1 and 3 to base; basal margins almost straight, impressed toward scutellum, finely, irregularly raised from about interstriae 2 to 6, a few submarginal subcrenulate elevations; scutellum small, depressed, longer than wide. Declivity evenly convex, moderately steep; striae weakly impressed, interstriae feebly convex; interstrial granules moderately large, rounded, rather widely spaced, in uniseriate rows on all interstriae except absent on 4, 6, 8, and 10; costal margin finely raised and sinuate, confluence of interstriae with costal margin or with one another not clear, except possibly 3 and 9, interstriae 10 minutely serrate on basal half of elytra, 9 minutely serrate on posterior half. Vestiture scanty, consisting of sparse rows of erect, blunt interstrial bristles on declivity and sides.

MALE.— Similar to female except frons convex above, impunctate at center, and glabrous.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: El Cameron, 22-VI-67, 16 miles (26 km) W Tehuantepec, 8-VII-53, 22-VI-67; all from the same host by S. L. Wood.

BIOLOGY.— This species constructed tunnels in the cambium region of its host, which was a low, shrubby, leafless, green plant that produced an abundance of white milky fluid when green stems were cut or broken.

NOTES.— The above treatment was based on the type series of 30 specimens and on 80 other specimens.

### 12. *Cnemonyx recavus* Wood

*Cnemonyx recavus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):11 (Holotype, male; 48 km E Tehuantepec, Oaxaca, Mexico)

DIAGNOSIS.— This distinctive species is somewhat allied to *confinis* Wood, but it is readily distinguished by characters summarized in the above key.

MALE.— Length 1.5–1.8 mm, 2.1 times as long as wide; color dark reddish brown.

Frons broadly, rather deeply concave from just below upper level of eyes to epistomal margin; concavity densely pubescent, setae moderately, uniformly long; surface of marginal and dorsal areas coarsely reticulate,

with fine, close punctures; surface in concavity obscured by pubescence. Scape short; funicle bearing a dense tuft of long hair; club obovate, with three strongly procurved sutures marked by setae, suture 1 extending almost two-thirds club length from base.

Pronotum 0.92 times as long as wide; basal margin bisinuate, marked by a fine, raised line; widest at base, arcuately converging to a slight constriction just before broadly rounded anterior margin; surface dull, minutely, longitudinally etched, punctures fine, oval, close, moderately deep. Glabrous.

Elytra 1.2 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on slightly more than basal half, rather narrowly rounded behind; basal margins indistinctly raised along a fine line; striae impressed, punctures fine, distinctly impressed; interstriae almost twice as wide as striae, convex, dull, each with a uniseriate row (confused on 2) of fine, short, transverse crenulations, puncture posterior to each crenulation fine, obscure. Declivity convex, moderately steep; about as on declivity, with interstriae 9 weakly elevated and more coarsely tuberculate, 10 with a row of fine tubercles posteriorly. Vestiture confined to declivity, consisting of interstrial rows of very short, flattened bristles each about twice as long as wide.

FEMALE.— Similar to male except frons very slightly less strongly impressed.

DISTRIBUTION.— Puebla to Oaxaca.

MEXICO: **Oaxaca**: 48 km E Tehuantepec, 22-VI-67, 120 m, No. 84, S. L. Wood. **Puebla**: 16 km NW Acatlán, 15-VI-67, 1700 m, No. 36, in "Leche Sillo," S. L. Wood.

BIOLOGY.— Specimens were attacking recently cut limbs 3–8 cm in diameter. The biramous parental galleries were transverse.

NOTES.— One hundred and sixty-one specimens were examined, including the type series. In the Acatlán series the posterior half of the pronotum tended to be smooth and shining and the punctures behind the interstrial crenulations were more conspicuous. Because these characters overlapped in the two series, geographical races were not designated.

### 13. *Cnemonyx splendens* (Wood)

*Loganius splendens* Wood, 1961, Great Basin Nat. 21:88 (Holotype, male; Mexico; U.S. Nat. Mus.)

DIAGNOSIS.— This species superficially resembles *ficus* Schwarz, but it is much more closely related to *vagabundus* Wood, from which it may be distinguished by characters summarized in the above key.

MALE.— Length 1.7–2.2 mm, 2.3 times as long as wide; color reddish brown.

Frons convex above, transversely impressed above epistoma; epistomal submargin with an impressed line on median two-thirds; surface reticulate above, rather coarsely, closely, deeply sculptured, punctures moderately close above, very close below; vestiture short, inconspicuous. Eye elongate, weakly sinuate on anterior margin; coarsely granulate. Antenna as in *ficus*.

Pronotum as long as wide, widest on basal third; sides weakly arcuate and converging toward narrowly rounded anterior margin; surface subshining, punctures rather large, deep, close, oval, somewhat larger in lateral areas. Glabrous.

Elytra 1.5 times as long as wide; sides straight and subparallel on basal two-thirds, rather broadly rounded behind; elytral bases weakly raised along a continuous, irregular line; scutellum small, rounded; striae weakly impressed, punctures moderately large, close deep; interstriae as wide as striae, moderately convex, smooth, subshining, punctures small, distinct, close. Declivity steep, convex; all striae more strongly, narrowly impressed and all interstriae more strongly convex than on disc; all interstriae finely tuberculate, tubercles becoming progressively larger laterally, largest on 9; interstriae 1, 2, 3, and 5 meet 10, 4 joins 5, 6 and 8 end short, 7 and 9 fuse apically; 10 very narrow, largely reduced but bearing a few tubercles. Vestiture consisting of rows of short, narrow, scalelike setae, each seta arising from posterior margin of a tubercle.

FEMALE.— Similar to male except frons flattened on a broad area to well above eyes and bearing a subcircular brush of moderately long hair, shorter toward center, extending from epistomal margin to upper level of eyes.

DISTRIBUTION.— "Mexico."

The type series was intercepted at San Pedro, California, in the bark of *Cybistax donnell-smithii* from Mexico.

NOTES.— The above treatment was based on the type series of five specimens.

### 14. *Cnemonyx squamifer* Wood

*Cnemonyx squamifer* Wood, 1979, Great Basin Nat. 39:138 (Holotype, male; Tikal, Petén, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *splendens* (Wood) by the smaller size, by the smaller, less strongly impressed strial punctures, by the larger, broader interstrial scales, and by the more strongly impressed male frons.

MALE.— Length 1.6–1.7 mm, 2.2 times as long as wide; color yellowish brown.

Frons similar to *splendens* except more strongly, more broadly concave, vestiture extending slightly above upper level of eyes and closer to margins of eyes.

Pronotum as in *splendens* except punctures conspicuously smaller.

Elytra resembling *splendens* except more weakly impressed, punctures much smaller, very close, interstriae twice as wide on striae, less strongly convex, punctures only slightly smaller than those of striae; interstrial setae in rows, slightly longer and much wider than in *splendens*, each about three to four times as long as wide, about half as long as distance between rows, spaced within a row by length of a seta.

DISTRIBUTION.— Guatemala.

GUATEMALA: Tikal, Petén, 13-IV-56, 100 m, at light.

NOTES.— The above treatment was based on the type series of three males.

### 15. *Cnemonyx vagabundus* (Wood)

*Loganius vagabundus* Wood, 1961, Great Basin Nat. 21:89 (Holotype, male; Key West, Florida; U.S. Nat. Mus.)

DIAGNOSIS.— This species is allied to *splendens* Wood, from which it is distinguished by characters summarized in the above key.

MALE.— Length 1.2–1.7 mm, 2.5 times as long as wide; body color light reddish brown.

Frons convex on upper half, flattened on a subtriangular area on lower half, more strongly impressed on a transverse line just above epistoma; narrow epistomal margin smooth and shining; surface reticulate, rather closely, deeply punctured above, punctures setose on flattened area; setae moderately abundant except at center, rather coarse, moderately long. Eye coarsely faceted; outline sinuate on both anterior and posterior margins. Segments 2 to 7 of antennal funicle as broad as pedicel, each bearing a tuft of long setae on inner margin; club broad, not septate, conspicuously marked by three strongly procurved rows of setae.

Pronotum 0.98 times as long as wide; widest on basal fourth, sides convergently arcuate toward rather narrowly rounded anterior margin, very slightly constricted just behind anterior margin; surface shining, with very feeble indication of minute longitudinal lines, and a few very minute impressed points between moderately coarse, deep, broadly oval punctures. Glabrous.

Elytra 1.5 times as long as wide; sides straight and subparallel on basal two-thirds, narrowly rounded behind; elytral bases not raised along a continuous costa, but with a few finely subcrenulate punctures suggesting a partial raised line; striae feebly if at all impressed, punctures moderately large, very close, deep; interstriae subconvex, smooth, subshining, about one and one-half times as wide as striae, punctures almost as large as those of striae, rather shallow, sparse, spaced at distances about equal to width of interstriae. Declivity moderately steep, convex; striae 1 and 2 more strongly impressed, interstriae 1, 2, 3, and 9 more strongly convex than others, their punctures closer than on disc and subserrate on anterior margins; interstriae 5 and 7 also minutely granulate; interstriae 1 and 2 reaching margin, 3, 5, and 7 join 9. Vestiture limited to declivity, consisting of sparse, short, narrowly flattened setae.

FEMALE.— Similar to male except frons more strongly, broadly impressed, impression ending well below upper level of eyes; and declivital sculpture finer.

DISTRIBUTION.— Florida, Puerto Rico, and Panama.

USA: **Florida**: Key West, 22, 30-V-12, *Ichthyomethia piscipala*, No. 9170, E. A. Schwarz. PUERTO RICO: Mona Island, 6,8-IV-27, W. A. Hoff. PANAMA: Barro Colorado Island, Canal Zone, IX-41, No. 41-20624, 20-VI-41, Z-4816, J. Zetek.

HOST.— *Pisidia piscipala*.

NOTES.— The above treatment was based on the type series of 43 specimens. Two additional specimens that probably belong to this species were collected at Little Harbor, British Virgin Islands, 1-IV-58, J. F. G. Clarke.

### 16. *Cnemonyx impressus* (Wood)

*Loganius impressus* Wood, 1961, Great Basin Nat. 21:90 (Holotype, male; Chilpancingo, Guerrero, Mexico; Wood Coll.)

DIAGNOSIS.— This species is allied to *prociduus* (Wood), but may be distinguished by characters given in the above key.

DESCRIPTION.— Length 1.3–1.5 mm, 2.3 times as long as wide; body color reddish brown.

Frons very shallowly, broadly concave almost to upper level of eyes; a rather wide, subtriangular, smooth, shining epistomal area immediately above epistomal brush; surface of impressed area finely granulate-punctate, largely obscured by abundant, subplumose yellow setae of moderate length. Eye large, coarsely faceted; anterior margin sinuate. Antennal scape short, stout, funicle as long as scape, with segments 2 to 7 each as wide as pedicel and bearing on ventral margin long setae, none of which extend beyond tip of club; club large, broadly obovate, about as long as scape and funicle combined, 1.3 times as long as wide, with three strongly procurved sutures indicated by rows of setae, first not quite reaching middle.

Pronotum 0.96 times as long as wide; widest on basal fourth, sides evenly, arcuately converging toward narrow, but broadly rounded, anterior margin; basal and lateral margins with a fine, raised line; surface apparently minutely, longitudinally strigose on anterior half, becoming smooth posteriorly, and with rather fine, longitudinally elongate punctures, becoming smaller posteriorly and with a few very minute pores interspersed posteriorly. Glabrous.

Elytra 1.4 times as long as wide, 1.6 times as long as pronotum; sides straight and subparallel on slightly more than basal half, rather narrowly rounded behind; humeral angles abrupt; striae 1 distinctly impressed from base, others feebly impressed, punctures fine, distinct, in regular rows; interstriae about two to three times as wide as striae, their surface smooth but very dull, punctures in uniseriate median rows, small, all finely granulate; basal margins almost straight and irregularly raised, interstriae 2 to 6 with up to six poorly developed subcrenulate elevations near base; scutellum small, rounded in outline, scarcely at all depressed. Declivity evenly convex, moderately steep, all striae rather narrowly, rather deeply impressed; interstriae 1, 2, 3, 5, 7, and 9 moderately convex and tuberculate, costal margin and posterior portion of 10 also tuberculate, tubercles on lateral interstriae appearing somewhat larger; interstriae 1 joins costal margin, 2 joins 10, 3 joins fused 7 and 9, 4 and 6 end short of 5. In dorsal profile interstriae 9 appears very finely serrate on posterior half of elytra; 10 finely serrate on anterior half. Vestiture confined to declivity, consisting of rows of short, stout, semierect, almost scalelike setae arising from interstrial tubercles; longest setae about one-third as long as distance between rows.

FEMALE.— Similar to male except frons evidently more strongly impressed.

DISTRIBUTION.— Guerrero.

MEXICO: Guerrero: Chilpancingo, 22-X-41, at light, D. M. DeLong.

NOTES.— The above treatment was based on the three specimens in the type series. Nothing more is known of the habits or distribution of this species.

### 17. *Cnemonyx prociduus* (Wood)

*Loganius prociduus* Wood, 1961, Great Basin Nat. 21:91 (Holotype, female; La Ceiba, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *impressus* (Wood) by the more coarsely sculptured elytra, by the longer, more scalelike, recumbent, declivital setae, and by the very different arrangement of the elytral interstriae.

FEMALE.— Length 1.4–1.5 mm, 2.6 times as long as wide; body color reddish brown.

Frons very shallowly, broadly concave from the sinuate epistomal margin to upper level of eyes; epistomal margin subcarinately raised and obscurely overlapping epistomal brush, with a rather narrow smooth subshining area immediately above epistomal brush; surface of impressed area finely granulate-punctate, largely obscured by abundant, subplumose, yellow setae of short to moderate length. Eye and antenna essentially as in *impressus*.

Pronotum 0.95 times as long as wide; widest on basal third, sides converging somewhat toward broadly rounded anterior margin; basal and lateral margins marked by a fine raised line; surface dull, punctures

moderately abundant, rather small except larger in lateral areas, oval, interspaces with a few very minute pores. Glabrous.

Elytra about 1.5 times as long as wide, 1.6 times as long as pronotum; sides straight and subparallel on slightly more than basal half, rather narrowly rounded behind; humeral angles abrupt; striae slightly impressed, punctures moderately large, in regular rows; interstriae less than one and one-half times as wide as striae, punctures almost as large as those of striae, moderately spaced in rows, those toward base with anterior margin elevated, those near declivity appearing subvulcanate, surface almost smooth, dull; basal margins slightly impressed toward scutellum, subcrenulately raised, basal area somewhat irregular but not subcrenulate; scutellum almost round in outline, very slightly if at all depressed. Declivity evenly convex, moderately steep, all striae narrower and more strongly impressed than on disc; costal margin and all interstriae except 8 convex and serrate; serrations uniseriate, moderately coarse, evidently larger laterally; interstriae 1, 2, 3, and 5 (usually appearing fused to 7 and 9) all reaching costal margin, 4, 6, and 8 end near middle of declivity; 10 with two to five small tubercles near posterior extremity; interstriae 9 serrate on posterior half of elytra, 10 apparently minutely serrate on anterior half. Vestiture confined to posterior half of elytra and sides, consisting of interstrial rows of short, recumbent, spatulate scales arising from interstrial punctures; each scale equal in length to half distance between rows of scales, and each about four times as long as wide.

DISTRIBUTION.— Veracruz to Honduras.

MEXICO: **Veracruz:** Lago Catemaco, 16–20-VI-69, D. E. Bright. HONDURAS: La Ceiba, 29-V-49, at light, E. C. Becker.

NOTES.— The above treatment was based on the two female specimens that comprise the type series and on nine other specimens.

### 18. *Cnemonyx opacus* Wood

*Cnemonyx opacus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):10 (Holotype, male; Playa del Coco, Guanacaste, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species, at least superficially, resembles *insignis* Wood, above, but it is distinguished by the smaller size, by the narrow frontal carina, by the much more extensively granulate elytra, and by characters mentioned in the key. However, the antennal club has an entirely different shape and has three strongly procurved sutures clearly marked by rows of setae, suggesting that the relationship is superficial at best. It is much more closely allied to *flavicornis* (Chapuis).

MALE.— Length 2.0–2.5 mm, 2.2 times as long as wide; color dark brown.

Frons shallowly concave on median half from upper level of eyes almost to epistoma; surface closely, deeply, rather coarsely punctured; median fourth of epistoma bearing a strongly elevated, procurved, transverse carina; vestiture consisting of short, erect, rather abundant, stout hair in concave area. Antennal funicle with inner angle of segments projecting and bearing tufts of long yellow hair; club obovate, longer than wide, with three strongly procurved sutures conspicuously marked by rows of closely set setae.

Pronotum about as long as wide; widest on basal third, sides rather weakly arcuate, converging to weak, transverse constriction just behind rather narrowly rounded anterior margin; surface smooth and shining behind, becoming reticulate anteriorly and toward lateral margins, punctures rather coarse, deep, close, somewhat larger in lateral areas. Glabrous.

Elytra 1.2 times as long as wide, 1.3 times as long as pronotum; sides straight and parallel on more than basal half, rather narrowly rounded behind; scutellum very small, rounded, not depressed; basal margins of elytra marked by a fine, irregular, raised line; striae impressed, punctures rather large, deep, clearly impressed in basal area, obscure behind; interstriae convex, finely, completely reticulate-granulate to granulate (including striae) posteriorly, coarsely punctured on basal third of disc. Declivity moderately steep, convex; striae deeply impressed, punctures obscure; interstriae narrow, strongly convex, minutely granulate, finely subserrate; interstriae 9 moderately elevated, continuing to apex, highest at junction with 3. Vestiture confined to declivity, consisting of uniseriate rows of minute interstrial scales.

FEMALE.— Similar to male except frons less strongly impressed, almost flat.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Playa del Coco, Guanacaste, 18-X-63, 1 m, No. 233, *Hippomane macinella* S. L. Wood.

BIOLOGY.— This aggressive species attacked and killed branches up to 8 cm in diameter in vigorous host trees; it also attacked felled trees up to 30 cm in diameter. The biramous parental tunnels were transverse; they engraved both phloem and xylem tissues. Larval mines were moderately short and wandered without any special direction.

NOTES.— The above treatment was based on the type series of 68 specimens.

### 19. *Cnemonyx fastigius* (Wood)

*Loganius fastigius* Wood, 1961, Great Basin Nat. 21:93 (Holotype, female; 15 km NW Acatlán, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *prociduus* (Wood) by the convex frons, by the transverse frontal carina, by the prominent crenulate tubercles of the elytral disc, and by the finer declivital sculpture.

MALE.— Length 1.4–1.7 mm, 2.6 times as long as wide; body color rather dark reddish brown.

Frons convex, with a broad, rather sharply elevated, transverse carina just above epistomal margin, its length equal to slightly more than half distance between eyes; lower slope of carina more gradual, smooth, shining, upper slope more abrupt, reticulate, and bearing several setae; surface above carina minutely granulose, impunctate in central area, finely, sparsely punctured at sides and above; vestiture longer and more conspicuous along upper slope of carina and along epistomal margin, a glabrous area extending from above bases of mandibles across lower slope of carina. Eye and antenna as in *prociduus*.

Pronotum 0.95 times as long as wide, widest on basal third, sides weakly arcuate behind, abruptly converging anteriorly toward broadly rounded anterior margin; basal and lateral margins marked by a fine raised line; surface dull, minutely, longitudinally strigose, punctures moderately abundant, rather small, oval, interspaces with a few very minute pores. Glabrous.

Elytra 1.3 times as long as wide, 1.4 times as long as pronotum; sides straight and subparallel on slightly less than basal half, rather narrowly rounded behind; humeral angles abrupt; striae 1 moderately impressed, others feebly if at all impressed; strial punctures small, in regular rows; interstriae at least twice as wide as striae, surface marked by a few irregular lines, punctures slightly smaller than those of striae, each bearing on its raised anterior rim a low, transverse crenulation about equal in length to half width of an interstriae, except crenulations entirely absent on interstriae 4 and 6; basal margins straight, slightly impressed near scutellum, anterior margins subcrenulately elevated and with a few submarginal crenulations on interstriae 2 to 4; scutellum round in outline, distinctly depressed below general surface of elytra. Declivity evenly convex, rather steep; striae more strongly, narrowly impressed; interstriae feebly convex, crenulations much narrower, very slightly higher; interstriae 4, 6, and 8 entirely unarmed; interstriae 1 evidently meets costal margin, 2 meets 10, 3 meets fused 7 and 9, 4 and 6 join 5 and end before meeting fused 7 and 9; 10 bearing four or five small tubercles posteriorly; posterior costal margin with a few punctures, sinuate, not serrate; interstriae 10 subserrate on basal half of elytra, 9 on posterior half. Vestiture scanty, consisting of stout, sparse, almost scalelike interstrial setae on declivity and posterior portion of disc except on interstriae 4 and 6, each seta equal in length to about half distance between rows of setae.

Fifth abdominal sternum bearing a low transverse ridge near middle of segment.

FEMALE.— Similar in all respects to male.

DISTRIBUTION.— Puebla.

MEXICO: **Puebla**: 9 miles (15 km) NW Acatlán, 13-VII-53, and 17 km NW Acatlán 15-VI-67, 1700 m, No. 36, "Leche Sillo," S. L. Wood.

BIOLOGY.— This species was taken in series with *recavus* Wood from branches of a small tree identified by a local farmer as "Leche Sillo." The parental galleries were biramous and transverse.

NOTES.— The above treatment was based on 34 specimens including the type series.

### 20. *Cnemonyx liratus* (Wood)

*Loganius liratus* Wood, 1961, Great Basin Nat. 21:92 (Holotype, female; 20 km E Matamoros, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is very closely related to *gracilens* Wood and *exilis* (Wood), but it is distinguished by characters summarized in the above key.

MALE.— Length 1.3–1.5 mm, 2.5 times as long as wide; body color dark reddish brown.

Frons convex above, transversely impressed on lower half, with a rather high, narrow, rounded, transverse carina occupying median half, rising abruptly below, sloping gradually above; epistoma with median portion produced in front of mandibles; surface reticulate-granulate, moderately punctured at sides and above; vestiture consisting of a conspicuous brush of short erect yellow hair on median half between carina and a point just below upper level of eyes, epistomal brush emerging from lower margin of smooth, shining, glabrous carina. Eyes and antenna as in *prociduus* (Wood.)

Pronotum equal in length and width; widest on basal third, sides arcuately converging to moderate transverse constriction just behind broadly rounded anterior margin; almost smooth and subshining posteriorly, punctures moderately coarse and deep, rather close, oval. Glabrous.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides straight and subparallel on basal two-thirds, rather narrowly rounded behind; sutural striae weakly, others not at all impressed; interstriae more than twice as wide as striae, punctures very fine, subgranulate, sparse, surface smooth, subshining; basal margins rounded, raised and subcrenulate, with a few small submarginal crenulations on interstriae 2 to 5; scutellum slightly depressed, almost round in outline. Declivity evenly convex; moderately steep; striae weakly impressed, odd-numbered interstriae more nearly convex; interstriae dull, 1, 2, 3, 5, 7, 9, and costal margin each bearing a row of fine, rather widely spaced tubercles, those on 7, 9, and costal margin larger, 5 devoid of tubercles on lower two-thirds; interstriae 1 joins raised costal margin, 2, 3, and 5 separately join fused 7 and 9, 10 virtually obsolete in declivital region. Vestiture sparse, inconspicuous, confined to declivity, except extending onto disc on odd-numbered interstriae; each seta fine, blunt, bristlelike, about half as long as space between rows, separated by three to four times their length from nearest bristle in same row.

FEMALE.— Similar to male in all respects.

DISTRIBUTION.— Puebla.

MEXICO: **Puebla**: 12 miles (20 km) SE Matamoros, 3-VII-53, S. L. Wood.

BIOLOGY.— Specimens were collected from the phloem tissues of branches 1–5 cm in diameter in a tree having reddish peeling bark (Euphorbiaceae).

NOTES.— The above treatment was based on 43 specimens including the type series.

### 21. *Cnemonyx gracilens* Wood

*Cnemonyx gracilens* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):10 (Holotype, male; 57 km SE El Cameron, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is very closely related to *exilis* (Wood), but it may be distinguished by the smaller size, by the more broadly impressed frons with the epistomal carina higher, by the less numerous, more nearly oval pronotal punctures, and by the shorter, finer, less strongly flattened elytral setae.

MALE.— Length 1.2–1.4 mm, 2.6 times as long as wide; color dark brown.

Frons as in *exilis* but more broadly planoconcave, transverse epistomal carina less procurved, slightly higher, occupying at least two-thirds width of epistomal margin; pubescence perhaps a little more abundant.

Pronotum 1.09 times as long as wide; punctures distinctly less numerous than in *exilis*, each about one and one-half times as long as wide. Glabrous.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; as in *exilis* except interstrial bristles on declivity much shorter, very weakly or not at all flattened, narrower, not increasing in width apically.

FEMALE.— Similar to male except frons less strongly impressed.

DISTRIBUTION.— Oaxaca.

MEXICO: **Oaxaca**: 57 km SE El Cameron, 22-VI-67, No. 81, S. L. Wood.

NOTES.— The above treatment was based on the type series of 100 specimens. They were collected from tunnels in the phloem tissues of twigs and small branches up to 3 cm in diameter of a small tree with thin peeling bark, simple leaves, and an abundance of white, milky latex (Euphorbiaceae).

### 22. *Cnemonyx exilis* (Wood)

*Loganius exilis* Wood, 1967, Great Basin Nat. 27:119 (Holotype, male; Volcán de Agua, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is rather closely related to *liratus* (Wood), but it is distinguished by the less strongly serrate costal margins of the elytral declivity, by the more strongly elevated alternate interstriae on the elytral declivity, by the poorly developed funicular tuft of hair, and by the somewhat narrower frons.

MALE.— Length 1.3–1.6 mm, 2.7 times as long as wide; color very dark brown.

Frons flattened or very feebly concave on lower half, convex above; surface rather coarsely, closely, deeply punctured in impressed area, more sparsely punctured above; median third of epistomal margin bearing a shining, elevated, procurved carina as in *liratus*; vestiture limited to impressed area, consisting of abundant, erect, stout, uniformly rather short setae.

Pronotum equal in length and width; widest near base, sides weakly arcuate and converging slightly toward rather narrowly rounded anterior margin; surface smooth, shining, punctures rather large, deep, moderately close, oval. Glabrous.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; sides straight and parallel on basal two-thirds, narrowly, subserrately rounded behind; striae weakly impressed, punctures moderately large, deep; interstriae shining, slightly wider than striae, very weakly convex, punctures uniseriate, rather small, widely spaced. Declivity rather steep, convex; striae narrower than on disc; interstriae subshining, 1, 3, 7, and 9 moderately elevated, 7 joins 9 and continues almost to 3, elevated interstriae and 2 (somewhat less) uniseriately granulate, granules moderately large, rounded, rather widely spaced; costal margin subserrate toward apex. Vestiture restricted to declivity, sparse; consisting of rows of erect, interstrial scales, each scale about five times as long as wide.

FEMALE.— Similar to male except frons less strongly impressed below, more broadly rounded above.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán de Agua, 19-V-64, 1000 m, No. 592, S. L. Wood.

BIOLOGY.— This species attacked branches and small trees 5–10 cm in diameter. Parental galleries were transverse. The host tree is a Euphorbiaceae very similar to the one described above for *gracilens*.

NOTES.— The above treatment was based on the type series of 83 specimens.

### *Cnemonyx longicollis* (Blandford)

*Loganius longicollis* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):128 (Holotype, female; "Mexico," tobacco refuse; British Mus. Nat. Hist.)

This species was among several species described by Blandford from material intercepted at Paris in tobacco crates that supposedly came from Mexico. It is definitely established above that one of these, *Cnemonyx errans* (Blandford), came from Brazil, not from Mexico as reported. The female holotype of *longicollis* (Blandford) is very elongate and has several characters not seen in any Central or North American species, but it is very closely related to *difformis* (Schedl), from Brazil. It should be removed from the Mexican fauna until proof of its existence there is found.

FEMALE (Holotype)— Length 2.4 mm, 2.4 times as long as wide; color dark reddish brown. In the above key it goes to couplet No. 5, but it does not fit either of the alternate statements. Whether or not it has been redescribed from Brazil under another name has not been determined.

## GENUS *CAMPTOCERUS* LATREILLE

*Camptocerus* Latreille, 1829, Regne Animale, ed. II, 5:91 (Type-species: *Hylesinus aeneipennis* Fabricius, monobasic)

DIAGNOSIS.— This genus is very closely related to certain species of *Cnemonyx* Eichhoff, but it is distinguished by the large, broad (1.5 or more times as wide as long) scutellum that is not depressed, not are the elytral bases noticeably depressed or notched for its reception; by the antennal club with suture 1 marked only internally by a septum; by the extensively excavated male frons; by the ambrosial habit; by the larger size; and by other characters noted in the key.

DESCRIPTION.— Length 2.7–8.5 mm, 1.9–2.0 times as long as wide. Color dark brown to black, a metallic sheen on one

species; some species, particularly males, ornamented by variegated patterns formed by erect scales.

Frons broadly, deeply excavated in male from vertex to epistoma and ornamented by hair; convex in female and inconspicuously, finely pubescent. Antennal funicle 7-segmented; club flattened, somewhat asymmetrical in outline, suture 1 indicated internally by a partial septum, surface very finely, closely pubescent. Pronotum large, broad, unarmed, actually or apparently wider than elytra, lateral margins acutely marked by a fine, raised line. Scutellum flush with elytral surface, moderately large, very broad. Elytral bases acutely marked by a fine, continuous, raised line, not emarginate toward scutellum; declivity gradual, unarmed except in one species. Abdomen ascending rather strongly to meet elytra at apex. All tibiae with lateral margins unarmed except for large curved spine on outer apical angle.

DISTRIBUTION.— The Neotropical realm; 17 species have been named from Central and South America; 5 of them occur in Central America.

BIOLOGY.— All species are ambrosia beetles. Several species construct a transverse, biramous tunnel in the cambium region. Near the center of this tunnel, but not below the entrance tunnel, a radial tunnel is constructed that penetrates deeply into the wood. This inner tunnel normally branches into two to four tunnels along which eggs are deposited in niches. The larvae expand these into short, broad, larval cradles where pupation occurs. The walls of the tunnels are stained black by a conspicuous fungal growth.

Key to the Species of *Camptocerus*

1. Discal interstriae 1 and 2 each ending in a large tooth at a point about one-third of elytral length from base, bases of these teeth join to form a fold overhanging base of declivity; Panama; 3.1 mm ..... 1. ***quadridens*** **Blackman**

— Elytra unarmed by conspicuous spines ..... 2

2(1). Elytra glabrous, usually brightly shining, fully mature specimens, usually with a metallic sheen; posterolateral angles of pronotum acute as seen from lateral aspect; male frons broadly, deeply excavated and uniformly pubescent above antennal insertions, lateral margins strongly elevated below antennal insertions; Costa Rica to Brazil and Bolivia; *Protium*; 4.5–6.4 mm ..... 2. ***aeneipennis*** **(Fabricius)**

— Elytra bearing at least a few lateral or declivital scales; posterolateral angles of pronotum obtuse as seen from lateral aspect ..... 3

3(2). Pronotum closely, very finely punctured, interspaces about three times as wide as punctures; punctures of elytral interstriae sparse, uniseriate; Costa Rica; 2.7–3.2 mm ..... 3. ***infidelis*** **Wood**

— Pronotum densely, finely punctured, interspaces about equal in width to diameter of a puncture; punctures of elytral interstriae rather numerous, confused ..... 4

4(3). Smaller species; male epistoma unarmed; setae on male declivity of shorter, blunt scales, similar to female; Costa Rica to Brazil; *Protium*; 2.6–3.5 mm ..... 4. ***niger*** **(Fabricius)**

— Larger species; male epistoma with a conspicuous median tubercle and just dorsad from tubercle a low, slightly procurved, transverse carina; setae on lower half of male declivity long, slender, pointed; Nicaragua to Venezuela; *Rheedia*, *Protium*, etc.; 3.3–4.0 mm ..... 5. ***auricomus*** **Blandford**

### 1. *Camptocerus quadridens* Blackman

Fig. 113

*Camptocerus quadridens* Blackman, 1943, Proc. U.S. Nat. Mus. 94(3174):379 (Holotype, male; Cooper's, near source of Río Aejeta, Canal Zone, Panama; U.S. Nat. Mus., 56556)

DIAGNOSIS.— The male is distinguished by the large, conspicuous spines on the basal half of the elytra and by other characters

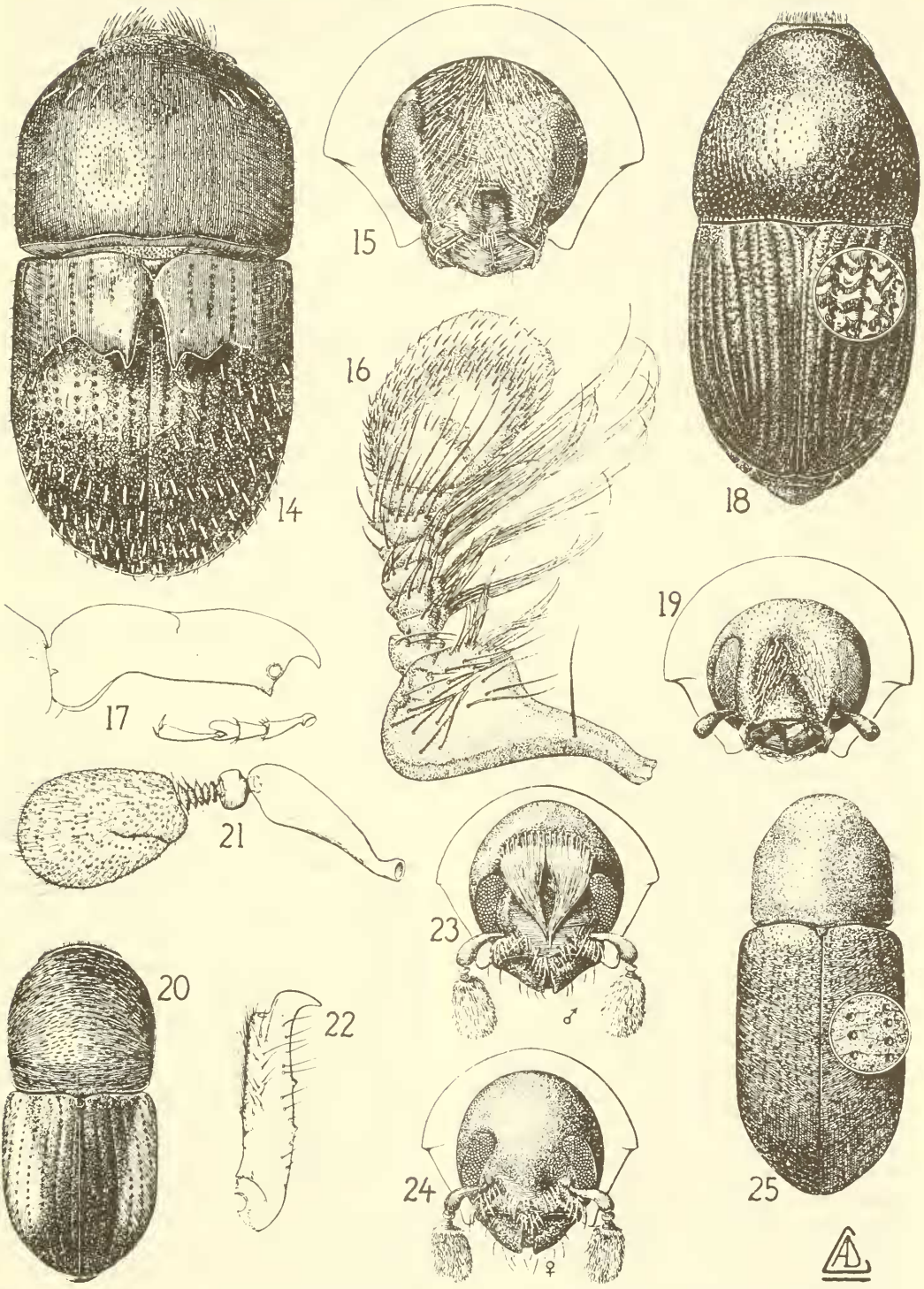



Fig. 113. Scolytini spp.: *Camptocerus quadridens,* male; 14, Adult; 15, head; 16, antenna; 17, protibia; *Cnemonyx boliviae,* male, 18, adult, 19, head; *Scolytodes swieteniae,* 20, adult, 21, antenna, 22, protibia, 23, female head, 24, male head; *Scolytodes levis;* 25, adult. (After Blackman 1943:pl. 16.)

described below. The only species that is even remotely related is *costatus* Chapuis.

MALE.— Length 3.1–3.4 mm, 1.9 times as long as wide; color dark reddish brown.

Frons broadly concave from eye to eye from level of antennal insertion to vertex, a rather strongly, acutely elevated transverse carina on median fourth at level of antennal insertion; concave area reticulate, rather coarsely, uniformly punctured, interspaces about equal to diameter of a puncture. Antenna about as in *costatus*.

Pronotum 0.88 times as long as wide; sides almost straight and converging anteriorly very slightly on more than basal half, base weakly bisinuate, anterior margin broadly rounded; basal and lateral margins with a fine, raised line; surface smooth, shining, obscurely reticulate in some areas; punctures very fine, distinct. Glabrous except near margins.

Elytra 1.1 times as long as wide, 1.2 times as long as pronotum; disc limited to basal one-fourth of elytra at suture, increasing to slightly more than basal half at lateral margins; discal surface almost smooth, subshining, striae from about 3 to 10 obscurely indicated by fine punctures, some finer interstrial punctures, mostly in rows, also indicated. Declivity beginning on basal fourth, its margin armed on interstriae 1 by a very coarse, pointed spine directed caudad on plane with disc; base of declivity below these spines abruptly, strongly impressed, basal margin more gradually rounded from striae 3 to 7, basal margin continuous with interstriae 7; strial punctures moderately coarse, distinct, very shallow; interstriae smooth, shining; interstrial punctures rather widely spaced, most at least slightly tuberculate on anterior margins; subapical margin rather acutely costate near suture. Vestiture consisting of rows of interstrial setae on declivity; setae near base in median area equal in length to up to three times distance between rows, very slender, gradually decreasing in length and increasing in width posteriorly to about one-fourth maximum length, almost scalelike near apex.

DISTRIBUTION.— Panama.

PANAMA: Cooper's near source of Río Aejeta, Canal Zone, 19-VIII-23, No. 2198, from felled tree, J. Zetek; Cerro Jefe (9° 12′ N, 79° 21′ W), Stockwell.

NOTES.— The holotype and one other male were examined. Zetek took specimens of *aeneipennis* (Fabricius) at the same locality and on the same date that he took the holotype of this species. Because the only known host of several species of *Camptocerus*, including *aeneipennis*, is *Protium*, it is possible that the holotype of *quadridens* came from this host.

### 2. *Camptocerus aeneipennis* (Fabricius)

*Hylesinus aeneipennis* Fabricius, 1801, Systema Eleutheratorum 2:392 (Lectotype, male; Essequibo, British Guiana, Copenhagen Mus., present designation)

*Hylesinus gibbus* Fabricius, 1801. Systema, Eleutheratorum 2:392 (Holotype, female, Essequibo, British Guiana; Copenhagen Mus.); Wood, 1972, Bull. Ent. Res. 62:24. *Synonymy*

DIAGNOSIS.— This distinctive species may be recognized by the submetallic sheen, by the glabrous pronotum and elytra, by the larger size, and by other characters mentioned in the above key.

MALE.— Length 4.5–6.4 mm, 1.8 times as long as wide; color black, elytra with a distinct metallic sheen.

Frons deeply concave from eye to eye from vertex to epistoma, floor of concavity in upper area ascending orad at level of antennal insertion and continuing as a broad trough to epistomal margin; lateral margins subacute from eye to level of antennal insertion then acutely elevated to epistomal margin; surface smooth, minutely punctured; vestiture of abundant, yellow, moderately long hair in upper three-fourths, a few sparse, short, recumbent hairs in troughlike portion. Antennal club 1.4 times as long as wide, devoid of sutures, surface finely pubescent; funicular fringe well developed.

Pronotum 0.8 times as long as wide; widest at base, sides almost straight, converging very slightly on posterior half then abruptly narrowed to distinct lateral constriction just before broadly rounded anterior margin; surface smooth, often wrinkled in posteromedian area, punctures very small, sparse, obscure on disc, larger, more distinct and closer in lateral areas. Glabrous.

Elytra 1.2 times as long as wide, 1.6 times as long as pronotum; sides widest at base, almost straight but converging posteriorly on

basal half, narrowly rounded behind; scutellum twice as wide as long, flat; basal margins with a distinct, elevated line; striae not impressed, punctures fine, close, shallow; interstriae flat, smooth, shining, about six times as wide as striae, punctures minute, close, confused. Declivity gradual, convex; interstrial punctures largely uniseriate. Apparently glabrous; actually, most interstrial punctures bear a very minute hair.

FEMALE.— Similar to male except frons weakly convex, with a very indistinct median carina, surface reticulate, with moderately abundant, short, frontal hair; flagellar fringe absent; pronotal disc smooth, shining.

DISTRIBUTION.— Costa Rica to Brazil and Bolivia.

COSTA RICA: Peralta, Cartago, 10-III-64, 500 m, No. 465, S. L. Wood; Hamburgfarm on Río Reventazon, Limon, 10-VI-23, F. Nevermann. PANAMA: Río Aejeta, Canal Zone, 19-VIII-28, R. Zetek.

HOST.— *Protium* spp.

BIOLOGY.— Limbs and boles larger than 5 cm in diameter are attacked on cut or injured trees. In Costa Rica the male excavated a transverse, biramous tunnel just below the surface of the wood, about 3 cm in length. From this gallery, but not directly below the entrance hole, a radial tunnel is made extending the gallery directly into the xylem, usually about 3 to 6 cm below the cambium. This inner tunnel normally divides into two to four branches, along which egg niches are constructed at about 3 mm intervals. There are two rows of niches above and one row below the egg gallery. The larvae enlarge the niches into cradles as they grow and later use them as pupation chambers, each completed chamber measuring about 3 by 5 mm. All gallery surfaces are stained black by an ambrosial fungus that evidently served as the principal source of food. In most samples observed in Venezuela the transverse tunnel in the cambium area was omitted and the entrance hole led directly into the xylem.

NOTES.— The above treatment was based on seven syntypes of *aeneipennis*, on the holotype of *gibbus*, on 45 Central American specimens, and on more than a thousand South American specimens. A male syntype from Essiquibo is here designated as lectotype of *aeneipennis*.

### 3. *Camptocerus infidelis* Wood

*Camptocerus infidelis* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):11 (Holotype, female; Peralta, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This small and distinctive species may be recognized by characters summarized in the above key.

FEMALE.— Length 2.7–3.2 mm, 2.0 times as long as wide; color black.

Frons rather strongly convex above, more nearly flattened below, with a distinct, transverse impression just above epistomal margin; surface rather coarsely reticulate and with rather abundant, shallow, indefinite punctures; vestiture sparse, inconspicuous. Antenna essentially as in *auricomus* Blandford.

Pronotum 0.98 times as long as wide; widest near base, sides rather weakly arcuate, converging slightly to rather strongly rounded anterior angles, broadly rounded in front; surface minutely reticulate and dull on anterior half, almost smooth and subshining behind; punctures minute, sharply impressed, separated by distances equal to two or more diameters of a puncture. Glabrous.

Elytra 1.2 times as long as wide, 1.3 times as long as pronotum; widest at base, sides converging posteriorly to narrow, subemarginate posterior margin; striae not impressed, punctures small, shallow, rather widely spaced; interstriae twice as wide as striae, shining, somewhat irregular, very sparsely punctured, shallow punctures almost as large as those of striae. Declivity gradual, convex; striae weakly impressed. Vestiture consisting of very sparse interstrial scales on sides and declivity.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Peralta, Cartago, 10-III-64, 500 m, No. 463, S. L. Wood.

BIOLOGY.— Two adult females and several larvae were removed from the same 15 cm longitudinal pith tunnel in a broken tree seedling 1 cm in diameter. The larval cradles were made on the upper and lower surfaces at an oblique angle to the egg gallery.

NOTES.— The above treatment was based on the type series of two females.

### 4. *Camptocerus niger* (Fabricius)

*Hylesinus niger* Fabricius, 1801, Systema Eleutheratorum 2:393 (Lectotype, male; America meridionali, actually Essequibo, British Guiana; Copenhagen Mus., present designation)

*Camptocerus squamiger* Chapuis, 1869, Synopsis des Scolytides, p. 51 (Syntypes, a male and a female, Cayenne; Brussels Mus.); Eggers, 1934, Ent. Nachrbl. 8:27. *Synonymy*

*Camptocerus striatulus* Hagedorn, 1904, Bull. Mus. Paris 10:547 (Syntypes; French Guyana; Paris Mus.); Eggers, 1933, Ent. Nachrbl. 7:20. *Synonymy*

DIAGNOSIS.— This species is distinguished from *auricomus* Blandford by the smaller size and by characters of the male frons described below.

MALE.— Length 2.6–3.5 mm, 1.8 times as long as wide; color dark brown, vestiture pale.

Frons as in *auricomus* except smooth, devoid of tubercle and carina.

Pronotum and elytra as in *auricomus* except vestiture usually uniformly pale and setae on lower half of declivity only slightly more slender than those on disc.

FEMALE.— Similar to female *auricomus* except interstrial punctures usually more distinctly, more extensively impressed, with their anterior margins finely granulate.

DISTRIBUTION.— Costa Rica to Brazil.

COSTA RICA: Hamburgfarm on Río Reventazon, Limón, 24-II-37, in trockenem holz, F. Nevermann. OTHER COUNTRIES: Brazil, Colombia, French Guiana, Peru.

HOST.— *Protium* sp.

NOTES.— Three female syntypes from the Copenhagen Collection and one female and one male syntype from the Kiel Collection, now at Copenhagen, were examined. The male is here designated as the lectotype of *Hylesinus niger* Fabricius. Four Dejean specimens of *squamiger* Chapius are now in the Chapius collection; of these, two are labeled "Amer. mer." and two are labeled Cayenne. The latter two, a male and a female, are considered to be syntypes. All four specimens are of *niger*.

Schedl (1940:205) reported this species from Costa Rica, although I have not seen Central American specimens. The above treatment was based on the five syntypes of *niger*, on the four Chapius specimens of *squamiger*, and on 20 other South American specimens.

### 5. *Camptocerus auricomus* Blandford

*Camptocerus auricomus* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):125 (Syntypes; Chontales, Nicaragua, Bugaba, and Volcán de Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished by the feebly elevated, procurved, transverse, male, frontal carina at the level of the antennal insertion, with a conspicuous, median, epistomal tubercle in the male, by the distinctive frontal vestiture in the male, and by other characters summarized in the above key.

MALE.— Length 3.3–4.0 mm, 1.8 times as long as wide; color dark brown, with abundant, erect scales in a variegated pattern, sparse scales and no pattern in female.

Frons moderately concave from eye to eye, from vertex to level of antennal insertion, ascending orad to a weakly elevated, procurved, transverse carina (precipitous on ventral side only), then flat to epistomal margin; epistomal margin armed by a rather large, rounded, median tubercle; surface of concavity smooth, dull, finely punctured, vestiture of long yellow hair in patches on either side of median line, much longer above, tips of none of hair reaching level of antennal insertion. Antennal club 1.2 times as long as wide; lateral half of suture 1 clearly indicated, septate; funicular fringe well developed.

Pronotum 0.83 times as long as wide; widest near base, sides arcuate, converging very little anteriorly on basal two-thirds, lateral margins slightly constricted just before broadly rounded anterior margin; surface dull, very closely, deeply, finely punctured, interspaces equal to less than diameter of a puncture; vestiture of fine, abundant short hair, and a few longer, coarse bristles on anterior third.

Elytra 1.1 times as long as wide; widest at base, sides almost straight on basal half, conspicuously converging posteriorly, narrowly rounded behind; scutellum twice as wide as long, flat; basal margins indistinctly marked by a raised line; striae not impressed, punctures small, distinct, close; interstriae about six times as wide as striae, flat, shining, punctures rather fine, dense, confused to indistinctly three-ranked, squamiferous. Declivity convex, moderately steep; strial punctures larger, deeper; interstriae less than twice as wide as striae. Vestiture of abundant erect interstrial scales, each about six times as long as wide, except bristlelike and sharply pointed on lower half of declivity.

FEMALE.— Similar to male except frons convex, devoid of carina, tubercle, and ornamental vestiture; funicular tuft absent; pronotum shining, usually glabrous; elytral scales unicolorous, fewer in number, fragile, usually abraded on basal half, not modified on lower half of declivity.

DISTRIBUTION.— Nicaragua to Venezuela.

NICARAGUA: Chontales, Belt. COSTA RICA: Peralta, Cartago, 10-III-64, 500 m, No. 465, probably *Protium*, S. L. Wood; Río Damitas, Dota Mts., San José, 18-II-64, 200 m, No. 435, *Rheedia edulis*, S. L. Wood; Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 81, S. L. Wood; Guápiles, Limón, 22-VI-66, 100 m, S. L. Wood. PANAMA: Bugaba and Volcán de Chiriquí, Chiriquí, G. C. Champion; Madden Forest, Canal Zone, 70 m, No. 367, S. L. Wood. OTHER COUNTRIES: Venezuela.

HOST.— *Reedia edulis*, and presumably *Cedrela* sp. and *Protium* sp.

BIOLOGY.— The galleries of this species are basically similar to those of *aeneipennis*. The transverse tunnel was in the cambium region, although as short as 1 cm at times. More than two branches of the brood tunnel were not observed; and there was only one rank of larval cradles above and one below the egg gallery.

NOTES.— The above treatment was based on the Blandford series at the British Museum (Natural History), including the syntypes, and on 71 other Central American specimens.

## GENUS *SCOLYTOPSIS* BLANDFORD

*Scolytopsis* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):123 (Type-species: *Scolytopsis puncticollis* Blandford, monobasic)

DIAGNOSIS.— This genus is very similar to *Scolytus* Geoffroy, but it may be distinguished by the conspicuously expanded metepisternum that fits into a broadly excised notch on the humeral margin of the elytra, and by the abdomen that ascends abruptly from the posterior margin of sternum 2.

DESCRIPTION.— Length 2.0–3.1 mm, 2.2 times as long as wide; color dark brown.

Frons broadly convex, punctured in female, in male broadly, subconcavely flattened from upper level of eyes to well back on vertex, lower area evidently evenly convex, central area above and below impunctate, smooth, brightly shining, lateral areas bearing a dense brush of long hair, some setae exceed epistomal margin and conceal most of central area above. Antennal club with suture 1 strongly procurved, represented only by remnants of a septum; funicle 7-segmented; scape much shorter than funicle. Pronotum large, unarmed, lateral margins acutely marked by a raised line. Elytral bases narrowly, strongly impressed along suture on basal fifth; scutellum reduced, pointed, elytral bases evidently notched for its reception; declivity very gradual, descending to meet strongly ascending abdomen. Abdomen ascending posterior to hind margin of sternum 2. Tibiae as in *Scolytus*; tarsi with segment 3 broad, emarginate.

DISTRIBUTION.— Mexico and Cuba to Argentina; seven species have been named.

BIOLOGY.— These species infest the inner bark, where they construct biramous parental galleries and rather long larval tunnels in patterns very similar to those of *Scolytus*.

### Key to the Species of *Scolytopsis*

1. Striae weakly, interstriae not at all impressed; elytral surface reticulate-granulate on more than posterior half; female frons strongly convex, devoid of a carina, pubescence short, sparse; Veracruz and Cuba to Argentina; 2.0–2.5 mm ..... 1. ***puncticollis* Blandford**

— Striae and interstriae narrowly impressed at least on declivity; elytral surface brightly shining except near apical margin; female frons rather strongly, transversely impressed on lower half, a median carina from upper level of eyes to epistoma, vestiture long, fine, moderately abundant; Oaxaca; 2.5–3.1 mm ..... 2. ***laticollis* Wood**

### 1. *Scolytopsis puncticollis* Blandford

Fig. 114

*Scolytopsis puncticollis* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):123 (Syntypes; Torola, Las Mercedes, Zapote, and Río María Linda, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species may be distinguished by characters summarized in the above key.

FEMALE.— Length 2.0–2.5 mm, 2.2 times as long as wide; color dark brown.

Frons strongly convex, moderately, transversely impressed above epistoma except for a median callus; epistoma weakly elevated, smooth, shining; surface rather coarsely, closely punctured, most punctures longitudinally strigose; vestiture of very short, stout bristles on lower half, a pair of small, longer tufts of hair on epistoma. Antennal club 1.3 times as long as wide, minutely, closely pubescent; sutures not evident except for remnants of a septum on suture 1.

Pronotum 0.96 times as long as wide; large, widest near base, sides weakly arcuate, not converging on basal two-thirds, rather broadly rounded in front; surface shining, with many minute, impressed points, punctures moderately large on disc, widely spaced, coarse in lateral areas and closer, some reticulation laterally. Glabrous.

Elytra 1.4 times as long as wide, 1.4 times as long as pronotum; slightly narrower than pronotum; sides conspicuously constricted on anterior third, rather broadly rounded behind; elytral bases not distinctly margined; sutural line narrowly, deeply impressed on basal third of elytral length; scutellum greatly reduced, angulate; striae feebly impressed, punctures coarse, deep, moderately coarse; interstriae slightly wider than striae, punctures almost as coarse as those of striae, deep, close; surface dull, reticulate-granulate on about basal three-fourths (variable). Declivity gradual, descending only slightly more than in *Scolytus*. Vestiture consisting of interstrial rows of moderately long, slender scales.

MALE.— Similar to female in all respects except frons as above in generic description.

DISTRIBUTION.— Veracruz and Cuba to Argentina.

MEXICO: Veracruz: Malinga, 12-III-80, *Laguncularia racemosa*, T. H. Atkinson. GUATEMALA: El Zapote, Río María Linda, and Torola, Esquintla; Las Mercedes, Quezaltenango; all by G. C. Champion. COSTA RICA: Cañas, Guanacaste, 13-VII-66, 50 m, No. 27, Malpighiaceae vine, S. L. Wood.

HOST.— Malpighiaceae, probably *Bauisteria cornifolia* and *Laguncularia racemosa*.

BIOLOGY.— This species attacked a recently cut woody vine (liana) 8 cm in diameter. The transverse, biramous, parental tunnels included a very large nuptial chamber. Each egg gallery was about 2–3 cm long; the longitudinal larval mines were usually straight, but some reversed their direction to end near the parent gallery. The mines scored both bark and wood.

NOTES.— The above treatment was based on the Blandford series in the British Museum (Natural History), one specimen from Costa Rica, three from Cuba, several from Veracruz, and four from Argentina.

Four specimens, identified as *S. argentinensis* Eggers, from Argentina, were compared to the type series of *puncticollis* and to a series from Cuba. This material suggests that the degree of elytral granulation has no taxonomic significance in this genus. Although additional material from other localities should be examined before synonymy is recognized, it is probable that *argentinensis* Eggers and *cubensis* Wood are no more than indistinct geographical races of Blandford's species.

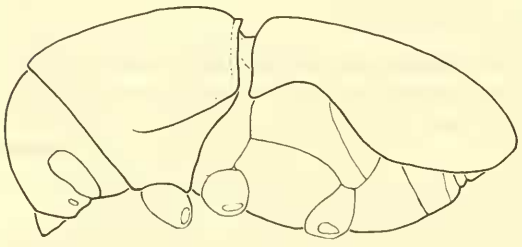


Fig. 114. *Scolytopsis puncticollis*, outline of female. Note the emarginate costal margin of the elytra.

### 2. *Scolytopsis laticollis* Wood

*Scolytopsis laticollis* Wood, 1968, Great Basin Nat. 28:14 (Holotype, female; 31 km SE Cameron, Oaxaca; Mexico; Wood Coll.)

DIAGNOSIS.— This species is allied to *puncticollis* Blandford, but it is distinguished by the much smaller lateral punctures on the pronotum, by the narrowly, deeply impressed declivital interstriae, and, in the female, by

the more nearly flattened, much more pubescent frons, with a more prominent median carina.

FEMALE.— Length 2.5–3.1 mm, 2.2 times as long as wide; color dark brown.

Frons broadly convex on upper two-thirds, transversely impressed below, epistomal margin rather abruptly elevated, shining; a narrow, rather strongly elevated median carina extending from upper level of eyes to epistomal elevation; surface coarsely, closely, deeply punctured; vestiture consisting of fine, rather long, moderately abundant, hairlike setae on a subtriangular area from epistoma to upper end of carina.

Pronotum 0.90 times as long as wide; widest just behind middle, sides rather strongly arcuate, converging somewhat on anterior half to the rather broadly rounded anterior margin; surface smooth and shining, with moderately abundant minute points and rather widely spaced, oval punctures of moderately large size, punctures spaced on disc by about one to two times their own diameter except on median line, in lateral areas punctures distinctly less than twice as large as on disc, surface very obscurely reticulate. Glabrous.

Elytra 1.4 times as long as wide, 1.4 times as long as pronotum, slightly narrower than pronotum; sides moderately constricted one-fourth pronotum length from base, then arcuate and converging on posterior half to broadly rounded posterior margin; striae narrowly, rather deeply impressed from just behind base to just before apex, punctures rather small, distinct; interstriae at least twice as wide as striae, with punctures as large, deep, and close as those of striae, middle third of each interstriae not impressed on basal fourth of elytra, gradually impressed with increasing depth posteriorly until equal to striae on posterior fourth; general surface shining, with moderately numerous minute points; apical margin elevated, subserrate. Vestiture consisting of stout, short, interstrial setae, becoming almost hairlike on posterior fourth.

MALE.— Similar to female except frons modified as in males of related species but with longer setae; setae of elytral declivity more nearly scalelike.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 31 km SE Cameron, 21-VI-67, No. 79, S. L. Wood.

BIOLOGY.— This species infested logs and cut limbs of at least three very different host species in a disturbed area in a stone quarry. The biramous, transverse parental galleries and longitudinal larval mines were as in the genus *Scolytus*; both larval and adult mines scored the wood lightly. One of the host species resembled *Plumeria*.

NOTES.— The above treatment was based on the type series of 15 specimens. All were dead specimens recovered from old, dry bark.

## GENUS *SCOLYTUS* GEOFFROY

*Scolytus* Geoffroy, 1762, Histoire abrégée des insects . . . 1:309 (Type-species: *Bostrichus scolytus* Fabricius, by designation under the plenary powers)

*Ekkoptogaster* Herbst, 1793, Natursystem aller bekanten in- und auslandischen Insekten, Käfer 5:124 (Type-species: *Bostrichus scolytus* Fabricuis, designated by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:121)

*Coptogaster* Illiger, 1807, Mag. Insekenk. 6:321 (Type-species: *Bostrichus scolytus* Fabricuis, designated by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:118)

*Eccoptogaster* Gyllenhal, 1813, Insecta Svecica descripta Coleopt. 1(3):346 (An isotypical emendation of *Ekkoptogaster* Herbst.)

*Scolytochelus* Reitter, 1913, Wiener Ent. Zeit. 32(Beiheft):23 (Type-species: *Ips multistriatus* Marsham, present designation); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:4. *Synonymy*

*Ruguloscolytus* Butovitsch, 1929, Stettiner Ent. Zeit. 90:20 (Type-species: *Bostrichus rugulosus* Müller, present designation). *New synonymy*

DIAGNOSIS.— This genus is distinguished from *Scolytopsis* Blandford by the normal metepisternum, with the costal margin of the elytra entire, and by the abdomen ascending from the posterior margin of sternum 1. It is distinguished from *Cnemonyx* Eichhoff by the antennal club that has only one or no sutures and by the depressed basal area of the elytra next to the scutellum.

DESCRIPTION.— Length 1.5–5.2 mm, 2.0–2.4 times as long as wide; color dark reddish brown to almost black.

Frons usually sexually dimorphic, male usually less strongly convex or variously impressed, often pubescent, female more strongly convex, rarely with impressed areas, usually less conspicuously pubescent. Eye elongate, sinuate to shallowly emarginate; finely faceted. Antennal scape short; funicle 7-segmented; club rather large, oval to

obovate, usually minutely pubescent, either devoid of sutures or with suture 1 partly or completely septate and with or without a surface groove. Pronotum large, lateral margins marked by a raised line. Scutellum large, depressed, its apex subacute. Elytra depressed toward scutellum, feebly declivous behind; striate. Anterior coxae rather narrowly separated. Abdomen ascending from posterior margin of sternum 1 to meet apex of elytra, sternum 2 usually ascending abruptly, often impressed, armed, or both; sexually dimorphic in most species.

DISTRIBUTION.— Most of the northern hemisphere and South America; more than 100 nominate species are known; 28 species occur in North and Central America.

BIOLOGY.— The species are phloeophagous in both coniferous and broadleafed trees. All temperate species are monogamous; some of the tropical species are bigamous. The entrance tunnel of the (usually) biramous gallery system is formed by the female. The parental gallery system engraves the wood moderately to deeply; it may be parallel, diagonal, or transverse to the grain of the wood. The larval mines wander aimlessly away from the parental tunnels in many species; in others they form a very definite pattern, usually engraving the wood rather deeply near their ends. Most species pupate in the cambium area; a few pupate 1–2 cm below the surface of the wood. Those species inhabiting the cooler regions produce one generation each year; evidently those in warmer climates may produce two or more generations annually.

NOTES.— The larger European elm bark beetle, *scolytus* (Fabricius) has been intercepted in the United States on numerous occasions and has been successfully reared in native elm bolts; however, no successful introductions of this species are known. It is included below to avoid possible confusion with other species in the event that it does become established.

Key to the Species of *Scolytus*

1. Suture between abdominal sterna 1 and 2 clearly visible, at least in lateral areas; suture 1 on antennal club strongly angulate, marked by a clearly visible external groove; temperate species, including all species north of Mexico and those from coniferous hosts in Mexico ..... 2

— Suture between abdominal sterna 1 and 2 entirely obsolete; antennal club without external evidence of a suture, a shining line indicated in one species; tropical species, never in coniferous hosts ..... 23

2(1). Abdominal sternum 2 oblique to subvertical, never armed; sternum 5 with subapical, transverse ridge absent in male, rather weakly developed in female; elytral disc conspicuously pubescent in two species; in broadleafed hosts ..... 3

— Abdominal sternum 2 vertical to concave, this or other sterna frequently armed by conspicuous spines; sternum 5 with a strongly elevated, transverse, subapical ridge (except male *quadrispinosus*); elytral disc always glabrous ..... 6

3(2). Profile of abdominal sternum 2 convex; disc of pronotum with punctures coarse, close; strial and interstrial punctures in rows, equally coarse; elytral setae in rows extending to base, each seta about equal in length to distance between rows; S Canada to N Mexico; *Malus*, *Pyrus*, *Prunus*; 1.5–2.7 mm ..... 1. ***rugulosus*** **(Müller)**

— Profile of abdominal sternum 2 flat to concave; pronotal punctures on disc smaller; larger species ..... 4

4(3). Strial and interstrial punctures moderately coarse, equal in size; elytral disc with rows of fine, very long, interstrial hair; frons rather coarsely aciculate and moderately pubescent in both sexes; North Dakota and Pennsylvania to Texas and Florida; *Celtis*; 2.8–4.2 mm ..... 2. ***muticus*** **Say**

— Strial punctures larger than those of interstriae; elytral disc glabrous ..... 5

5(4). Frons finely aciculate and glabrous in both sexes; Ohio and Ontario to Maryland; *Malus, Pyrus, Ulmus*; 3.1–4.1 mm ..... 3. ***mali*** **(Bechstein)**

— Frons rather coarsely, closely punctured, not at all aciculate, pubescent from epistoma to near vertex, vestiture shorter and rather sparse in female, rather abundant and longer in male; Illinois to Texas; *Fagus, Celtis*; 3.5–4.5 mm ..... 4. ***fagi*** **Walsh**

6(2). Antennal club broad 1.3 times as long as wide; transverse subapical ridge on sternum 5 poorly developed; male sternum 2 deeply concave, 3 armed by three coarse spines, 4 armed by one median spine, segment 5 shorter than 3 or 4, female sterna unmodified, unarmed, opaque; striae slightly impressed, punctures rather coarse, interstrial punctures very fine; Iowa and Quebec to Texas and Georgia; *Carya*; 2.9–5.0 mm ..... 5. ***quadrispinosus*** **Say**

— Antennal club more slender, at least 1.5 times as long as wide; transverse ridge on sternum 5 more strongly developed; sternum 3 never armed ..... 7

7(6). Transition from sternum 2 to 3 oblique or rounded, 2 always with a well-developed median spine in both sexes ..... 8

— Transition from sternum 2 to 3 abruptly angulate, margin often strongly produced in males, those species with male angle poorly developed lack median spine, females either with spine absent or represented by a small granule if margin not produced as in male ..... 11

8(7). Sternum 2 with base of spine touching its anterior margin; striae and interstriae equally, narrowly impressed, their punctures subequal in size; British Columbia and Nova Scotia to California and Florida; *Ulmus*; 1.9–3.1 ..... 6. ***multistriatus*** **(Marsham)**

— Base of spine remote from anterior margin of sternum 2; interstriae never impressed, punctures smaller than those of striae; in coniferous hosts ..... 9

9(8). Spine on sternum 2 at middle of segment, its base remote from posterior margin of segment; abdominal sterna more coarsely punctured; male frons flattened from eye to eye, rather coarsely aciculate-punctate (about equal to *laricis*); Alaska and Nova Scotia to California and New York; *Picea*; 2.2–2.8 ..... 7. ***piceae*** **(Swaine)**

— Base of spine on sternum 2 in contact with posterior margin of segment; abdominal sterna more finely punctured ..... 10

10(9). Frons shallowly, finely aciculate, punctures fine, male feebly convex between eyes; female spine on sternum 2 conical, male spine more slender; British Columbia and Alberta to California and New Mexico; *Pseudotsuga*; 2.0–2.4 mm ..... 8. ***unispinosus*** **LeConte**

— Frons deeply, rather coarsely aciculate-punctate, male frons flat between eyes; female spine on sternum 2 laterally compressed, male spine stouter; British Columbia and Montana to Oregon;2 .4–3.0 ..... 9. ***laricis*** **Blackman**

11(7). Male and female sternum 2 without any indication of a median spine, tubercle, or carina (some male *praeceps* with a feeble tubercule or carina) ..... 12

— Male sternum 2 with a median spine, tubercle, or carina (rather weakly developed in some species), female usually with a similar but smaller structure ..... 17

12(11). Frons granular, pubescence rather dense, fine, moderately short; abdominal sterna 3 and 4 shining, each armed by a median tubercle on posterior margin; introduced from Europe but not established; *Ulmus*; 3.5–5.2 mm ..... 10. ***scolytus*** **(Fabricius)**

— Frons aciculate or punctured or both, vestiture sparse; abdominal sterna 3 and 4 unarmed (except *dentatus*); coniferous hosts ..... 13

13(12). Angle formed at junction of sterna 1 and 2 usually obtuse, margin never projecting caudad, sternum 2 at least weakly convex; posterior apical margin of elytra sometimes with a small, abrupt emargination in line with interstriae 3; crest of transverse carinate ridge on male sternum 5 sometimes as close or closer to anterior margin than to posterior margin of segment ..... 14a

— Posterior margin of sternum 1 acutely projecting, 2 concave; apical margin of elytra entire, either smooth or minutely serrate; male sternum 5 with transverse ridge much closer to apical margin than basal margin of segment ..... 14c

14a(13). Transverse carina on male sternum 5 much more strongly elevated, particularly on median third, its crest at median line closer to anterior margin than to posterior margin of segment; posterior margin of elytra distinctly notched at a point in line with interstriae 3; largest setae on median half of abdominal sternum 1 as coarse and as long as those on metasternum; Wyoming to Durango and Nuevo León; *Pseudotsuga*; 2.2–3.5 mm (see also 11. ***virgatus*** **Bright**) ..... 12. ***reflexus*** **Blackman**

— Transverse carina on male sternum 5 more uniformly, less strongly elevated, its crest at median line closer to posterior margin than to anterior margin; elytral margin not emarginate at position of interstriae 3; setae on median half of sternum 1 much shorter and finer than longest setae on metasternum ..... 14b

14b(14a). Striae narrowly, distinctly impressed from base to declivity, punctures larger, closer, spaced by one to two diameters of a puncture; color uniformly very dark brown; odd-numbered discal interstriae almost never with setae; declivity more gradual, shorter; British Columbia to N California and E Montana; *Tsuga*; 2.2–3.5 mm ..... 14. ***tsugae*** **Swaine**

— Striae not impressed, occasionally part or all of 1 or 2 weakly impressed, punctures smaller, spaced by two to three diameters of a puncture; elytra usually of conspicuously lighter color; odd-numbered interstriae usually with a few setae; declivity more abrupt, slightly longer; British Columbia and N California to Wyoming and N Utah; *Pseudotsuga*; 2.2–3.0 mm ..... 13. ***monticolae*** **Swaine**

14c(13). Surface of abdominal sterna brightly shining; projecting margin of male sternum 1 more than twice as high as thick at median line; male frons above upper level of eyes flat to weakly convex ..... 15

— Surface of abdominal sterna dull, reticulate; height of projecting margin of male sternum 1 about equal to its thickness; male frons above eyes moderately to rather strongly convex ..... 16

15(14c). Punctures on elytra and on abdominal sterna much smaller; male frons less deeply, less closely aciculate; Nuevo León to Puebla; *Abies religiosa*; 3.0–3.7 mm ..... 15. ***hermosus*** **Wood**

— Punctures of elytra and abdominal sterna rather coarse; male frons more deeply, more closely aciculate; Utah and Colorado to Arizona and New Mexico; *Abies concolos*; 2.5–3.1 mm ..... 16. ***robustus*** **Blackman**

16(14c). Larger species; median length of sternum 2 equal to 1.2 times combined lengths of 3 and 4; male sternum 2 with surface of concave area small, irregular, its anterior margin very thick; male frons below upper level of eyes weakly convex to transversely impressed; Oregon to California; *Pseudotsuga*; 2.7–3.3 mm ..... 17. ***oregoni*** **Blackman**

— Smaller species; median length of sternum 2 equal to 1.7 times combined lengths of 3 and 4; male sternum 2 with floor of concave area flat, extensive, its anterior margin rather thin, particularly in lateral areas; male frons below upper level of eyes more strongly convex; British Columbia and Idaho to California; *Abies*; 2.0–2.7 mm ..... 18. ***praeceps*** **LeConte**

17(11). Very large species; apical margin of elytra shallowly to rather deeply emarginate at interstriae 3; posterior margin of male abdominal sternum 1 weakly produced, less than half as high as thick (male *aztecus* not seen), summit of spine at posterior margin of segment 2; abdominal surfaces brightly shining ..... 18

— Smaller species; apical margin of elytra entire, usually minutely serrate; abdominal surfaces dull, usually reticulate ..... 19

18(17). Apical margin of elytra with a weak to moderate emargination in line with interstriae 3; strial and interstrial punctures subequal in size; margin of epistomal process almost straight; elytra almost black; Puebla-Tlaxcala to Mexico; *Abies religiosa*; 3.6–4.5 mm ..... 19. ***mundus*** **Wood**

— Apical margin of elytra rather deeply emarginate at interstriea 3 and 6; strial punctures about twice as large as those of interstriae; margin of epistomal process strongly recurved; elytra reddish brown; Michoacán; *Abies religiosa*; 4.5–5.3 mm ..... 20. ***aztecus*** **Wood**

19(17). Summit of spine on male sternum 2 at or anterior to middle of segment, carina descending to posterior margin of segment; female sternum 2 with a weak median carina on posterior half present or absent but never with a tuberculate summit at posterior margin of segment (some females apparently indistinguishable from some females of *praeceps* and *obelus*); Oregon and Montana to California and Colorado; *Abies*, *Picea*, *Tsuga*; 2.0–2.6 mm ..... 21. ***opacus*** **Blackman**

— Summit of spine on male sternum 2 at posterior margin of segment ..... 20

20(19). Posterior margin of male sternum 1 weakly produced, about half as high as thick, small pointed tubercle on 2 at posterior margin; British Columbia and Montana to California and New Mexico; *Abies*, rare in other hosts; 2.5–3.8 mm ..... 22. ***ventralis*** **LeConte**

— Posterior margin of male sternum 1 strongly produced, about twice as high as thick ..... 21

21(20). Smaller species; male frons largely convex, weakly flattened on median third below upper level of eyes, vestiture sparse; epistomal process weakly developed, its lateral angles not elevated; male spine on posterior margin of sternum 2 conspicuous, sharply pointed; Nevada and Colorado to New Mexico; *Abies concolor*; 2.0–2.4 mm ..... 23. ***obelus*** **Wood**

— Larger species; male frons broadly flattened on at least lower half, flat to rather weakly convex to vertex, vestiture moderately abundant, rather long ..... 22

22(21). Male sternum 4 unarmed; female interstrial punctures with their anterior margins elevated to form a tubercle; British Columbia to California; *Abies*; 2.9–4.4 mm ..... 24. ***subscaber*** **LeConte**

— Male sternum 4 with a median spine on posterior margin, 2 and 3 with a feeble tubercle in comparable position; female interstrial punctures normal, unarmed; California; *Abies bracteata*; 3.2–3.8 mm ..... 25. ***dentatus*** **Bright**

23(1). Male frons flat or convex, without a conspicuous median elevation; abdominal sternum 2 armed or not, if armed then longitudinal basal width of process greater than its height, except male *nodatus*, which also bears a spine on sternum 4; monogamous species ..... 24

— Male frons with a conspicuous median elevation slightly below center; abdominal sternum 2 with a conspicuous subconical spine arising from its anterior half, sternum 4 never armed; bigamous species ..... 26

24(23). Male sternum 1 with posterior margin abruptly, subacutely carinate on median half, 2 unarmed; female transition from sternum 1 to 2 rounded, anterior fourth of 2 with a rounded, ovate elevation about half as high as wide, about twice as long as wide; Costa Rica to Brazil; 3.2–3.9 mm ..... 26. ***costellatus*** **Chapuis**

— Male sternum 2 armed by a process higher than wide ..... 25

25(24). Sternum 2 armed by a strongly, laterally compressed process, its basal length arising from anterior two-thirds of segment in both sexes, sternum 4 never armed; frons finely aciculate, subglabrous in male, pubescence moderately abundant in female; Jalisco to Venezuela; 2.0–2.6 mm ..... 27. ***cristatus*** **Wood**

— Male sternum 2 armed by a blunt spine arising from less than anterior half of segment, sternum 4 armed by a large, rounded, median nodule, female sterna unarmed; transition from sternum 1 to 2 abruptly angulate in both sexes; Costa Rica to Panama; 2.7–3.7 mm ..... 28. ***nodatus*** **Wood**

26(23). Abdominal sternum 2 coarsely, rather deeply punctured, width of interspaces average about half diameter of a puncture; male sternum 2 oblique, spine conical; male frons convex, median elevation feebly developed, its width about one-sixth as wide as space between eyes, vestiture in lateral areas short, more generally distributed; female frons weakly convex, with a sparse row of long hair on lateral and dorsal margins; Costa Rica; 2.0–2.4 mm (see also 33. ***marginatus*** **Chapuis**) ..... 34. ***torulus*** **Wood**

— Abdominal sternum 2 finely punctured, width of interspaces two or more times greater than diameter of a puncture; abdominal sternum 2 vertical; median frontal elevation of male conspicuous, wider; female frons with vestiture much more abundant ..... 27

27(26). Male frontal elevation dorsoventrally compressed, area between elevation and epistoma concavely impressed, area above eyes convex; female frons weakly convex, reticulate, aciculate, upper and lateral margins ornamented by a dense brush of very long hair; Vera Cruz and Cuba to Venezuela; 2.1–3.2 mm (see also 31. ***incognitus*** **Eggers**) ..... 30. ***dimidiatus*** **Chapuis**

— Male frons not concave between epistoma and frontal elevation; female frons shallowly concave, vestiture abundant, uniformly distributed, sparse above upper level of eyes (see also 32. ***nevermanni*** **Schedl**) ..... 28

28(27). Male frons flattened from epistoma to vertex, its surface obscurely, finely reticulate, median elevation obtusely conical; male abdominal vestiture abundant, short, stout except for tuft of long hair immediately posterior to spine on sternum 2; Nayarit and Vera Cruz to Costa Rica; 2.4–3.6 mm ..... 29. ***propinquus*** **Blandford**

— Male frons moderately convex, strongly reticulate, low median elevation dorsoventrally compressed; abdominal sternum 2 with vestiture long, without a tuft of hair posterior to spine; Nayarit; 2.4–2.6 mm ..... 35. ***laetus*** **Wood**

### 1. *Scolytus rugulosus* (Müller)

Figs. 115, 116, 117

*Bostrichus rugulosus* Müller, 1818, Mag. Ent. 3:247 (Syntypes; Europe, presumably Germany; not located)

*Eccoptogaster punctatus* Ratzeburg, 1837, Die Forstinsekten, p. 187 (Syntypes, Germany; not located; cited in synonymy, never validated)

*Scolytus haemorrhous* Schmidberger, 1837, *in* Kollar, Naturgesch. Schädl. Ins., p. 27 (not seen, cited by Schedl 1948:12); Ratzeburg, 1837, Die Forstinsekten, p. 187. *Synonymy*

*Eccoptogaster assimilis* Boheman, 1858, Kongliga Svenska Fregatten Eugenies resa omkring Jorden . . . zoologie 1:88 (not examined); Schedl, 1962, Ent. Blätt. 58:201. *Synonymy*

*Scolytus rugulosus fauveli* Reitter, 1894, Bestimmungs-Tabelle der Borkenkäfer, p. 43 (Syntypes; Kaukasus, Armenien, Persien; not located); Reitter, 1913, Wiener Ent. Zeit. 32(Beiheft):22. *Synonymy*

*Eccoptogaster mediterraneus* Eggers, 1922, Ent. Blätt. 18:121 (Lectotype, male; Adana, Asia Minor; U.S. Nat. Mus., 60418, designated by Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:19); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:12. *Synonymy*

*Scolytus rugulosus similis* Butovitsch, 1929, Stettiner Ent. Zeit. 90:52 (Syntypes; Deutschland, Tschechoslowakien; not located); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:12. *Synonymy*

*Scolytus rugulosus caucasicus* Butovitsch, 1929, Stettiner Ent. Zeit. 90:54 (Syntypes; Dshubga, Kaukasus; not located); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:12. *Synonymy*

*Scolytus rugulosus samarkandicus* Butovitsch, 1929, Stettiner Ent. Zeit. 90:56 (Syntypes; Samarkand, Turkestan; not located); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:12. *Synonymy*

*Scolytus rugulosus sanctaluciae* Hoffmann, 1935, Trav. Soc. Sav. Seine et Oise, p. 82 (not seen); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:12. *Synonymy*

*Scolytus manglissiensis* Lezhava, 1940, Bull. Mus. Georgia Tbilissi 10A:71 (Georgia, USSR; not seen); Sokanovskii, 1954, Byull. Mosk. O.I.P. (Biol.) 59(5):15. *Synonymy*

*Scolytus taxicola* Lezhava, 1941, Bull. Mus. Georgia 11A:193 (Georgia, USSR; not seen); Sokanovskii, 1954, Byull. Mosk. O.I.P. (Biol.) 59(5):15. *Synonymy*

*Scolytus rugulosus baluchistani* Schedl, 1957, Indian For. Rec. 9:165 (Syntypes; Baluchistan, Quetta, India; Dehra Dun Forest Research Institute and Schedl Coll.; syntypes seen)

*Scolytus rugulosus intermedius* Sokanovskii, 1960, Ent. Obozr. 39:674 (Bukhara, Central Asia; not seen)

DIAGNOSIS.— This introduced species resembles certain *Cnemonyx* species much more closely than it does native American *Scolytus* species. It is distinguished from other species of *Scolytus* by the more nearly declivous elytra that are pubescent to their bases and by the gradually ascending abdominal sternum 2.

MALE.— Length 1.5–2.7 mm, 2.2 times as long as wide; color very dark brown.

Frons broadly convex, weakly impressed on lower fourth toward median line; surface subshining, rather finely aciculate; punctures fine, rather obscure; vestiture fine, moderately abundant, rather long.

Pronotum 1.0 times as long as wide; widest one-third pronotum length from base, sides strongly arcuate, converging anteriorly to rather broadly rounded anterior margin; surface shining, punctures coarse, close, deep, much larger in anterolateral areas, most interspaces narrower than punctures, with a few impressed points.

Elytra 1.3 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal half, then arcuately converging to broad, shallow, sutural emargination; surface shining; striae and interstriae closely, coarsely, equally, uniseriately punctured, striae weakly impressed, interstrial punctures setose. Declivity moderately steep for this genus; posterior margin finely subserrate. Vestiture of interstrial rows of erect, stout hair to base of elytra, of moderate length.

FEMALE.— Similar to male except frons more strongly convex and frontal vestiture slightly less abundant.

DISTRIBUTION.— Cosmopolitan, wherever the hosts are cultivated.

CANADA: All southern provinces where apples grow. USA: All states. MEXICO: Chihuahua.

HOSTS.— *Malus* spp., *Prunus* spp., *Pyrus* sp., and less common in *Crataegus* spp., *Cydonia* sp., *Ulmus* spp., etc.

BIOLOGY.— Cut, broken, or unthrifty limbs and branches are usually selected for attack. The female forms the entrance tunnel and the uniramous egg gallery without a nuptial chamber. The male joins her early in the process of gallery formation and removes frass

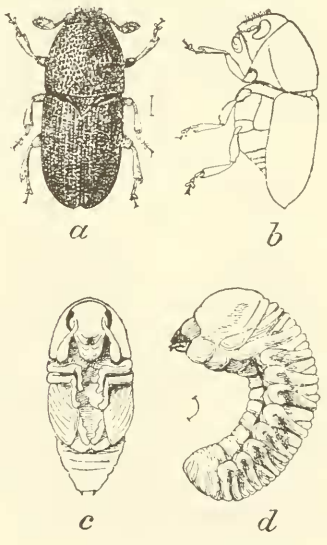



Fig. 115. *Scolytus rugulosus*: a, b, adult; c, pupa; d, larva. (After Chittenden 1909:1.)

that she excavates. Larval mines are irregular; pupation occurs about 1–2 cm below the surface of the wood in the overwintering brood chamber, but may take place in the cambium region during the summer months. The larvae pupate during the late winter or early spring and emerge from about mid-April to mid-May. Up to four generations may be produced each year in warmer climates; this may be reduced to less than two in the northern areas.

NOTES.— Several hundred specimens were examined. No attempt was made to locate or evaluate the types of this introduced species. In Europe and Asia distinct geographical races have been reported as indicated in the above synonymy.

### 2. *Scolytus muticus* Say
Fig. 117

*Scolytus muticus* Say, 1824, J. Acad. Nat. Sci. Philadelphia 3(1):323 (Syntypes; Missouri; lost)

DIAGNOSIS.— In this species, *mali* (Bechstein,) and *fagi* Walsh the male sternum 5 is inflated and its posterior margin is poorly developed in both sexes. This species is distinguished from the other two by the very long, fine hair on the elytra, by the sculpture of the frons, and by the male sternum 5.

MALE.— Length 2.8–4.2 mm, 2.1 times as long as wide; color very dark reddish brown.

Frons impressed from eye to eye from epistoma to vertex, flat to obscurely concave on upper half, lower half irregularly, weakly concave, epistoma shallowly, broadly emarginate; surface shining, strigose, punctures fine, mostly obscure. Vestiture of very long, fine hair, rather sparse in central area, abundant on margins.

Pronotum 0.92 times as long as wide; widest just behind middle, sides moderately arcuate from base, a narrow, abrupt constriction immediately behind anterior margin; surface brightly shining, impressed points obscure, punctures rather small, moderately close, deep, distinctly larger in anterolateral areas. Vestiture confined to lateral areas, of fine hair.

Elytra 1.13 times as long as wide, 1.1 times as long as pronotum; sides straight and parallel on basal half, arcuately converging very slightly on posterior half, then abruptly rounded to broad, feeble emargination on median third at sutural apex; surface brightly shining; striae and interstriae rather narrowly, weakly impressed, striae slightly deeper, punctures of equal size, rather small, moderately deep, decreasing in size toward declivity. Declivity gradual, short; subapical margin a smooth costa, apical margin subserrate. Vestiture of very long, fine hair in interstrial rows to base; each hair two to four times as long as distance between rows.

Sternum 2 ascending abruptly on its basal two-thirds. Sternum 5 with a pair of rather strongly elevated areas on basal two-thirds, subconcavely, rather strongly impressed on posterior third; inflated area with abundant, fine, long hair.

FEMALE.— Similar to male except frons less extensively, less strongly impressed, more nearly convex, vestiture greatly reduced; sternum 5 without elevated or impressed areas, weakly concave on median half, subapical costa moderately developed, vestiture sparse, rather short; sterna shining.

DISTRIBUTION.— North Dakota and Pennsylvania to Texas and Florida.

USA: District of Columbia, Florida, Kansas, Kentucky, Maryland, Mississippi, Missouri, New Jersey, North Dakota, Ohio, Oklahoma, Pennsylvania, South Carolina, Texas, West Virginia.

HOST.— *Celtis occidentalis.*

BIOLOGY.— This species attacks limbs and boles of cut and unthrifty material. The biramous parental tunnels are transverse.

NOTES.— The type is lost, but the species is easily identified from the original description. My material was comapred to that of LeConte, Blackman, etc., and is of the same species as reported by them.

### 3. *Scolytus mali* (Bechstein)

*Bostrichus mali* Bechstein, 1805, Vollstandige Naturgeschichte der Schädlichen Forstinsekten 3:882 (Syntypes, presumably Germany; not located)

*Eccoptogaster pruni* Ratzeburg, 1837, Die Forstinsekten, p. 186 (Syntypes; presumably Germany; not located); Reitter, 1913, Wiener Ent. Zeit. 32(Beiheft):19. *Synonymy*

*Eccoptogaster pyri* Ratzeburg, 1837, Die Forstinsekten, p. 186 (Syntypes; presumably Germany; not located); Ratzeburg, 1839, Die Forstinsekten, p. 229. *Synonymy*

*Eccoptogaster castaneus* Ratzeburg, 1837, die Forstinsekten, p. 187 (Syntypes; presumably Germany; not located); Eichhoff, 1880, Die Europäischen Borkenkäfer, p. 154. *Synonymy*

*Scolytus sulcatus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:167 (Holotype, female; New York; Mus. Comp.

Zool.); Brown, 1950, Canadian Ent. 82:203. *Synonymy*

*Scolytus nitidulus* Chapuis, 1869, Synopsis des Scolytides, p. 59 (Holotype, female; France meridionale; presumably Brussles Mus.); Hagedorn, 1910, Coleopt. Cat. 4:85. *Synonymy*

*Scolytus mali* abberation *strigilatus* Reitter, 1913, Wiener Ent. Zeit. 32(Beihett):19 (No status in nomenclature)

*Scolytus bicallosus* Eggers, 1933, Ent. Nachrbl. 7:75 (Holotype, male; Sagver, Ungarn; U.S. Nat. Mus. 60494); Eggers, 1942, Arb. Morph. Taxon. Ent. Berlin-Dahlem 9:280. *Synonymy*

DIAGNOSIS.— This introduced European species is distinguished from native American species by the oblique abdominal sternum 2, however sternum 5 is very similar to that of *fagi* Walsh, suggesting at least a distant relationship. From *fagi* this species is distinguished by the aciculate frons, by the more finely punctured pronotum, and by the finer strial punctures.

MALE.— Length 3.1–4.1 mm, 2.2 times as long as wide; color very dark brown.

Frons shallowly, subconcavely impressed on median two-thirds from epistoma to upper level of eyes; surface shining, aciculate on impressed area, punctures fine, deep, rather numerous, evident on upper half and in lateral areas; vestiture of fine hair, short and sparse on upper half, longer and more abundant below.

Pronotum 1.0 times as long as wide; about as in *muticus* except slightly narrower than in front; punctures fine to minute. Glabrous.

Elytra 1.2 times as long as wide; about as in *muticus*; striae feebly impressed, punctures fine; interstriae about four times as wide as striae, smooth, shining, punctures about half as large as those of striae, confused toward base, uniseriate on more than posterior half. Almost glabrous.

Sternum 2 subvertical to oblique. Sternum 5 subinflated on its apical half before apex as in *fagi*, not transversely carinate; vestiture of minute hair.

FEMALE.— Similar to male except frons rather strongly convvex, punctures smaller, less clearly impressed; abdominal sternum 5 almost flat, with subapical carina moderately elevated, acute.

DISTRIBUTION.— Ontario and New York to Ohio and Maryland; most of Europe, N Asia, and N Africa.

CANADA: S Ontario. USA: Connecticut, Maryland, New Jersey, New York, Ohio, Pennsylvania.

HOSTS.— *Malus* spp., *Prunus* spp., *Pyrus* sp., *Ulmus* spp.

BIOLOGY.— This species attacks unthrifty or cut limbs and boles. The gallery system apparently is as in *rugulosus* except that a large nuptial chamber is formed at the end of the entrance tunnel, from which one longitudinal egg gallery extends. Pupation occurs in the wood as in *rugulosus*. The winter may be passed as partly grown larvae in the cambium or as mature larvae in pupation cells (Pechuman 1938). There is one generation each year in New York.

NOTES.— The above treatment was based on 38 European specimens, on the holotype of *sulcatus*, and on 16 other specimens.

### 4. *Scolytus fagi* Walsh

*Scolytus fagi* Walsh, 1967, Practical Ent. 2:58 (Six syntypes; Southern Illinois; not located)

DIAGNOSIS.— This species is distinguished from *mali* (Bechstein) by the closely punctured frons, with no indication of aciculation, by the larger pronotal and strial punctures,



Fig. 116. *Scolytus rugulosus*, galleries. (After Ratzeburg 1837:Taf. XI.)

and by the uniseriate interstrial punctures on the basal half of the elytra.

MALE.— Length 3.5–4.5 mm, 2.1 times as long as wide; color dark reddish brown.

Frons almost flat on median two-thirds from epistoma to upper level of eyes; surface shining, punctures close, of irregular size, many with a margin finely granulate; median

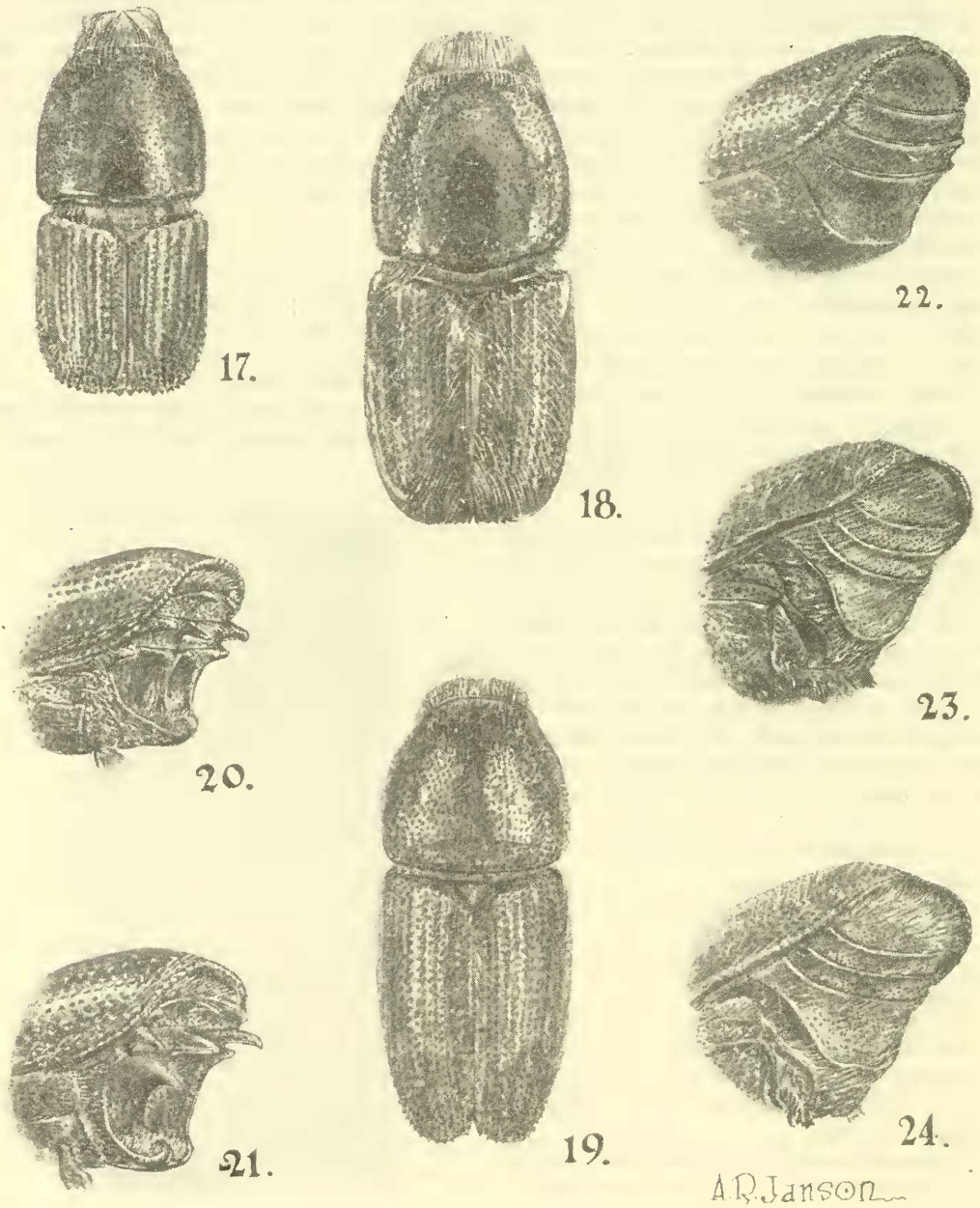



Fig. 117. *Scolytus* spp.: 17, 20, 21, *quadrispinosus*, male, 22, same, female; 18, 23, *muticus*, female, 24, same, male; 19, *rugulosus*. (After Blackman 1922:pl. IV.)

line almost impunctate; vestiture of rather abundant, uniformly distributed, moderately long, fine hair, not longer or more abundant at margins.

Pronotum as in *mali* except punctures distinctly larger.

Elytra as in *mali* except strial punctures larger, interstriae two to two and one-half times as wide as striae; interstrial punctures about one-fourth as large as those of striae and uniseriate to base.

Sternum 2 vertical on its basal half. Sternum 5 with its apical fourth subvertical, transversely impressed, and modestly pubescent, subinflated just anterior to this point, entirely devoid of a subapical carina.

FEMALE.— Similar to male except frons convex, devoid of granules; sternum 5 coarsely, densely punctured, transverse subapical carina rather strongly elevated.

DISTRIBUTION.— Illinois to Texas.

USA: Illinois: "Southern Illinois." Texas: "Tex."

HOSTS.— *Fagus grandifolia* and *Celtis* sp.

NOTES.— The types were not located, although several specimens from the type series were examined. The above treatment was based on specimens labeled "Tex."

### 5. *Scolytus quadrispinosus* Say
Fig. 117

*Scolytus quadrispinosus* Say, 1824, J. Acad. Nat. Sci. Philadelphia 3(1):323: (Holotype, male; Missouri; lost)

*Scolytus carya* Riley, 1867, Prairie Farmer 19:68, 2 February (Syntypes; Princeton, Illinois; not located); LeConte, 1876, Proc. Amer. Philos. Soc. 15:371. *Synonymy*

*Scolytus caryae* Walsh, 1867, Practical Ent. 2:58, in latter part of February (Four female syntypes; Princeton, Illinois; not located; *synonymy*)

DIAGNOSIS.— The sculpture of the male abdomen of this species is unique in the genus. The female is distinguished from the female of *muticus* Say by the glabrous elytra, by the uniformly short, stout setae on the abdomen, by the coarse strial punctures, and by the serrate posterior margin of the elytra.

MALE.— Length 2.9–5.0 mm, 2.0 times as long as wide; color very dark reddish brown.

Frons as in *muticus* except epistomal process more strongly elevated and marginal pubescence longer and much more abundant.

Pronotum about as in *muticus* except punctures much finer, glabrous.

Elytra 1.03 times as long as wide, 1.1 times as long as pronotum; about as in *fagi* Walsh except striae more distinctly impressed, punctures larger, deeper; interstriae one to one and one-half times as wide as striae, punctures very fine, uniseriate; declivital area shorter and steeper than in *fagi* and posterior margin much more coarsely serrate.

Sternum 2 opaque, strongly concave, its anterior margin strongly produced and with an obtuse median prominence, median line weakly carinate on posterior half. Sternum 3 opaque, armed by three large spines, one on median line, others at lateral margins. Sternum 4 opaque, armed by a median spine. Sternum 5 shorter than 4, a somewhat poorly defined transverse elevation at its middle, its posterior half pubescent.

FEMALE.— Similar to male except frons and abdomen about as in female *muticus*; abdominal sterna opaque.

DISTRIBUTION.— Iowa and Quebec to Texas and Georgia.

CANADA: Ontario, Quebec. USA: Alabama, Connecticut, District of Columbia, Georgia, Illinois, Indiana, Iowa, Louisiana, Michigan, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia, Wisconsin.

HOSTS.— *Carya* spp.

BIOLOGY.— The limbs and bole are attacked. The female forms the entrance tunnel and a uniramous, longitudinal gallery without a nuptial chamber. Mating takes place either with the male on the bark surface and the female just inside, or with both just inside the burrow (Blackman 1922:45). The males rarely enter the tunnels and, when they do enter, remain for only a brief time. Egg galleries vary from 2–7 cm in length and contain 20–140 egg niches. Larval mines usually begin in the transverse direction then curve to parallel the grain of the wood during the late instars. When mature, the larvae bore into the outer phloem tissues, where they pupate. Newly emerged adults feed in the bark of twigs before seeking a new host. Two generations occur annually. This is said to be the most destructive insect in hickory.

NOTES.— The types of *quadrispinosus* are lost; however, this species is easily recognized from the original description. My material was compared to that of LeConte, Blackman, etc., and is of the same species.

### 6. *Scolytus multistriatus* (Marsham)
Figs. 118, 119

*Ips multistriatus* Marsham, 1802, Ent. Britannica, p. 54 (Syntypes?; presumably England; not located)

*Scolytus flavicornis* Chevrolat, 1838, *in* Guérin-Méneville, Iconographie du règne animal de G. Cuvier 7:181 (not seen); Hagedorn, 1910, Gen. Ins. 4:86. *Synonymy*

*Scolytus ulmi* Redtenbacher, 1849, Fauna Austriaca, die Käfer, p. 361 (Syntypes?; presumably Austria; not located); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:61. *Synonymy*

*Scolytus javanus* Chapuis, 1869, Synopsis des Scolytides, p. 56 (Holotype, male; Java; Brussels Mus.); Schedl, 1954, Philippine J. Sci. 83:137. *Synonymy*

*Scolytus multistriatus* var.? *triornatus* Eichhoff, 1880, Die Europäischen Borkenkäfer, p. 160 (Syntypes; Thüringen, Germany; not located); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:61. *Synonymy*

*Eccoptogaster orientalis* Eggers, 1910, Deutsche Ent. Zeitschr., p. 557 (Lectotype, male, Elisabetpol, Caucasiae rossicae; U.S. Nat. Mus., 60419, designated by Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:23); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:61. *Synonymy*

*Scolytus nodifer* Reitter, 1913, Wiener Ent. Zeit. 32(Beiheft); 24 (Holotype, male, Walachia, Romania; Budapest Mus.); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:61. *Synonymy*

*Eccoptogaster abhorrens* Wichmann, 1913, Wiener Ent. Zeit. 32:210 (not seen); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:61. *Synonymy*

*Eccoptogaster affinis* Eggers, 1914, Ent. Blätt. 11:108 (Holotype, male; Mazedonien; U.S. Nat. Mus., 60409); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:61. *Synonymy*

*Scolytus multistriatus therondi* Hoffmann, 1939, Misc. Ent. 11:36 (not seen); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:61. *Synonymy*

*Scolytus papuanus* Schedl, 1936, J. Fed. Malay St. Mus. 18:8 (Syntypes; Kap Koenig Wilhelm, New Guinea; Berlin Zool. Mus.); Schedl, 1962, Ent. Blätt. 58:201. *Synonymy*

DIAGNOSIS.— This introduced European species is distinguished from other American representatives of the genus by the large median spine on the anterior half of sternum 2 and by the fine tubercles on the posterolateral margins of abdominal sterna 2–4.

MALE.— Length 1.9–3.1 mm, 2.2 times as long as wide; color dark reddish brown, elytra often slightly lighter.

Frons feebly concave from eye to eye, from epistoma to vertex; surface rather coarsely aciculate, punctures not clearly defined. Vestiture of fine, rather long, moderately abundant, uniformly distributed hair.

Pronotum 1.0 times as long as wide; outline as in other species; surface brightly shining, punctures moderately coarse, deep, rather close, interspaces averaging about twice diameter of a puncture. Glabrous.

Elytra 1.3 times as long as wide, 1.3 times as long as pronotum; outline as in most other species; striae moderately impressed, interstriae weakly impressed, punctures of striae and interstriae uniseriate, rather small, moderately deep, close, interstrial punctures often slightly smaller than those of striae; surface smooth. Glabrous except for a few setae on declivity. Declivity gradual, rather short; posterior margin smooth.

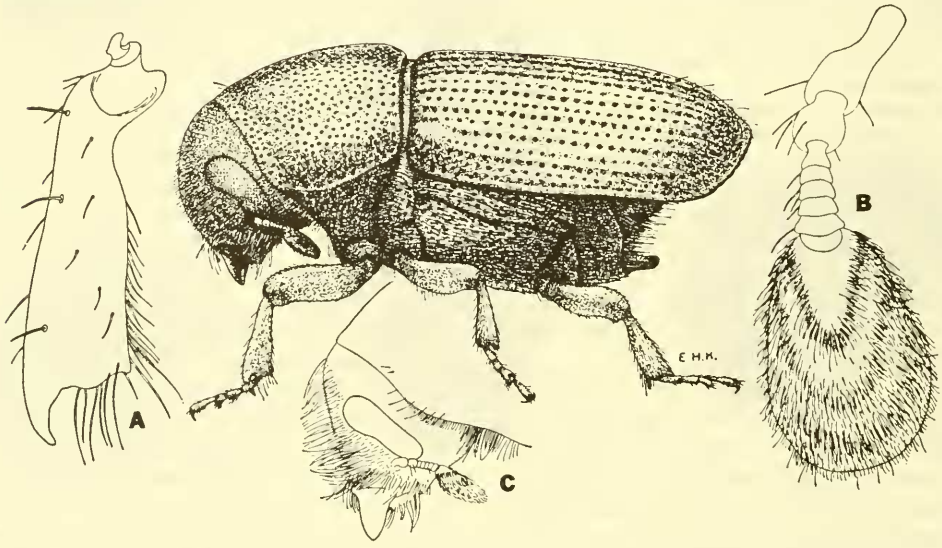



Fig. 118. *Scolytus multistriatus*, female: a, protibia; b, antenna; c, male head. (After Kaston 1936:615.)

Sternum 2 subvertical, anterior half on median margin armed by a coarse cylindrical, projecting spine; posterolateral margins of 2–4 each bearing a small, pointed tubercle; occasional males also with small median tubercle on posterior margin of 3 and 4.

FEMALE.— Similar to male except frons rather strongly convex, with vestiture sparse, very short.

DISTRIBUTION.— British Columbia and Nova Scotia to California and Florida. Europe and N Asia.

CANADA: Southern Provinces, presumably from British Columbia to Nova Scotia. USA: All states.

BIOLOGY.— This species is the principal American vector of the Dutch elm disease fungus, *Ceratocystis ulmi*; consequently, it is the most important insect attacking elms. They overwinter as larvae in the brood tree and emerge as adults in May. Emerging beetles construct feeding tunnels in healthy elm twigs, at which time disease spores are introduced into the living phloem. They then fly to a new host tree to rear their brood. Cut, unthrifty, or diseased trees are selected for attack where uniramous, longitudinal egg galleries are formed by the females. Larval mines radiate from the parental mine along a more or less definite course. Pupation occurs in the bark. From one and one-half (Canada) to three generations (southern U.S.) may occur annually.

NOTES.— No attempt was made to locate the types of this introduced species. More than 1,000 specimens from Europe and America were examined.

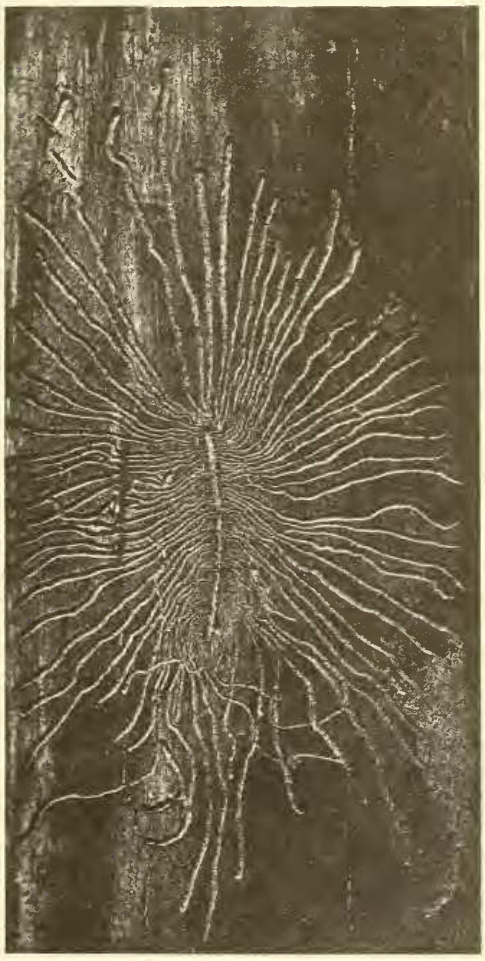


Fig. 119. *Scolytus multistriatus*, gallery system. (After Welch, Rankin, and Readio 1945:9.)

### 7. *Scolytus piceae* (Swaine)
Fig. 120

*Eccoptogaster piceae* Swaine, 1910, Canadian Ent. 42:32 (Lectotype, male; "Ste. Ann's" or Ste. Anne de Bellevue, Quebec; Cornell Univ. Coll., designated by Bright, 1967, Canadian Ent. 99:674)

DIAGNOSIS.— This species is distinguished from all other American species by the position of the spine on abdominal sternum 2.

MALE.— Length 2.2–2.8 mm, 2.2 times as long as wide; color very dark reddish brown, pronotum often almost black.

Frons flat to weakly convex to vertex, ascending slightly toward epistomal process; surface shining, moderately aciculate, moderately abundant, fine granules uniformly distributed; vestiture of rather abundant, long hair.

Pronotum as in *multistriatus* (Marsham) except punctures more widely spaced, varying in size within a series from rather fine to moderately coarse.

Elytral outline about as in *multistriatus*; striae usually feebly impressed, punctures rather small, moderately impressed; interstriae smooth, shining, about three times as wide as striae, punctures uniseriate, usually smaller than those of striae (strial and interstrial punctures vary within and between series from minute to moderately coarse); posterior margin subserrate.

Sternum 2, subvertical, its basal margin meeting 1 at an obtuse angle; armed on

middle third by a coarse, rather long, conical, median spine, its base remote from both anterior and posterior margins of segment; surface subreticulate, somewhat dull, punctures variable between series, very fine to rather coarse; vestiture of minute, sparse, fine hair.

FEMALE.— Similar to male except frons rather strongly convex, vestiture much less abundant, shorter; spine on sternum 2 distinctly smaller (variable).

DISTRIBUTION.— Alaska and Nova Scotia to California and New York.

ALASKA: Several localities. CANADA: Alberta, British Columbia, Manitoba, Northwest Territories, Ontario, Quebec. USA: California, Colorado, Idaho, Maine, Massachusetts, Michigan, Montana, New Mexico, New York, North Dakota, Oregon, Utah, South Dakota, Washington, Wisconsin, Wyoming.

HOSTS.— *Picea* spp., rare or accidental in other conifers.

BIOLOGY.— Longitudinal, biramous parental galleries are constructed in shaded-out branches of living trees. Larval mines radiate from the parental mine along a directed course.

NOTES.— The above treatment was based on the lectotype and on 81 other specimens. Fossil fragments of this species were recovered from prehistoric lake deposits at East Grand Forks, Minnesota, estimated age 10,000 years; at Scarborough, Ontario, estimated age 70,000 years; and from several other dates and localities between these areas.

### 8. *Scolytus unispinosus* LeConte
Fig. 121

*Scolytus unispinosus* LeConte, 1876, Proc. Amer. Philos. Soc. 15:372 (Lectotype, male; Oregon; Mus. Comp. Zool. 965, present designation)

*Scolytus sobrinus* Blackman, 1934, U.S. Dept. Agric. Tech. Bull. 431:23 (Holotype, male; Kent, Washington; U.S. Nat. Mus., 43840); Wood, 1966, Great Basin Nat. 26:30. *Synonymy*

*Scolytus fiskei* Blackman, 1934, U.S. Dept. Agric. Tech. Bull. 431:25 (Holotype, male; Capitan Mts., New Mexico; U.S. Nat. Mus., 43840); Wood, 1977, Great Basin Nat. 37:388. *Synonymy*

DIAGNOSIS.— This species is distinguished from *piceae* (Swaine) by the posterior basal margin of the spine on abdominal sternum 2 attaining the posterior margin of the segment, the spine also being slightly, longitudinally compressed in the male; by the reticulate area on and near the posterior margin of the elytra; and by the weakly convex male frons, with the aciculation evidently finer.

MALE.— Length 2.0–2.4 mm, 2.1 times as long as wide, color very dark brown, elytra usually slightly lighter.

Frons feebly concave, rather finely aciculate, granules not evident, surface shining; vestiture of rather short, fine, uniformly distributed hair.

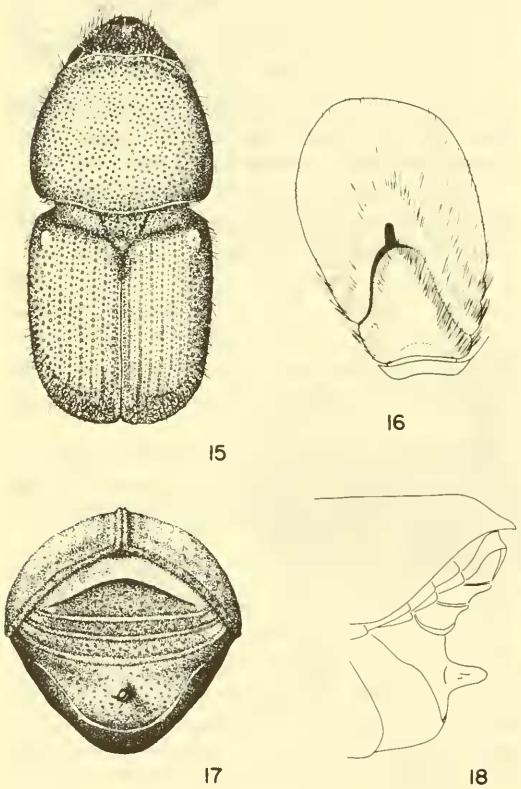



Fig. 120. *Scolytus piceae*, male: 15, dorsal aspect; 16, antennal club; 17, caudal aspect; 18, profile of posterior area. (After Edson 1967:40.)

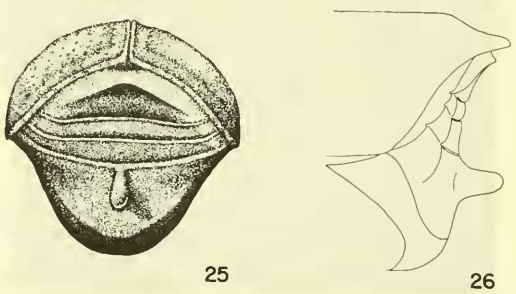



Fig. 121. *Scolytus unispinosus*, male: 25, caudal aspect; 26, profile of posterior area. (After Edson 1967:42.)

Pronotum as in *piceae* except punctures much finer.

Elytra as in *piceae* except punctures on declivital area much finer; surface on posterior half of declivital area reticulate (smooth in *piceae*).

Sternum 2 with anterior margin rounded, not angulate as in *piceae*, spine laterally compressed, its base extending from posterior margin to middle of segment; surface dull, reticulate; punctures on all sterna very fine.

FEMALE.— Similar to male except frons rather strongly convex, surface feebly aciculate, punctures fine, clearly impressed; spine on sternum 2 greatly reduced (variable), conical, its summit near posterior margin.

DISTRIBUTION.— British Columbia and Alberta to California and New Mexico.

CANADA: SW Alberta, British Columbia. USA: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

HOST.— *Pseudotsuga menziesii*, rare or accidental in other conifers.

BIOLOGY.— This species attacks the unthrifty tops and limbs of living trees and slash where longitudinal uniramous or biramous parental galleries are formed. Larval mines radiate from the egg gallery along a directed course. Pupation occurs in the phloem. Chamberlin (1958:48) reports two generations annually in Oregon, with flight periods in May and July. One generation apparently is the rule in cooler areas.

NOTES.— The above treatment was based on the holotypes of *sobrinus* and *fiskei*, on the syntypes of *unispinosus*, and on 164 other specimens. The species *unispinosus* was based on two syntypes, only one of which is now in the LeConte Collection. This syntype, labeled "type," is here designated as the lectotype of *unispinosus* LeConte.

Blackman described *sobrinus* and *fiskei* on minor differences in sculpture, which I regard as individual variation. Although there is a slight geographical association with the variation in size and shape of the spine on sternum 1 and, apparently, in the uniramous or biramous parental galleries, both features are variable within a given area. At the present time there is insufficient evidence to warrant the recognition of subspecies.

### 9. *Scolytus laricis* Blackman

Fig. 122

*Scolytus laricis* Blackman, 1934, U.S. Dept. Agric. Tech. Bull. 431:24 (Holotype, male; Moscow, Idaho; U.S. Nat. Mus., 43839)

DIAGNOSIS.— This species is distinguished from *unispinosus* LeConte by the more strongly flattened male frons, by the more coarsely aciculate frons in both sexes, and by the larger spine on the male sternum 2; this spine is also laterally compressed in the female.

MALE.— Length 2.4–3.0 mm, 2.1 times as long as wide; color very dark reddish brown, elytra slightly lighter.

Frons as in *unispinosus* except transversely flat at upper level of eyes, feebly concave below, surface coarsely aciculate, vestiture more abundant.

Pronotum and elytra as in *unispinosus* except declivital area near posterior margin smooth, without any indication of reticulation. Sternum 2 as in *unispinosus* except spine much stouter.

FEMALE.— Similar to male except sexes differing as in *unispinosus*; spine on sternum 2 at least slightly laterally compressed.

DISTRIBUTION.— British Columbia and Oregon to Montana.

CANADA: British Columbia. USA: N Idaho, W Montana, Oregon, Washington.

HOSTS.— *Larix occidentalis* and *L. lyallii*.

BIOLOGY.— Apparently as in *unispinosus*.

NOTES.— The above treatment was based on the holotype and on 54 other specimens.

### 10. *Scolytus scolytus* (Fabricius)

*Bostrichus scolytus* Fabricius, 1775, Systema Entomologiae, p. 59 (types not located)

*Scolytus punctatus* Müller, 1776, Zoologiae Danicae, 57 (types not located); Goeze, 1777, Ent. Beytr. 1:143. *Synonymy*

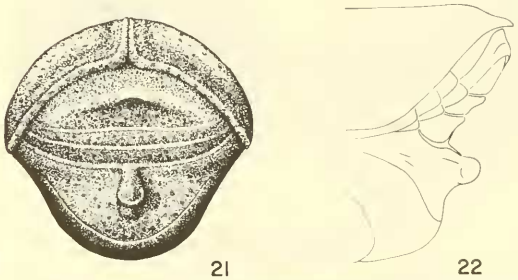



Fig. 122. *Scolytus laricis*, male: 21, caudal aspect: 22, profile of posterior area. (After Edson 1967:41.)

*Dermestes scolythus* Sulzer, 1776, Gesch. Ins. 1:21 (not located); Fabricius, 1792, Ent. Syst. 1(2):366. *Synonymy*

*Dermestes scolytus geoffroi* Goeze, 1777, Ent. Beytr. 1:143 (not located); China, 1962, Bull. Zool. Nomencl. 19:6. Status and *synonymy*

*Scolytus niger* Geoffroy, 1785, *in* Fourcroy, Ent. Paris., p. 139 (not located); China, 1962, Bull. Zool. Nomencl. 19:6. *Synonymy*

*Scolytus destructor* Olivier, 1795, Entomologie 4(78):1 (Syntypes; Europe; not located); Gyllenhal, 1813, Insecta Svecica Descripta 1(3):347. *Synonymy*

*Scolytus californicus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:166 (Holotype, male; California; Mus. Comp. Zool.); Blackman, 1934, U.S. Dept. Agric. Tech. Bull. 431:5. *Synonymy*

*Scolytus destructor* var. *sulcifrons* Rey, 1892, L'Exchange, p. 20 (a variant form, apparently with no status in nomenclature); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:45. *Synonymy*

*Scolytus destructor* var. *ciliatus* Rey, 1892, L'Exchange, p. 30 (a variant form, apparently with no status in nomenclature); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:45. *Synonymy*

*Scolytus eichhoffi* Reitter, 1894, Verh. naturf. Ver. Brünn 33:40 (Holotype, male; Talyschgebirge, am Kaspischen Meere; Budapest Mus.); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:45. *Synonymy*

*Eccoptogaster leonii* Eggers, 1908, Nat. Siciliano 20:194 (Lectotype, male; Cerchio, Aquilensi, Italy; U.S. Nat. Mus., 70152, designated by Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:17); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:45. *Synonymy*

*Eccoptogaster triarmatus* Eggers, 1912, Ent. Blätt. 8:205 (Holotype, female; origin uncertain, possibly France; U.S. Nat. Mus., 60587); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:45. *Synonymy*

*Scolytus fuchsi* Reitter, 1913, Wiener Ent. Zeit. 32(Beiheft):15 (Two male syntypes; Russisch-armenisches Gebirge, am Alagoes; Budapest Mus.); Schedl, 1948, Zlb. Ges. Ent., Monogr. 1:45. *Synonymy*

This European species has been introduced on numerous occasions into the United States, but it is not known to be established here. It is distinguished from established and native American species by the large size, by the granular frons, and by the armature of abdominal sterna 3 and 4 as indicated in the above key.

In Europe it is the most serious vector of Dutch elm disease; consequently, its establishment in America would be of immediate concern.

### 11. *Scolytus virgatus* Bright

*Scolytus virgatus* Bright, 1972, Canadian Ent. 104:1490 (Holotype, male; Cerro Potosí, Nuevo León, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *reflexus* Blackman by characters of the venter of the abdomen as indicated below.

MALE.— Length 3.0–3.5 mm, 2.1 times as long as wide; color almost black.

As in female *reflexus* except frons less strongly convex (more strongly convex than in male *reflexus*, but less strongly aciculate), vestiture as in male *reflexus*; venter resembling female *reflexus* except posterior margin of segment 1 more angulate, projecting slightly as in female *ventralis* LeConte, posterior margin of 2 at median line with a feeble, elevated, subtuberculate crest, resembling poorly developed equivalent of structure seen in *ventralis*; transverse, elevated carina on sternum 5 as in female *reflexus*.

FEMALE.— Apparently identical to female *reflexus* except lower frons more evenly convex, epistomal process less conspicuously elevated.

DISTRIBUTION.— Nuevo León.

MEXICO: Nuevo León: Cerro Potosí, 2-V-71, 2800 m, *Pseudotsuga menziesii*, D. E. Bright.

NOTES.— The above treatment was based on the type series of six specimens.

### 12. *Scolytus reflexus* Blackman

Fig. 123

*Scolytus reflexus* Blackman, 1934, Dept. Agric. Tech. Bull. 431:13 (Holotype, male; Santa Catalina Mts., Arizona; U.S. Nat. Mus., 43831)

*Scolytus wickhami* Blackman, 1934, U.S. Dept. Agric. Tech. Bull. 431:13 (Holotype, male; Buena Vista, Colorado; U.S. Nat. Mus., 43832); Wood, 1977, Great Basin Nat. 37:388. *Synonymy*

DIAGNOSIS.— This species is distinguished from *monticolae* Swaine by the larger average size, by the marginal notch in line with the apex of elytral interstriae 3, by the much more strongly elevated transverse carina of the male abdominal sternum 5, with its median crest closer to the basal margin than to the apical margin of the segment, and by the longer, coarser hair on abdominal sternum 5.

MALE.— Length 2.2–3.5 mm, 2.1 times as long as wide; color very dark brown.

Essentially as in *monticolae* except as indicated above. Elytral surface sculpture variable, mostly intermediate between *monticolae* and *tsugae*.

FEMALE.— Similar to male except sexes differing as in *tsugae*; abdominal sternum 5 with transverse carina as in *tsugae*.

DISTRIBUTION.— Wyoming to Durango and Nuevo León.

USA: **Arizona**: Kaibab N.F., Santa Catalina Mts. **Colorado**: Boulder, Buena Vista, Estes Park, Evergreen. **New Mexico**: Jemez Springs. **Wyoming**: Saratoga, Clarks Fork Road in Shoshone N.F. MEXICO: **Chihuahua**: San Juanito. **Durango**: Durango. **Nuevo León**: Cerro Potosí.

HOST.— *Pseudotsuga menziesii.*

BIOLOGY.— Longitudinal parental tunnels may occur in shaded-out branches of living trees, but there is a great tendency for this species to occur in slash, tops, and the bole of small trees.

NOTES.— The above treatment was based on the holotypes of *reflexus* and *wickhami* and on 108 other specimens. There appears to be a north-south cline in the intensity of elevation of the male abdominal sternum 5 and in the degree to which it is reflexed cephalad. Some series in the southern half of the range also have longer setae on all abdominal sterna, but this character is inconsistent and apparently without pattern.

### 13. *Scolytus monticolae* Swaine
Figs. 124, 135

*Scolytus monticolae* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):32 (Lectotype, female; Arrowhead, British Columbia; Canadian Nat. Coll., 9240, designated by Bright, 1967, Canadian Ent. 99:674)

DIAGNOSIS.— As indicated in the above key, this species is distinguished from *tsugae* Swaine by the unimpressed striae, by the more widely spaced strial punctures, by presence of setae on some odd-numbered interstriae (easily abraded), by the lighter color of the elytra, by the host, and by the longitudinal egg gallery.

MALE.— Length 2.2–3.0 mm, 2.1 times as long as wide; color very dark brown, elytra distinctly lighter.

Essentially as in *tsugae* except as noted above.

FEMALE.— Similar to male except sexes differing as in *tsugae.*

DISTRIBUTION.— British Columbia to N California and N Utah.

CANADA: **British Columbia**: Arrowhead, Merritt in Midday Valley, Trinity Valley. USA: **California**: Angwin, Callistoga. **Idaho**: Elk River in Clearwater Co., Fernan Lake in Kootenai Co., Franklin Basin in Franklin Co., Malta, St. Maries. **Oregon**: Paulina. **Utah**: Logan Canyon, Provo Canyon. **Washington**: Cliffdell. **Wyoming**: Cody.

HOST.— *Pseudotsuga menziesii.*

BIOLOGY.— Shaded-out branches on living trees are preferred for attack, although they do breed in tops, seedlings, and occasionally in slash. The parental galleries are longitudinal.

NOTES.— The above treatment was based on two specimens from Midday Valley that were compared to the lectotype and on 72 other specimens. The exact southern limits of distribution for this species are unknown, apparently because it breeds largely in shaded-out branches of living trees and is overlooked by collectors.

### 14. *Scolytus tsugae* (Swaine)
Fig. 135

*Eccoptogaster tsugae* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):32 (Lectotype, female; Glacier, British Columbia; Canadian Nat. Coll., 9239, designated by Bright, 1967, Canadian Ent. 99:674)

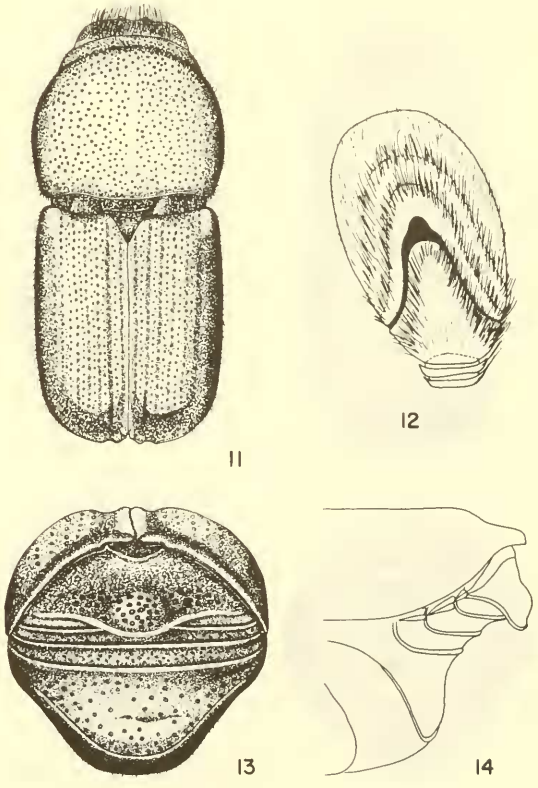



Fig. 123. *Scolytus reflexus*, male: 11, dorsal aspect; 12, antennal club; 13, caudal aspect; 14, profile of posterior area. (After Edson 1967:39.)

DIAGNOSIS.— This species is distinguished by the modestly convex, unarmed abdominal sternum 2, by the emargination on the apical margin of the elytra that is in line with interstriae 3, by the crest of the transverse carina on abdominal sternum 5 being as close to the anterior margin as to the posterior margin of the segment, by the host, and by other characters in the above key.

MALE.— Length 2.2–3.5 mm, 2.1 times as long as wide; color dark brown.

Frons broadly, rather weakly convex from epistoma to upper level of eyes; surface moderately aciculate, punctures deep, moderately coarse, rather sparse, uniformly distributed; epistomal process rather strongly elevated on median half; vestiture of coarse, moderately long, uniformly distributed hair.

Pronotum 0.96 times as long as wide; essentially as in *piceae* (Swaine) except punctures much smaller. Glabrous except near anterior margin.

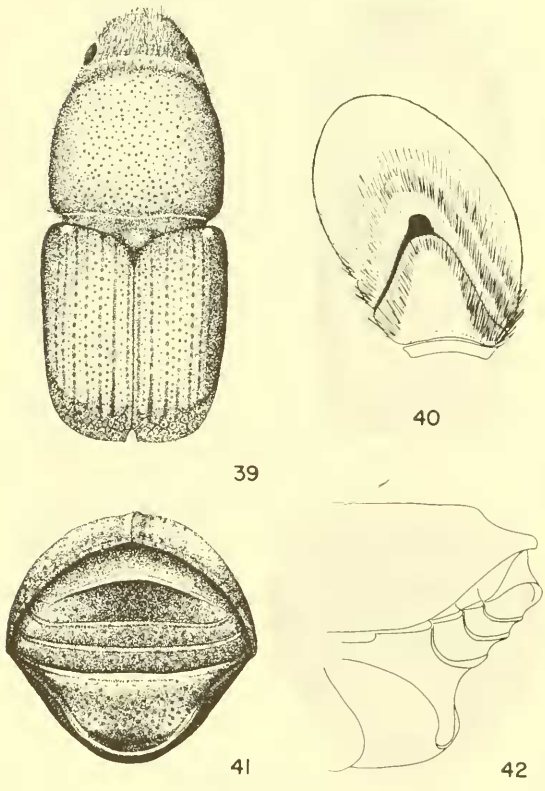



Fig. 124. *Scolytus monticolae*, male: 39, dorsal aspect; 40, antennal club; 41, caudal aspect; 42, profile of posterior area. (After Edson 1967:46.)

Elytra 1.5 times as long as wide, 1.5 times as long as pronotum; outline as in *piceae* except posterior margin with a distinct emargination in line with interstriae 3; striae narrowly, distinctly, moderately impressed, punctures rather coarse, spaced by one to two diameters of a puncture, deep; interstriae about three times as wide as striae, distinctly convex, smooth, shining, punctures fine, shallow, uniseriate. Declivital area with punctures larger and deeper than on disc, confused. Vestiture confined to declivity, of a few stout, interstrial hairs.

Sternum 2 subvertical on basal three-fourths, rather weakly convex; surface smooth, shining to opaque, punctures rather coarse, close; vestiture minute. Sternum 5 with transverse carina arcuate, commencing at anterolateral angles, attaining a point slightly behind middle of segment at median line; area posterior to carina rather closely pubescent.

FEMALE.— Similar to male except frons more strongly convex, its vestiture much finer; sternum 2 more evenly convex; carina on sternum 5 much closer to posterior margin than to anterior margin of segment.

DISTRIBUTION.— British Columbia and E Montana to N California.

CANADA: **British Columbia.** USA: **California**: Vista Trail, Yosemite. **Idaho**: Big Sand Creek and Priest River Expt. For. in Latah Co., Deception Creek in Kootenai Co. **Montana**: E Montana. **Oregon**: Crater Lake, Reedport. **Washington**: Seattle.

HOSTS.— *Tsuga* sp.

BIOLOGY.— Shaded-out limbs, slash, and tops of trees are selected for attack. The transverse parental gallery is either mono- or biramous. Larval mines follow a directed course away from the parental system. Pupation occurs in the bark. Apparently only one generation each year occurs in most areas, although this may not be true in warmer areas along the Pacific Coast.

NOTES.— The above treatment was based on the lectotype of *tsugae* and on 81 other specimens. The shining abdominal sterna found universally in specimens from the southeastern parts of the range is gradually replaced by opacity in those of the northwest, commencing with segment 5 and extending cephalad, reaching its greatest intensity in northwestern California. Because

the opaque surface feature could be mechanically peeled from some specimens, its significance is not clear. More information on this species is needed before this problem can be settled.

### 15. *Scolytus hermosus* Wood
Fig. 128

*Scolytus hermosus* Wood, 1968, Great Basin Nat. 28:12 (Holotype, male; 18 km N Tlaxco (Tlaxcala), Puebla, Mexico; Wood Coll.)

*Scolytus sylvaticus* Bright, 1972, Canadian Ent. 104:1489 (Holotype, male; Cerro Potosí, Nuevo León, Mexico; Canadian Nat. Coll.); Wood, 1975, Great Basin Nat. 35:22. *Synonymy*

DIAGNOSIS.— This species is distinguished from *robustus* Blackman by the larger size, by the more finely punctured pronotum and elytra, by the brightly shining, very finely, densely punctured abdominal sterna, and by the somewhat less strongly elevated anterior margin of abdominal sternum 2.

MALE.— Length 3.0–3.7 mm, 2.1 times as long as wide; color black with dark reddish brown elytra.

Frons broadly, weakly convex to vertex, with slight transverse impressions just above eyes and just above epistoma; surface shining, rather coarsely punctate-aciculate; vestiture consisting of rather sparse, uniformly distributed, long, dark hair. Antennal club 1.7 times as long as wide; suture 1 distinct.

Pronotum as in *robustus* except punctures distinctly smaller.

Elytra essentially as in *robustus* except strial and interstrial punctures distinctly smaller; interstrial punctures minute, distinctly smaller than those of striae; posterior margin finely serrate on median third.

Abdominal sternum 2 with anterior margin about two-thirds as high as in *robustus*, general contours otherwise similar to that species; surface of sterna 2 to 5 brightly shining, very finely, closely, deeply punctured; each puncture bearing a fine, semirecumbent, short hair about two to three times as long as diameter of a puncture.

FEMALE.— Similar to male except frons much more strongly convex; anterior margin of abdominal sternum 2 weakly elevated, elevation about as high as thick.

DISTRIBUTION.— Nuevo León to Puebla.

MEXICO: **Nuevo León**: Cerro Potosí, 3-V-71, 3300 m, *Pseudotsuga menziesii*, D. E. Bright. **Puebla**: 18 km N Tlaxco (2 km N state boundary line), 9-VII-67, 2900 m, No. 182, *Abies religiosa*, S. L. Wood.

HOST.— *Abies religiosa*, *Pseudotsuga menziesii*.

BIOLOGY.— Specimens were taken from transverse, biramous parental tunnels in slash larger than 10 cm in diameter.

NOTES.— The above treatment was based on the type series of 24 specimens of *hermosus* and the type series of three specimens of *sylvaticus*.

### 16. *Scolytus robustus* Blackman
Figs. 125, 135

*Scolytus robustus* Blackman, 1934, U.S. Dept. Agric. Tech. Bull. 431:19(Holotype, male; Prescott, Arizona; U.S. Nat. Mus., 43835)

DIAGNOSIS.— This species is distinguished from *hermosus* Wood by the smaller size, by the slightly more coarsely punctured pronotum and elytra, by the obscurely reticulate abdominal sterna, and by the more strongly

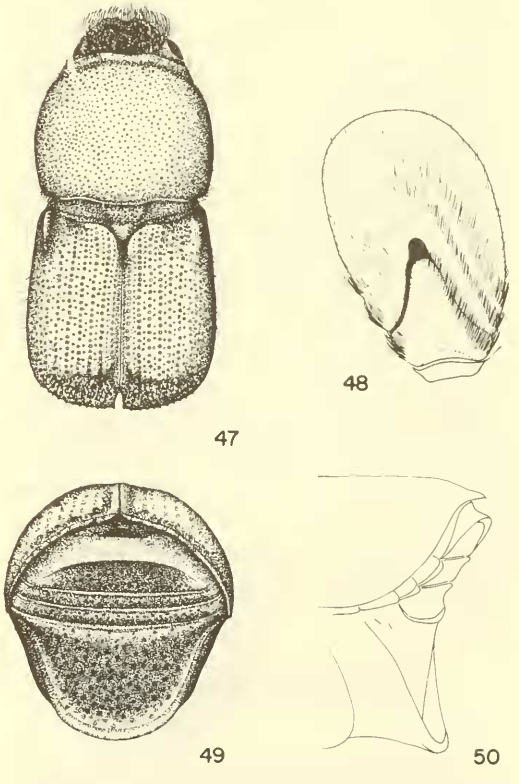



Fig. 125. *Scolytus robustus*, male: 47, dorsal aspect; 48, antennal club; 49, caudal aspect; 50, profile of posterior area. (After Edson 1967:48.)

projecting posterior margin of male sternum 1.

MALE.— Length 2.5–3.1 mm, 2.0 times as long as wide; color very dark brown, almost black, elytra often reddish brown.

Frons broadly, feebly convex, deeply, rather coarsely aciculate, punctures obscure; surface shining; epistomal process rather strongly elevated, broadly emarginate; vestiture of fine, rather long, moderately abundant hair.

Pronotum 0.90 times as long as wide; as in *tsugae* (Swaine).

Elytra 1.1 times as long as wide, 1.4 times as long as pronotum; outline about as in *piceae* (Swaine) except lateral and posterior margins serrate; striae not impressed, punctures fine; interstriae about three times as wide as striae, smooth, punctures fine, uniseriate. Declivital area longitudinally strigose; posterior margin rugose-reticulate, finely serrate.

Sternum 1 with posterior margin projecting caudad, projection twice as high as thick; 2 vertical, flat, obscurely reticulate, shining, punctures rather coarse, deep, moderately close, vestiture minute; 3–5 of similar surface sculpture.

FEMALE.— Similar to male except frons much more strongly convex, finely aciculate, small punctures clearly impressed, vestiture less abundant, shorter; sternum 1 weakly projecting, 2 weakly convex.

DISTRIBUTION.— Utah and Colorado to Arizona and New Mexico.

USA: Arizona, Colorado, Nevada, New Mexico, Utah.

HOST.— *Abies concolor.*

BIOLOGY.— This species breeds in limbs, tops, and slash. The biramous galleries are most commonly oblique, but may vary from almost transverse to almost longitudinal. The larval mines tend to be longitudinal. Pupation occurs in the cambium area.

NOTES.— The above treatment was based on the holotype and on 65 other specimens.

### 17. *Scolytus oregoni* Blackman
Figs. 126, 135

*Scolytus oregoni* Blackman, 1934, U.S. Dept. Agric. Tech. Bull. 431:18 (Holotype, male; Ashland, Oregon; U.S. Nat. Mus., 43834)

DIAGNOSIS.— This species is distinguished from *robustus* Blackman by the reticulate, much more coarsely punctured abdominal sterna, and, in the male, by the much thicker, less strongly projecting posterior margin of sternum 1.

MALE.— Length 2.7–3.3 mm, 3.1 times as long as wide; color dark brown.

Frons, pronotum, and elytra as in *robustus* except punctures of pronotum and elytra finer; setae on declivital area of elytra much finer.

Sternum 1 with thick posterior margin projecting caudad less than its thickness; 2 vertical on slightly more than anterior half, this area irregularly impressed, usually more strongly impressed on anteromedian portion; sterna 2–5 reticulate, dull, much more finely punctured than in *robustus*. Vestiture minute.

FEMALE.— Similar to male except frons rather strongly convex, less strongly aciculate, vestiture finer, shorter; sternum 1 projecting only slightly, 2 weakly convex.

DISTRIBUTION.— Washington(?) to California.

USA: **California**: Angwin, Fenner Canyon. **Oregon**: Ashland, Woods. **Washington**: Seattle.

HOSTS.— *Pseudotsuga macrocarpa, P. menziesii.*

BIOLOGY.— This species breeds in limbs, tops, and slash. The longitudinal parental tunnels are biramous. Apparently its flight period is in August and, consequently, it has been largely overlooked by those studying forest insects.

NOTES.— The above treatment was based on the holotype and on 21 other specimens. I have seen one specimen labeled Seattle, Washington, but this record should be confirmed by additional collections before it is accepted.

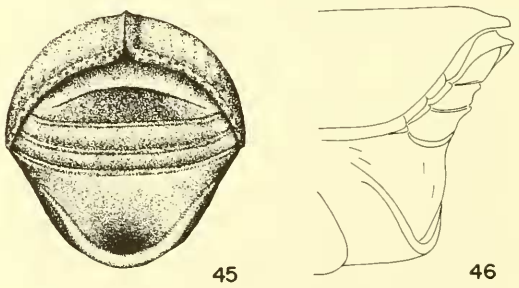



Fig. 126. *Scolytus oregoni*, male: 45, caudal aspect; 46, profile of posterior area. (After Edson 1967:47.)

### 18. *Scolytus praeceps* LeConte
Figs. 127, 136

*Scolytus praeceps* LeConte, 1876, Proc. Amer. Philos. Soc. 15:373 (Lectotype, female; Calaveras, California; Mus. Comp. Zool., 967, present designation)

DIAGNOSIS.— This species is distinguished from *oregoni* Blackman by the smaller size, by the thinner projecting posterior margin of the male abdominal sternum 1, by the more extensively flattened, vertical, male sternum 2, which often has a weak, subcarinate summit at its posteromedian margin, and by the rather stout, almost scalelike, minute setae as on the other abdominal sterna.

MALE.— Length 2.0–2.7 mm, 1.9 times as long as wide; color very dark brown, elytra usually slightly lighter.

Frons as in *oregoni* except very slightly more strongly convex. Pronotum more coarsely punctured than in *oregoni*, about as in *robustus* Blackman. Elytra as in *oregoni*. Sternum 1 as in *robustus* except usually arising more abruptly from 2 and projecting less strongly. Sternum 2 flat, as in *robustus*, but often with a feeble median crest at posterior margin, surface reticulate, dull, punctures fine; vestiture on all sterna of minute, stout, almost scalelike setae.

FEMALE.— Similar to male except frons more strongly convex; posterior margin of sternum 1 poorly developed, projecting very slightly.

DISTRIBUTION.— British Columbia and Idaho to California.

CANADA: British Columbia. USA: California, N Idaho, Oregon, Washington.

HOST.— *Abies concolor*; records from other conifers may be accidental.

BIOLOGY.— Apparently as in *obelus* except that the biramous parental galleries tend to be transverse.

NOTES.— The LeConte collection contains six specimens under this name, the first four of which are of this species. The first two are females, and the third and fourth specimens are males; one male has no carina whatever on sternum 2, and the other has a weak carina. The first female is labeled as the type, but has never been so designated; I designate that female as the lectotype of *praeceps* LeConte. More than 80 specimens were examined.

### 19. *Scolytus mundus* Wood
Fig. 129

*Scolytus mundus* Wood, 1968, Great Basin Nat. 28:13 (Holotype, male; 18 km N Tlaxco (Tlaxcala), Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *ventralis* LeConte by the larger size, by the more finely punctured elytra, with the surface of the posterior margin smooth and the margin more nearly sinuate, by the subemarginate notch on the posterior margin of the elytra, which is in line with striae 3, by the more coarsely punctured abdominal sterna, and by the larger spine on sternum 2.

MALE.— Length 3.6–4.5 mm, 2.3 times as long as wide; color black.

Frons moderately convex with a shallow, rather broad, median impression just above epistoma; surface longitudinally, rather coarsely punctate-aciculate, with a slight median, longitudinal carina on middle third; vestiture of moderately abundant, uniformly distributed, fine, long hair.

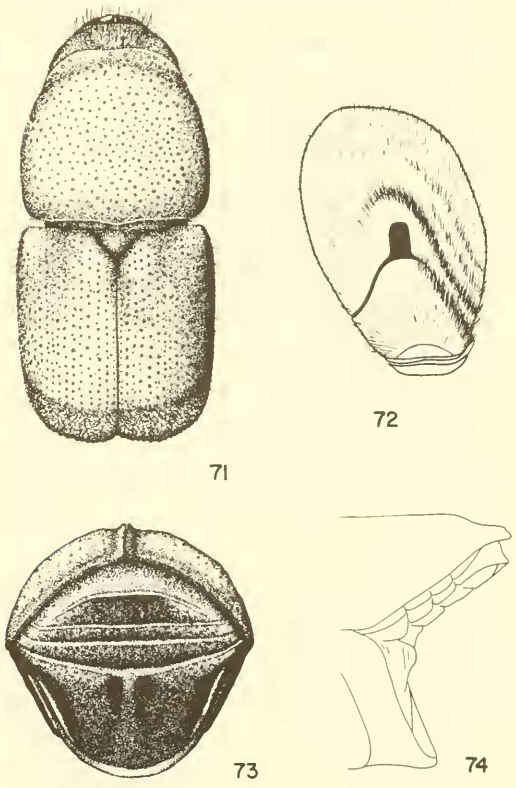



Fig. 127. *Scolytus praeceps*, male with maximum development of spine: 71, dorsal aspect; 72, antennal club; 73, caudal aspect; 74, profile of posterior area. (After Edson 1967:54.)

Pronotum essentially as in *ventralis*.

Elytra about as in *ventralis* except punctures smaller, deep; strial and interstrial punctures about equal in size; posterior margin almost smooth, with a weak to moderate notch in line with interstriae 3.

Abdominal sternum 2 abruptly declivous (about a 90 degree angle) but margin not projecting posteriorly; posteromedian margin of 2 armed by a rather large, sharply pointed spine, its apex at suture, its anterior slope descending gradually to about middle of segment much as in *obelus* Wood; all sterna shining, rather finely, closely, deeply punctured; each puncture bearing a fine, long hair, each hair about equal in length to length of sternum 3.

FEMALE.— Similar to male except frons much more strongly convex, impression obsolete, but with a small median impression on vertex, surface much less strongly aciculate; abdominal sternum 2 more nearly convex, not as steeply declivous, spine rudimentary (not entirely obsolete in any female at hand); abdominal vestiture abraded.

DISTRIBUTION.— Puebla to Mexico.

MEXICO: **Mexico**: Cerro Tlaloc, 24-IV-80, T. H. Atkinson. **Puebla**: 18 km N Tlaxco (2 km N state boundary line), 9-VII-67, 2900 m, No. 182, *Abies religiosa*, S. L. Wood.

BIOLOGY.— Specimens were taken from transverse, biramous parental tunnels in slash larger than 10 cm in diameter.

NOTES.— The above treatment was based on the type series of 34 specimens.

### 20. *Scolytus aztecus* Wood

*Scolytus aztecus* Wood, 1967, Great Basin Nat. 27:120 (Holotype, female; 43 km or 27 miles E Morelia, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *mundus* Wood by the very large size and by other characters summarized in the above key.

FEMALE.— Length 4.5–5.3 mm, 2.3 times as long as wide; color very dark brown, elytra reddish brown.

Frons convex, transversely impressed just above epistoma, a slight median impression at vertex; surface shining, punctures small, rather close, substrigose above; epistoma with a distinctly elevated, dorsally arched ridge above epistomal brush, its lateral extremities blending into a marginal callus; vestiture short, sparse, inconspicuous.

Pronotum 1.03 times as long as wide; widest just behind middle, sides very weakly arcuate, not converging until anterior third, rather strongly constricted at sides just before anterior margin, anterior margin broadly, very feebly emarginate; surface smooth, shining, punctures fine, deep on disc, about twice as large in lateral areas; vestiture confined to lateral areas.

Elytra 1.4 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two thirds, then converging very slightly to rather abrupt posterolateral angles; median half of posterior outline (of apical margin) occupied by two pairs of

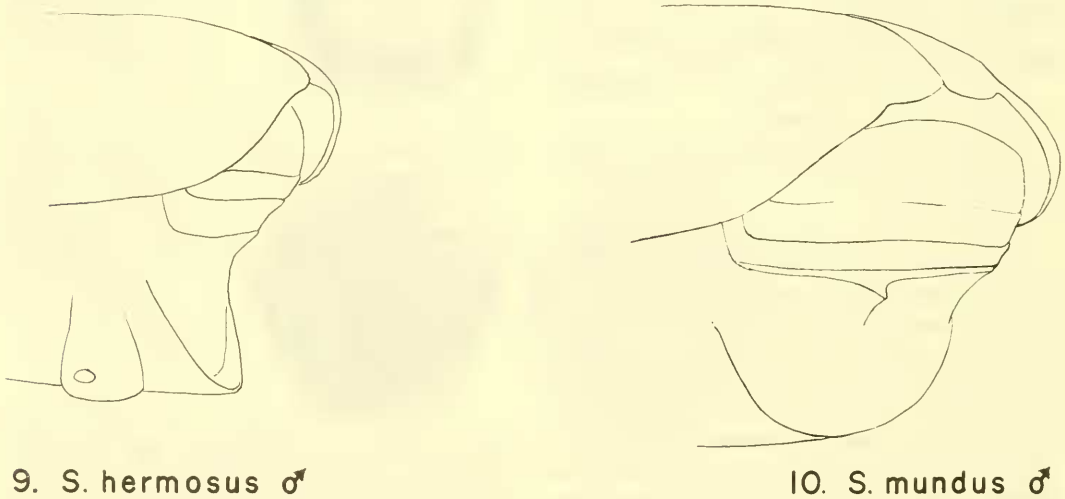



Fig. 128–129. *Scolytus* spp., males: 128, *hermosus*; 129, *mundus*. (After Wood 1968:12.)

broad serrations, each serration half as long as wide; striae not impressed, punctures small, deep, regular; interstriae about three to four times as wide as striae, almost flat, shining, punctures moderately large, deep, uniseriate except confused on 2; declivity descending slightly; glabrous, except more coarsely punctured, the feeble, carinate elevation at posterior margin of sternum 2 present on all four specimens.

DISTRIBUTION.— Michoacán.

MEXICO: Michoacán: 43 km (27 miles) E Morelia, 14-VI-65, 2600 m, No. 52, *Abies religiosa*, S. L. Wood.

BIOLOGY.— Specimens were taken from transverse biramous parental galleries in the bole of a standing tree 60 cm in diameter.

NOTES.— The above treatment was based on the type series of four specimens.

### 21. *Scolytus opacus* Blackman
Figs. 130, 135, 136

*Scolytus opacus* Blackman, 1934, U.S. Dept. Agric. Tech. Bull. 431:20(Holotype, male; Ouray, Colorado; U.S. Nat. Mus., 43836)

*Scolytus abietis* Blackman, 1934, U.S. Dept. Agric. Tech. Bull. 431:21 (Holotype, male; Sandpoint, Idaho; U.S. Nat. Mus., 43837); Wood, 1977, Great Basin Nat. 37:388. *Synonymy*

DIAGNOSIS.— This species is distinguished from other species in the genus by the median, male spine on sternum 2 that increases in height from the posterior margin to a point slightly anterior to the middle of the segment, where it terminates abruptly, and by the more strongly produced posterior margin of the female sternum 1.

MALE.— Length 2.0–2.6 mm, 2.0 times as long as wide; color very dark brown, elytra slightly lighter.

Frons, pronotum, and elytra as in *praeceps* LeConte.

Sternum 2 similar to *praeceps* except anterior margin more evenly arcuate, spine considerably larger, its crest beginning at posteromedian margin, rising to a summit about two-thirds of segment length from posterior margin, its shape geographically variable; surface dull, reticulate, apparently more sparsely punctured than in *praeceps*. Other sterna as in *praeceps*.

FEMALE.— As in female *praeceps* except posterior margin of sternum 1 more strongly produced, projection at least as high as thick (less than half as high as thick in *praeceps*).

DISTRIBUTION.— Oregon and Montana to California and Colorado.

USA: N Arizona, N California, Colorado, Idaho, Montana, Oregon, Utah, Washington, Wyoming.

HOSTS.— *Abies concolor, A. grandis, A. lasiocarpa, Picea engelmannii, Tsuga* sp.

BIOLOGY.— This species apparently prefers small branches and tops of weakened, broken, or cut material. The biramous parental galleries vary from oblique to transverse.

NOTES.— The above treatment was based on the holotypes of *opacus* and *abietis* and on 69 other specimens. Specimens from the Pacific Coast states and northern Idaho have a slightly smaller spine on the male sternum 2, the summit more narrowly rounded and the crest acute, and the vertex of the head more strongly convex. In some male specimens from the southern Rocky Mountain area the spine on sternum 2 may have the crest flattened or sulcate, as well as the opposite extremes of the other characters mentioned above. However, these features appear to intergrade over a broad area to such an extent that I cannot justify the continued recognition of two names for this taxon.

### 22. *Scolytus ventralis* LeConte
Figs. 131, 136

*Scolytus ventralis* LeConte, 1868, Trans. Amer. Ent. Soc. 2:167 (Lectotype, male, Washington Territory; Mus. Comp. Zool., 970, present designation)

DIAGNOSIS.— This species is distinguished from all preceding species by the presence of a small, definite, carinate, median tubercle at the posterior margin of male sternum 2 (this elevation is more poorly developed in the female) and by the vertical sternum 2, with the posterior margin of sternum 1 projecting only feebly in the male, not projecting in the female.

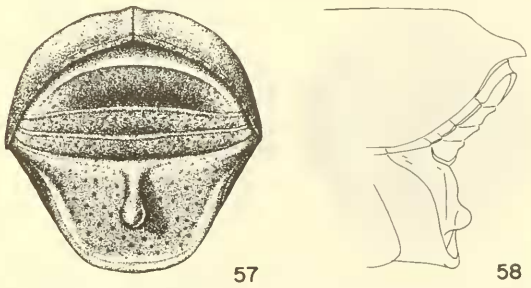



Fig. 130. *Scolytus opacus*, male: 57, caudal aspect; 58, profile of posterior area. (After Edson 1967:50.)

MALE.— Length 2.5–3.8 mm, 2.0 times as long as wide; color very dark brown, elytra usually lighter.

Frons broadly convex, slight transverse impressions at vertex and just above epistoma; epistomal process distinctly elevated; surface shining, rather coarsely aciculate, as in *oregoni* Blackman; vestiture uniformly distributed, of rather short, fine hair.

Pronotum 0.90 times as long as wide; as in allied species, punctures slightly larger than in *oregoni*, separated by about two to four times diameter of a puncture. Glabrous except at margins.

Elytra as in *oregoni*.

Sternum 1 with posterior margin projecting less than half its thickness, 2 vertical, feebly convex, median area at posterior margin slightly elevated, weakly tuberculate, surface dull, obscurely reticulate in some areas, punctures moderately coarse, rather deep, spaced by about two to four diameters of a puncture. Vestiture of very minute, fine hair.

FEMALE.— Similar to male except frons more strongly convex, more finely pubescent; sternum 1 with posterior margin much less strongly projecting, sternum 2 more feebly elevated at median line on posterior margin and usually without a tubercle.

DISTRIBUTION.— British Columbia and Montana to California and New Mexico.

CANADA: British Columbia. USA: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

HOSTS.— *Abies concolor*, *A. grandis*, *A. magnifica*, probably accidental in other conifers.

BIOLOGY.— This species infests the bole, tops, and slash larger than 10 cm in diameter. Under certain circumstances it evidently is capable of killing healthy trees. The parental tunnels are biramous and transverse; the larval mines are longitudinal. One generation occurs annually. Details of the life history are reported by Ashraf and Berryman (1969).

NOTES.— This species was based on two syntypes, only one of which, a male, remains in the LeConte collection. This male is here designated as the lectotype of *ventralis* LeConte. The above treatment was based on the lectotype and on 134 other specimens.

The abdominal sterna of specimens from the Pacific Coast are more finely, less deeply impressed than those from inland areas; however, the difference does not appear to be of sufficient magnitude to warrant taxonomic distinction.

### 23. *Scolytus obelus* Wood

Figs. 132, 136

*Scolytus obelus* Wood, 1962, Great Basin Nat. 22:81 (Holotype, male; Payson Canyon, Utah; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *praeceps* LeConte by the much more finely aciculate frons and by the more strongly concave male sternum 5, which is subshining and armed by a conspicuous median denticle at its posterior margin.

MALE.— Length 2.0–2.4 mm, 2.0 times as long as wide; color very dark brown, elytra usually lighter.

Frons as in *praeceps* except much more finely aciculate. Pronotum and elytra as in *praeceps*.

Sternum 1 with posterior margin more strongly produced than in *praeceps*, 2 more strongly concave, subshining, punctures distinctly larger, carinate on posterior fourth of median line, carina ending at margin of segment in a moderate to very strong denticle (variable). Vestiture minute, hairlike.

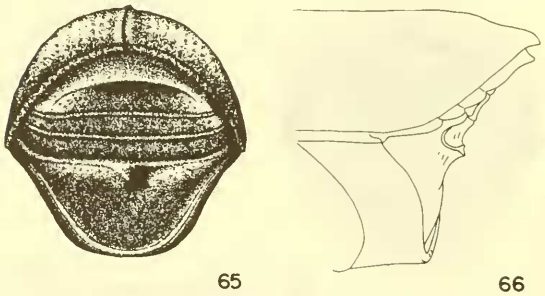



Fig. 131. *Scolytus ventralis*, male: 65, caudal aspect; 66, profile of posterior area. (After Edson 1967:52.)

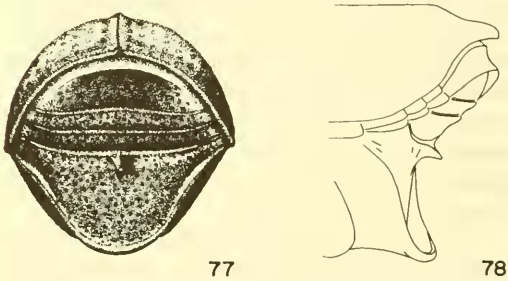



Fig. 132. *Scolytus obelus*, male: 77, caudal aspect; 78, profile of posterior area. (After Edson 1967:55.)

FEMALE.— Similar to male except frons more strongly convex; sternum 1 with posterior margin projecting slightly more than in female *praeceps*; sternum 2 weakly carinate on median line at posterior margin.

DISTRIBUTION.— Nevada and Colorado to Arizona and New Mexico.

USA: N Arizona, Colorado, W Nevada (Baker), New Mexico, Utah.

HOST.— *Abies concolor.*

BIOLOGY.— Specimens were taken from diagonal, biramous parental galleries in limbs, tops, and slash 5–10 cm in diameter.

NOTES.— The above treatment was based on the type series of 15 specimens and on 26 other specimens.

### 24. *Scolytus subscaber* LeConte

Figs. 133, 136

*Scolytus subscaber* LeConte, 1876, Proc. Amer. Philos. Soc. 15:373 (Lectotype, female; Vancouver, British Columbia; Mus. Comp. Zool., 968, present designation)

DIAGNOSIS.— This species is distinguished from *praeceps* LeConte by the much larger size, the flattened male frons, the very finely punctured pronotum, and the much more strongly concave male sternum 2.

MALE.— Length 2.9–4.4 mm, 2.0 times as long as wide; color very dark brown, elytra lighter.

Frons flat to feebly impressed from epistoma to vertex, rather finely aciculate; vestiture fine, long, moderately abundant.

Pronotum as in *praeceps* except much more finely punctured.

Elytra as in *praeceps* except rather obscurely reticulate to base.

Sternum 2 about as in *obelus* Wood except surface subreticulate, punctures minute, carina and tubercle at posterior margin rather poorly developed.

FEMALE.— Similar to male except frons strongly convex; anterior margin of each interstrial puncture finely crenulate; sternum 2 as in female *ventralis* LeConte.

DISTRIBUTION.— British Columbia to California.

CANADA: British Columbia. USA: California, N Idaho, Oregon, Washington.

HOSTS.— *Abies concolor, A. grandis, A. magnifica.*

BIOLOGY.— This species breeds in the shaded-out limbs and tops of overmature trees. It is virtually unknown in slash. The distinctive parental galleries form a somewhat rounded E-shape. Larval mines radiate in all directions and do not score the wood until almost mature.

NOTES.— The above treatment was based on the first two female syntypes in the LeConte Collection; the third syntype is of *ventralis* LeConte. I here designate the first syntype as the lectotype of *subscaber.* Thirty-one other specimens were also examined.

### 25. *Scolytus dentatus* Bright

Figs. 134, 135

*Scolytus dentatus* Bright, 1964, Pan-Pacific Ent. 40:167 (Holotype, male; Cone Peak, Monterey Co., California; California Acad. Sci.)

DIAGNOSIS.— This species is distinguished from *subscaber* LeConte by the more strongly convex male frons, by the presence of a median spine on male sternum 4, and by the normal, unarmed female interstrial punctures.

MALE.— Length 3.2–3.8 mm, 1.9 times as long as wide; color very dark brown to almost black, elytra dark reddish brown.

Frons as in *subscaber* except feebly convex on lower half, more strongly convex above, vestiture slightly coarser, longer.

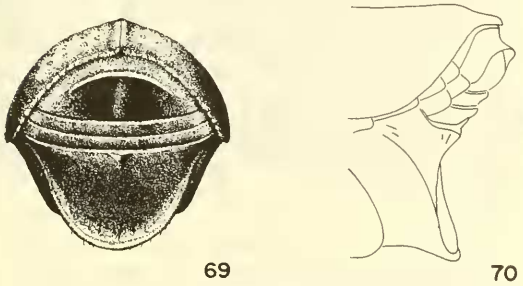



Fig. 133. *Scolytus subscaber*, male: 69, caudal aspect; 70, profile of posterior area. (After Edson 1967:53.)

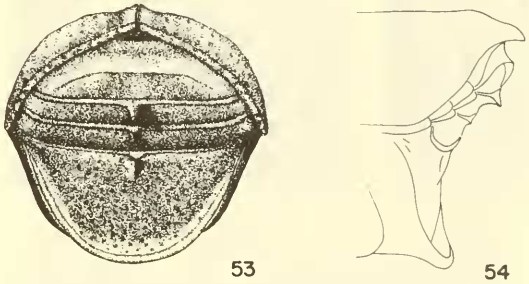



Fig. 134. *Scolytus dentatus*, male: 53, caudal aspect; 54, profile of posterior area. (After Edson 1967:49.)

Pronotum and elytra similar to *subscaber* except pronotal punctures averaging slightly larger; elytra with discal surface smooth, posterior margin more strongly serrate.

Sterna as in *subscaber* except more coarsely punctured; sternum 4 armed by a coarse, median spine, sterna 2 and 3 with a small, median, subtuberculate elevation at posterior margin.

FEMALE.— Similar to male except frons strongly convex; sterna about as in *subscaber* except more coarsely punctured, and posterior margin of 1 projecting slightly.

DISTRIBUTION.— California.

USA: California: Cone Peak, Monterey Co., 29-VI-63, *Abies bracteata*, C. J. Wray.

BIOLOGY.— Specimens were taken from longitudinal, biramous galleries in the limbs and bole of a dying tree.

NOTES.— The above treatment was based on the holotype and on more than 40 paratypes.

### 26. *Scolytus costellatus* Chapuis

*Scolytus costellatus* Chapuis, 1869, Synopsis des Scolytides, p. 58 (Holotype, female; Nova-Fribourg, Brazil; Brussels Mus.)

DIAGNOSIS.— This species is distinguished by characters presented in the above key and by the unique frontal, elytral, and abdominal characters.

MALE.— Length 3.2–3.9 mm, 1.8 times as long as wide; color black.

Frons flat from eye to eye, from epistoma to vertex, epistoma rather deeply emarginate; surface shining, rather finely aciculate over entire surface; vestiture fine, moderately abundant, rather long.

Pronotum 0.96 times as long as wide; basal margin conspicuously bisinuate; sides widest slightly behind middle, moderately arcuate on basal two-thirds, then rather strongly converging to broadly rounded anterior margin; surface brightly shining, with numerous

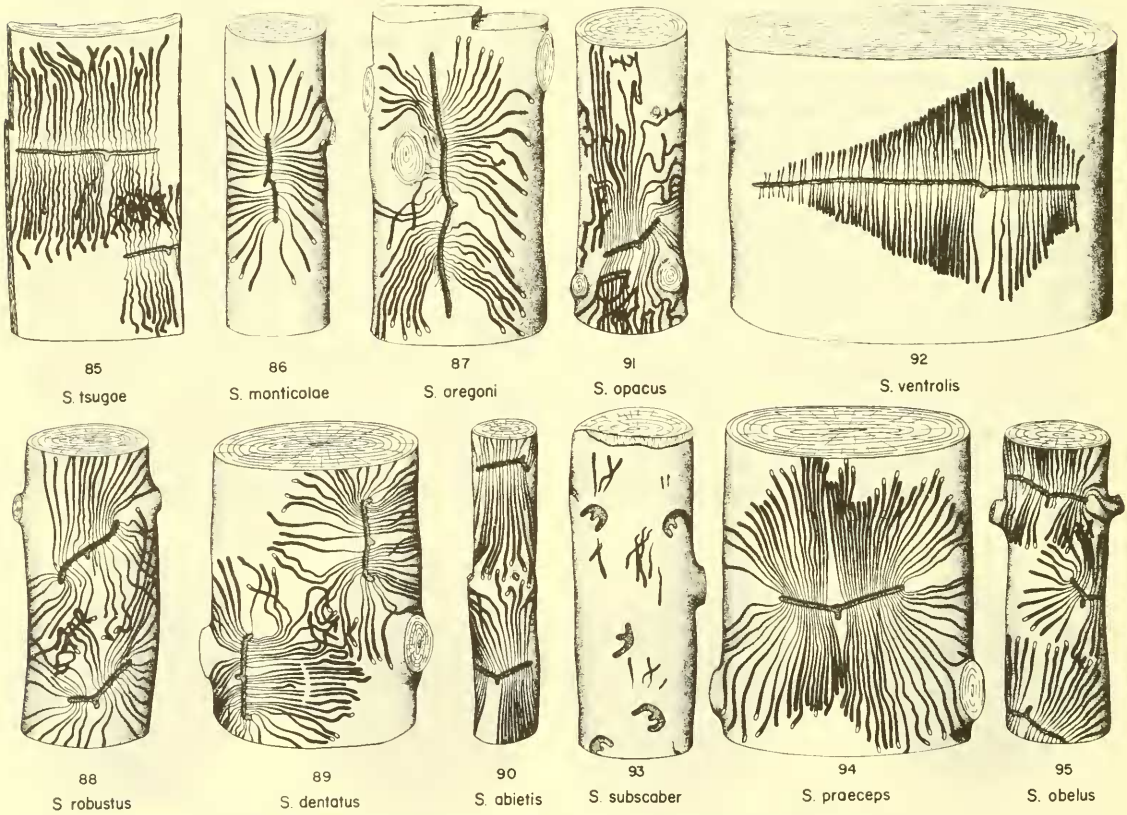



Fig. 135. *Scolytus* spp., gallery systems: 85, *tsugae*; 86, *monticolae*; 87, *oregoni*; 88, *robustus*; 89, *dentatus*; 90, *opacus*. (After Edson 1967:57.)

Fig. 136. *Scolytus* spp., gallery systems: 91, *opacus*; 92, *ventralis*; 93, *subscaber*; 94, *praeceps*; 95, *obelus*. (After Edson 1967:58.)

minute points, punctures fine on disc, becoming rather coarse laterally; surface longitudinally etched in lateral areas. Glabrous except at margins.

Elytra 0.88 times as long as wide, 0.94 times as long as pronotum; scutellum absent; striae and interstriae strongly, narrowly, equally impressed, interspaces as wide as grooves, smooth and shining, strial and interstrial punctures fine, distinctly impressed; approximately alternate interstrial punctures each bearing a rather stout, short, dark hair; posterior margin smooth.

Junction of sterna 1 and 2 with an abruptly elevated, strongly arcuate costa on median two-thirds extending from anterior margin at median line to middle of segment at its lateral extremities; surface of 2 smooth, shining, punctures coarse, rather close, their interiors reticulate and often with a small granule at their centers; other sterna more finely punctured. Vestiture of erect, stout, rather short hair.

FEMALE.— Similar to male except frons weakly convex above, vestiture less abundant; elytral punctures evidently slightly larger; junction between sterna 1 and 2 rounded, costa absent, anterior third of sternum 2 with a low, rounded median elevation half as high as wide, its summit punctured.

DISTRIBUTION.— Costa Rica to Brazil.

COSTA RICA: Guápiles, Limón, 22-VII-66, 100 m, No. 107, woody vine, S. L. Wood; Turrialba, Cartago, 9-III-64, 700 m, No. 468, woody vine, S. L. Wood. OTHER COUNTRIES: Brazil, Venezuela.

NOTES.— The above treatment was based on the holotype and on 84 other specimens.

### 27. *Scolytus cristatus* Wood
Fig. 137

*Scolytus cristatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):12 (Holotype, male; Lower Río Tempisque, Guanacaste, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from other American species by the convex, finely aciculate frons in both sexes, with a median subcarinate ridge, and by the low carina arising from the anterior two-thirds of sternum 2.

MALE.— Length 2.3–2.7 mm, 2.0 times as long as wide; color dark reddish brown.

Frons convex, somewhat flattened below; surface convergently strigose, grooves usually wider than ridges, median ridge higher, subcarinate, extending from epistomal margin almost to upper level of eyes; vestiture fine, long, rather abundant, uniformly distributed.

Pronotum very slightly wider than long; widest on basal third, sides moderately arcuate and converging slightly to constriction just behind broadly rounded anterior margin; surface smooth, shining, with some very minute points and rather widely separated, moderately small, deep, oval punctures, punctures larger in lateral areas and in front; glabrous.

Elytra 1.1 times as long as wide, 1.2 times as long as pronotum; striae and interstriae strongly, equally impressed, punctures moderately large, shallow, ridges between rows of punctures smooth, shining, convex, almost as wide as grooves; declivity descending slightly; a few scattered, slender scales on declivity. Venter with sternum 2 ascending abruptly, not sharply, armed by a median, laterally compressed, rather high elevation extending from near anterior margin of segment two-thirds of its length, highest point on elevation near its posterior limits; sternum 2 very coarsely, shallowly punctured, surface within each puncture reticulate, interspaces subreticulate; sternum 3 with one row of punctures, 4 and 5 not clearly punctured, dull.

FEMALE.— Similar to male except frons subglabrous; carinate armature of sternum 2 not as high, occupying middle third of length of segment.

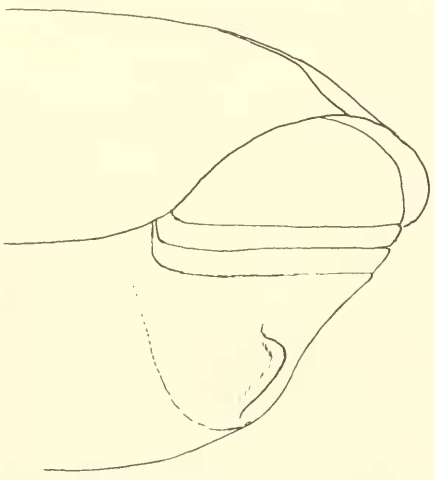


Fig. 137. *Scolytus cristatus*, male: posterolateral aspect of abdomen. (After Wood 1969:13.)

DISTRIBUTION.— Jalisco to Venezuela.

MEXICO: Colima, Jalisco. COSTA RICA: Cañas and Río Tempisque in Guanacaste. OTHER COUNTRIES: Venezuela.

HOST.— Woody vine.

BIOLOGY.— This species was taken from transverse, biramous parental tunnels in recently cut woody vines (lianas).

NOTES.— The above treatment was based on the type series of 31 specimens and on 47 other specimens.

### 28. *Scolytus nodatus* Wood
Fig. 138

*Scolytus nodatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):12 (Holotype, male; Santa Ana, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from other American members of the genus by the armature of the male abdomen as described below.

MALE.— Length 3.1–3.8 mm, 2.0 times as long as wide; color dark brown, anterior margin of thorax and bases and apices of elytra may be reddish brown.

Frons weakly convex; surface coarsely, somewhat convergently strigose toward shallowly, broadly emarginate epistomal margin; punctures not evident; vestiture consisting of fine, rather long, moderately abundant hair. Eye emarginate; very finely granulate. Antennal club 2.0 times as long as wide; sutures not evident, very finely, closely pubescent.

Pronotum equal in length and width; widest at base, sides moderately arcuate and converging to distinct constriction just behind broadly rounded anterior margin; surface smooth, brightly shining, punctures rather small, deep, oval, larger in lateral and anterior areas; glabrous on disc, sparse hair at sides and in front.

Elytra 1.1 times as long as wide, 1.1 times as long as pronotum; sides straight and parallel on basal half, converging slightly behind to broadly rounded posterolateral angles, almost straight on median half; posterior margin smooth, striae and interstriae moderately impressed, punctures small, rather deep, those of striae very slightly larger; elytra descending very slightly near posterior margin; vestiture confined to scutellar impression. Sternum 2 ascending sharply, margin not

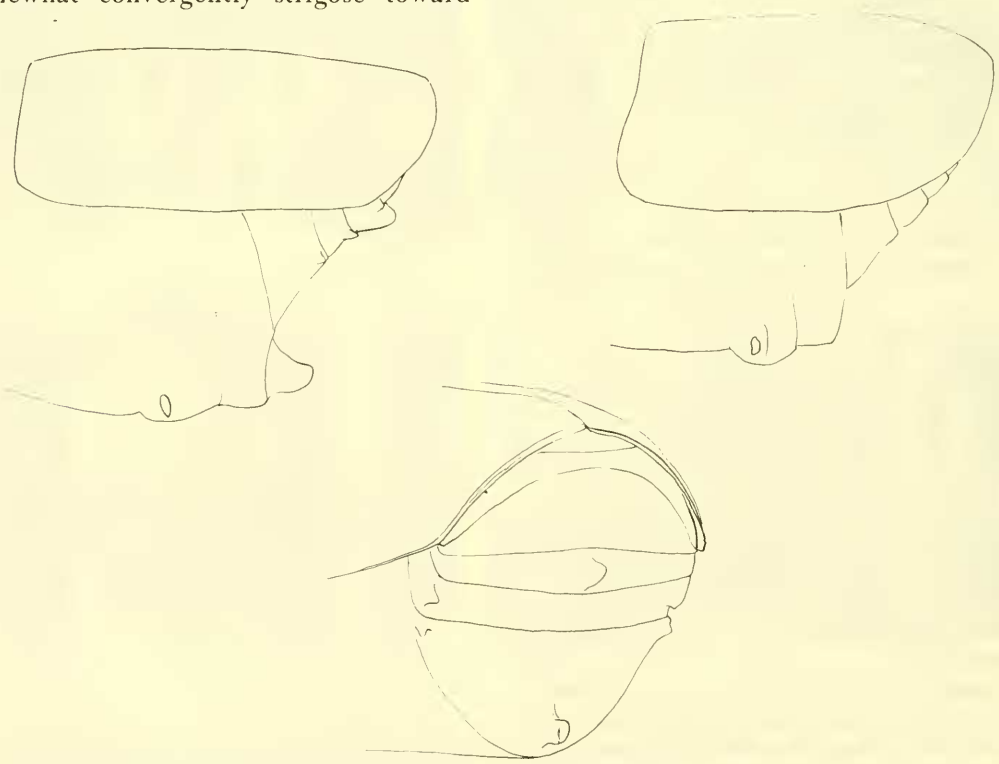


Fig. 138. *Scolytus nodatus*: male, left and below; female, right. (After Wood 1969:12.)

produced, armed by a laterally compressed, median spine, its base extending from anterior margin to middle of segment, longitudinal length of base and height of spine about equal; sternum 4 armed by a large, rounded tubercle, 2 and 3 each armed at lateral margins by a pair of small teeth; surface finely, obscurely punctured, dull except anterior half of 2 shining; pubescence sparse, hairlike.

FEMALE.— Similar to male except frons more nearly flat; all abdominal sterna unarmed.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Santa Ana, San José, 8-XI-63, 1300 m, No. 254, tree limb, S. L. Wood. PANAMA: Ft. Clayton, Canal Zone, 22-XII-63, 30 m, No. 328, woody vine, S. L. Wood.

BIOLOGY.— The Panama series made longitudinal, biramous parental galleries in a large, spiny vine. The Costa Rica specimens apparently were estivating in shallow tunnels in the outer phloem tissues.

NOTES.— The above treatment was based on the type series of 25 specimens.

### 29. *Scolytus propinquus* Blandford

*Scolytus propinquus* Blandford, 1896, Biol. Centr. Amer., Coleopt. 4(6):121 (Syntypes; Mexico, Guatemala, and Cuba; British Mus. Nat. Hist.)

*Scolytus penicillus* Schedl, 1973, Papeis Avulosos Zool. 26:165 (Holotype, male; Veracruz, Mexico; Schedl Coll.); Wood, 1977, Great Basin Nat. 37:210. *Synonymy*

DIAGNOSIS.— This species is distinguished from *dimidiatus* Chapuis by the very different frons and abdominal sterna in both sexes as described below.

MALE.— Length 2.4–3.6 mm, 1.8 times as long as wide; color very dark brown, almost black.

Frons almost flat from epistoma to well above eyes, a slight, transverse impression above epistoma; a stout, moderately large, conical, median elevation slightly below middle; surface obscurely reticulate, punctures fine, not close, longitudinally elongate; vestiture confined to lateral margins, consisting of a dense row of long hair from near base of mandible to slightly above upper level of eyes, setae reduced in size and number on vertex.

Pronotum and elytra about as in *dimidiatus*.

Sterna as in *dimidiatus* except anterior margin of 2 very weakly produced; vestiture of very abundant, short, stout (somewhat scalelike) setae; a conspicuous tuft of long hair immediately posterior to spine on 2 as in *dimidiatus*.

Posterior face of metatibia with a conspicuous brush of very long hair.

FEMALE.— Similar to male except frons shallowly, broadly concave from epistoma almost to upper level of eyes, obscurely reticulate, with dense, deep, rather fine punctures, vestiture uniformly distributed throughout impressed area, of very long, fine hair; sterna with longer, finer setae, 2 unarmed, subvertical, its anterior margin not projecting, tuft of hair absent.

DISTRIBUTION.— Nayarit and Veracruz to Costa Rica.

MEXICO: Chihuahua: Río Urique, 1-I-80, L. Kirkendall. Nayarit: 8 km N Rosamorada, 15-VII-65, 100 m, No. 251, tree limb, No. 249, *Inga paterno*, S. L. Wood. Veracruz: 5 km W Jáltipan, 25-VI-67, No. 99, tree limbs, S. L. Wood; 24 km W Veracruz, 30-VI-53, tree limbs, S. L. Wood. COSTA RICA: Cañas, Guanacaste, 13-VII-56, 50 m, No. 136, leguminous tree, S. L. Wood.

HOSTS.— *Inga paterno*, etc.

BIOLOGY.— This species is bigamous; two females are normally associated with each male. Transverse, biramous parental galleries are cut in limbs and boles larger than 5 cm in diameter.

NOTES.— The above treatment was based on Blandford's three syntypes and on 105 other specimens.

### 30. *Scolytus dimidiatus* Chapuis

Fig. 139

*Scolytus dimidiatus* Chapuis, 1869, Synopsis des Scolytides, p. 57 (Syntypes; Toxpam, Cuba; Brussels Mus.)

DIAGNOSIS.— This species is distinguished from *torulus* Wood as described below.

MALE.— Length 2.1–3.2 mm, 1.8 times as long as wide; color very dark brown, almost black.

Frons almost flat above upper level of ocular emargination, this area minutely reticulate, with a few rather widely spaced, fine punctures; lower third strongly, transversely impressed, subconcave on its median third; a rather strongly developed, transverse elevation on median fifth immediately above impressed area; transverse axis of elevation

about twice as great as its longitudinal axis; vestiture confined to lateral margins, consisting of a dense row of very long, dark hair from near base of mandible to upper level of eye.

Pronotum 0.98 times as long as wide; outline as in allied species; punctures fine on disc, becoming moderately coarse in lateral areas.

Elytra 0.99 times as long as wide, 1.0 times as long as pronotum; outline as in *costellatus* Chapuis; striae feebly impressed, punctures rather small, spaced by more than diameter of a puncture; interstriae smooth, shining, three times as wide as striae, punctures very fine, uniseriate. Vestiture of a few long, stout setae on declivity.

Sternum 2 with basal two-thirds vertical, flat, anterior margin subangulate, not projecting, armed on anterior third by a coarse, median, subconical spine; surface subreticulate, dull, punctures rather fine, moderately deep; surface of sterna 3–5 similar; vestiture of rather short, stout, moderately sparse setae; sternum 2 with a conspicuous tuft of long hair immediately posterior to spine.

FEMALE.— Similar to male except frons weakly concave from epistoma to vertex, reticulate, median half with coarse, longitudinal striations, margins on upper half bearing a dense row of very long hair, tips of some attaining mandibles; sternum 2 weakly convex, spine slightly smaller, tuft of hair absent.

DISTRIBUTION.— Veracruz and Cuba to Venezuela.

MEXICO: Veracruz: 5 km W Jaltipan, 25-VI-67, 50 m, No. 99; tree limbs, S. L. Wood; 24 km W Veracruz, 30-VI-53, tree limbs, S. L. Wood. COSTA RICA: San Ignacio de Acosta, San José, 5-VII-63, 1500 m, No. 29, fence post, S. L. Wood; Santa Ana, San José, 4-X-63, 1300 m, No. 320, tree bole, S. L. Wood. OTHER COUNTRIES: Venezuela (in *Lonchocarpus margaritensis*).

BIOLOGY.— This species is normally bigamous, with two females associated with each male. It attacks the limbs and boles of recently cut or unthrifty trees, apparently including a rather broad spectrum of host species. The biramous parental galleries are transverse.

NOTES.— The above treatment was based on the Chapuis syntypes and on 283 other specimens.

### 31. *Scolytus incognitus* Eggers

*Scolytus incognitus* Eggers, 1951, Ent. Blätt. 45–46:154 (Holotype, female; "Mexico"; deposited in but not now in Eggers Collection, presumably on loan to Schedl)

DIAGNOSIS.— This species differs from *nevermanni* Schedl only by the sculpture and ornamentation of the frons and, in all probability, is the female of that species. It is

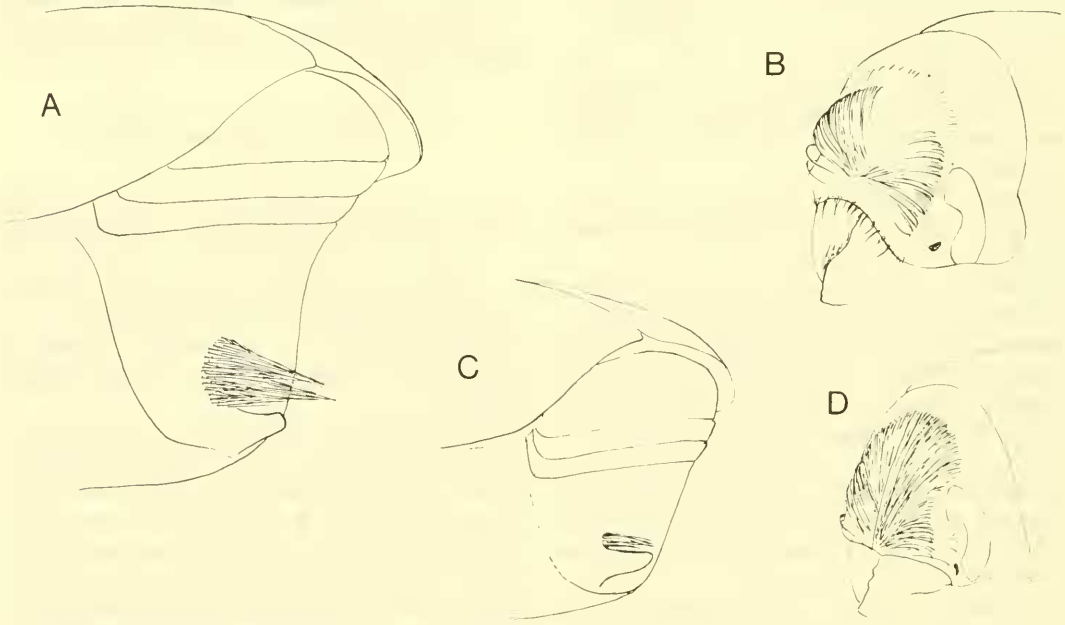



Fig. 139. *Scolytus dimidiatus*, head and abdomen: A, B, male; C, D, female.

distinguished from *dimidiatus* Chapuis in details of sculpture as noted below.

FEMALE.— Length 1.4 mm, 2.2 times as long as wide; callow cotype yellowish brown.

Frons about as in *dimidiatus* except upper areas very obscurely subaciculate, a distinct median callus in position of *nevermanni* elevation; lateral areas adjacent to dorsomedian margin of eye abruptly, more strongly impressed; vestiture confined to margins, hair on lateral margins below eye longer and slightly more abundant than in *dimidiatus*, hair above eyes much shorter and less abundant than in *dimidiatus*, with tips of longest setae reaching slightly below middle of frons.

Pronotum, elytra, and abdominal sterna as in *nevermanni*.

DISTRIBUTION.— "Mexico."

MEXICO: "Mexico, ded. 30-VI-1897, C. Höge."

NOTES.— The above treatment was based on a male in the Schedl collection bearing five labels: (1) *Scolytus incognitus* n. sp. ♂ type, Eggers 1925; (2) ♂ ; (3) the locality record quoted above; (4) cotype; (5) ♀ . The last label was added by Schedl. The first label suggests that this specimen is the holotype although label four places doubt on such a conclusion. This species is not represented in the Eggers collection, although the type and only cotype were deposited there. Schedl (1979:123) lists both type and cotype as being in his collection.

### 32. *Scolytus nevermanni* Schedl

*Scolytus nevermanni* Schedl, 1935, Stylops 4:272 (Lectotype, male; Hamburgfarm on Río Reventazón, Ebene Limón, Costa Rica; Schedl Coll., present designation)

DIAGNOSIS.— This species is distinguished from *proximus* Chapuis by the larger size, by the more coarsely sculptured frons, by the slightly smaller pronotal and elytral punctures, and by the much more slender elytral scales.

MALE.— Length about 3.4 mm, about 2.0 times as long as wide (slightly crushed); color very dark brown.

Frons as in *proximus* except punctures slightly larger, upper half more strongly subaciculate; median elevation positioned as in *proximus* but higher, slightly wider, its dorsal face subconcave; vestiture finer, slightly less abundant.

Pronotum as in *proximus* except punctures averaging slightly smaller.

Elytra as in *proximus* except strial and interstrial punctures on basal two-thirds much finer; interstrial scales similar but more slender and evidently slightly longer (mostly abraded). Abdominal sterna evidently as in *proximus* (partly obscured by debris).

DISTRIBUTION.— Costa Rica.

COSTA RICA: Hamburgfarm on Río Reventazón, Limón, 3-XII-24, *Sapium*, F. Nevermann; Bananito, Limon.

NOTES.— The above treatment was based on the specimen referred to by Schedl as the female; actually, it is a male. The specimen is here designated as the lectotype of this species.

### 33. *Scolytus marginatus* Chapuis

*Scolytus marginatus* Chapuis, 1869, Synopsis des Scolytides, p. 56 (Holotype, female; Yucatán; Brussels Mus.)

DIAGNOSIS.— This species is distinguished from *torulus* Wood by the more strongly convex frons, with the surface smooth except for weak reticulation near the elevation, by the larger frontal elevation, and by the obscure to absent impressed points on the pronotum.

FEMALE.— Size and proportions as in *torulus*; elytral punctures apparently average smaller; distinguished from *torulus* as indicated in the above diagnosis.

DISTRIBUTION.— Yucatán.

MEXICO: Yucatán, Deyr.

NOTES.— The above treatment was based on the holotype.

### 34. *Scolytus torulus* Wood

*Scolytus torulus* Wood, 1975, Great Basin Nat. 35:25 (Holotype, male; Rincón de Osa, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *dimidiatus* Chapuis by the smaller average size, by the subvertical, somewhat convex abdominal sternum 2, by the absence of a tuft of hair on sternum 2 immediately posterior to the spine, by the very different male frons, and by other characters described below.

MALE.— Length 2.0–2.4 mm, 2.1 times as long as wide; color very dark brown to black, elytra slightly lighter.

Frons rather weakly convex above, a distinct, moderately deep, transverse impression just above epistoma, deepest in median area, a distinct but weak, rounded, median elevation immediately above impressed area; surface strongly reticulate above, more shining and obscurely aciculate in impressed area, punctures fine, rather deep, sparse in median area, more numerous laterally; vestiture of fine hair on margins and impressed area, a few of them rather long.

Pronotum as in *dimidiatus* except punctures in lateral areas considerably larger.

Elytra 1.1 times as long as wide, 1.2 times as long as pronotum; surface about as in *dimidiatus* but much more finely punctured, a few to many longitudinal lines or striations sometimes present. Sparse setae shorter and much stouter than in *dimidiatus*.

Sternum 2 subvertical, moderately convex, spine similar to *dimidiatus* but smaller; surface dull, very coarsely, deeply, closely punctured; sterna 3–5 similar but more finely punctured; vestiture of very fine, short hair, without a specialized tuft posterior to spine on 2.

FEMALE.— Similar to male except frons without impression or elevation, not strigose, vestiture similar to but finer and about one-third as abundant as in *dimidiatus* female; spine on sternum 2 about half as large as in male.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 72, leguminous tree, S. L. Wood.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 35. *Scolytus laetus* Wood

*Scolytus laetus* Wood, 1975, Great Basin Nat. 35:25 (Holotype, male; 48 km or 30 miles N Rosamorada, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *torulus* Wood by the flattened sternum 2, which is much more finely, sparsely punctured, with longer, more abundant hair, and by characters of the frons described below.

MALE.— Length 2.4–2.5 mm, 2.4 times as long as wide; color very dark brown.

Frons as in *torulus* except elevation wider, area above elevation more distinctly, more broadly impressed, vestiture on lateral margins more abundant, much longer.

Pronotum and elytra as in *torulus*.

Sternum 2 vertical, almost flat, surface dull, punctures small, not clearly evident, spines as in *torulus*, vestiture much longer, some setae as long as spine.

FEMALE.— Similar to male except frons as in *torulus* but with vestiture slightly more abundant and longer, particularly in lower areas; sternum 2 unarmed, spine absent, vestiture finer, more abundant.

DISTRIBUTION.— Nayarit.

MEXICO: Nayarit: 48 km N Rosamorada, 15-VII-65, 100 m, No. 257, *Inga paterno*, S. L. Wood.

BIOLOGY.— Specimens were mixed with a series of *propinquus* Blandford and, presumably, have similar habits.

NOTES.— The above treatment was based on the type series of five specimens.

## Tribe CTENOPHORINI

Ctenophoridae Chapuis, 1869, Synopsis des Scolytides, p. 49 (Type-genus: *Scolytodes* Ferrari, 1867 = *Ctenophorus* Chapuis, 1869)

Problechilidae Eichhoff, 1878, preprint of Mem. Soc. Roy. Sci. Liége (2)8:298 (Type-genus: *Gymnochilus* Eichhoff, 1867 = *Problechilus* Eichhoff, 1878)

Hexacolidae Eichhoff, 1878, preprint of Mem. Soc. Roy. Sci. Liége (2)8:306 (Type-genus: *Hexacolus* Eichhoff, 1868 = *Scolytodes* Ferrari, 1867)

Anatomical features.— The frons is usually sexually dimorphic, with the male impressed and the female flat to convex in *Pycnarthrum* and *Gymnochilus*; sexual differences are not readily apparent in *Microborus*; the male is convex and the female variously sculptured and ornamented in *Scolytodes*. In addition, the posterior face of the head is truncate, the eye is entire to sinuate, the antennal funicle is 6–7-segmented, the club is usually marked by sutures, the pronotum is armed or not, its lateral margins are costate, the procoxae are rather widely separated, the protibiae have one or more nonsocketed denticles on the lateral margin, with the apical one extending beyond the level of the tarsal insertion, and the pleural suture is essentially as in the Scolytini.

Biological features.— All species are monogamous except for a few *Scolytodes*, and all except one (*Scolytodes multistriatus* Wood is xylophagous) are phloeophagous. The parental tunnels vary in *Scolytodes* from a simple cave to an irregular or elongate cavity; in *Pycnarthrum* and *Gymnochilus* they are biramous, and in *Microborus* an indefinite, nondirectional tunnel is excavated after entry is made into the host through the tunnel of another insect. The eggs may be scattered loosely or placed in crude niches in *Scolytodes*; in *Pycnarthrum* and *Gymnochilus* definite egg niches are formed. The larvae usually feed communally and extend the parental galleries in *Scolytodes*; in *Pycnarthrum* and *Gymnochilus* they are individual and follow a somewhat definite direction, but commonly cross one another. Symbiotic relationships with fungi are not known.

Taxonomy.— This tribe is restricted to the American tropics, except that *Microborus boops* Blandford was introduced into tropical Africa. *Microborus* and *Scolytodes* are closely allied to one another; *Pycnarthrum* and *Gymnochilus* are remotely related to those and to one another. *Pycnarthrum* could just as easily be placed in the Hylesininae as in its present position. This tribe marks a transition from Scolytini to the more highly evolved tribes in this subfamily.

### Genus *MICROBORUS* Blandford

*Microborus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):175 (Type-species: *Microborus boops* Blandford, monobasic)

*Pseudocrypturgus* Eggers, 1919, Ent. Blätt. 15:236 (Type-species: *Pseudocrypturgus camerunus* Eggers = *Microborus boops* Blandford, monobasic); Wood, 1961, Great Basin Nat. 21:101. *Synonymy*

Diagnosis.— This genus is distinguished from *Pycnarthrum* Eichhoff by the very large, approximate eyes, by the unsegmented, subglobular antennal club, by the more slender body form, and by the hairlike vestiture.

Description.— Length 1.1–1.5 mm, 2.7–2.9 times as long as wide; color dark reddish brown; vestiture hairlike, bristles or occasional scales on declivity.

Frons convex; eyes narrowly separated above and below, shallowly emarginate, very coarsely faceted. Antennal club subglobular, feebly flattened, unmarked by sutures; funicle 6-segmented; scape short. Pronotum elongate, unarmed, acutely margined laterally by elevated line. Scutellum small, flush with elytral surface. Elytral striae conspicuous; declivity rather steep, convex, armed on interstriae 2 in some species.

Sexually dimorphic characters usually limited to elytral declivity.

DISTRIBUTION.— Guatemala to Surinam; one introduced species in tropical Africa; eight species are known, and four of them occur in Central America.

BIOLOGY.— Species of this genus live in unusually moist habitats, where they infest logs and limbs previously infested by other beetles. The species are monogamous; they do not construct their own entrance tunnel but utilize that of another species. The tunnels are somewhat nondirectional for both larvae and adults. Evidently several generations may be completed in one piece of bark; the converging brood tunnels become new egg galleries. The tunnels penetrate all parts of the phloem, but in thick-barked trees they are most abundant at the fracture point between inner and outer bark.

Key to the Species of *Microborus*

1. Pronotal surface smooth, shining, with no suggestion of reticulation, punctures coarse, pronotum less than 1.26 times as long as wide; elytral vestiture more abundant, extending to base on both striae and interstriae, little if any longer on declivity ..... 2

— Pronotum slightly to entirely reticulate, punctures fine to moderately coarse, pronotum more slender, at least 1.27 times as long as wide; elytral vestiture largely absent from disc, strial setae rarely present, interstrial setae conspicuously longer on declivity ..... 3

2(1). Elytral declivity without an acutely elevated carina from junction of interstriae 7 and 9 to sutural apex; frons smooth, shining; pronotum more slender, 1.26 times as long as wide; Puerto Rico; 1.3–1.6 mm ..... ***lautus*** **Wood**

— Elytral declivity with an acutely elevated carina from junction of interstriae 7 and 9 to sutural apex; frons uniformly, strongly reticulate; pronotum stouter, 1.1 times as long as wide; Morelia; *Bursera*; 1.0–1.1 mm ..... 1. ***mexicanus*** **Wood**

3(1). Punctures on at least discal interstriae 3 and 4 minute, almost obsolete, very widely spaced; vestiture absent except sparse and minute on declivity; tubercles on male declivital interstriae 2 small, not larger than in female ..... 4

— Punctures on discal interstriae closer, more regular; elytral vestiture more abundant, longer; one or more tubercles on male declivital interstriae 2 conspicuously wider than on female ..... 5

4(3). Discal striae not impressed, punctures small; pronotal punctures fine, rather sparse; declivital interstrial granules minute, scarcely visible; Costa Rica; 1.3–1.5 ..... 2. ***limatus*** **Wood**

— Discal striae distinctly impressed, punctures rather coarse; pronotal punctures rather coarse, close; declivital interstrial granules larger, clearly visible; Veracruz to Tabasco; 1.3–1.4 mm ..... 3. ***ambitus*** **Wood**

5(3). Eyes broadly separated above by twice width of an eye; tubercles on male declivital interstriae 2 only slightly enlarged; setae on all declivital interstriae uniseriate, none longer than distance between rows; crest of subapical declivital carina of almost uniform height, only feebly serrate; Venezuela; *Clusia*; 1.4–1.5 mm ..... ***lectus*** **Wood**

— Eyes narrowly separated above by half width of an eye; one to four tubercles on male declivital interstriae 2 enlarged; setae (except on a few females) on at least declivital interstriae 2 abundant, confused, most much longer than distance between rows; crest of subapical declivital carina more strongly serrate ..... 6

6(5). Discal striae more strongly impressed, as wide or wider than interstriae; setae on declivital interstriae as long as distance between rows, those on 3 usually uniseriate; crest of subapical declivital carina strongly serrate; Guatemala to Panama, etc.; *Rheedia*, lianas, etc.; 1.2–1.4 mm ..... 4. ***boops*** **Blandford**

— Declivital striae feebly impressed, narrower than interstriae; setae on declivital interstriae up to two or more times longer than distance between rows, those on 3 abundant and confused; crest of subapical declivital carina only moderately serrate; Venezuela to Surinam; *Clusia*; 1.3–1.4 mm ..... ***imitans*** **Eggers**

### 1. *Microborus mexicanus* Wood

*Microborus mexicanus* Wood, 1981, Great Basin Nat. 41:123 (Holotype, male; Las Piedras, Moyotepec, Morelia, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *lautus* Wood by the darker color, by the stouter body and pronotum, by the different declivity, and by other characters described below.

MALE.— Length 1.0–1.1 mm, 2.3 times as long as wide; color almost black.

Frons convex, reticulate; eyes separated above by 2.5 times width of an eye. Antenna typical of genus, with funicle stouter than normal.

Pronotum 1.1 times as long as wide; sides straight and parallel on basal half, rather broadly rounded in front; surface smooth, shining, punctures rather coarse, deep, spaced by less than diameter of a puncture. Short hairlike setae arise from punctures, each about as long as diameter of a puncture.

Elytra 1.3 times as long as wide, 1.4 times as long as pronotum; outline and disc as in *lautus* except striae more distinctly impressed; declivity steeper than but similar to *lautus* except on declivity interstriae 7 and 9 more acutely carinate, acute carina continuing from their junction to apex; strial setae continue to base, only very slightly shorter than those of interstriae; interstrial setae extend to base, close, uniseriate on disc, each three-fourths as long as distance between rows, slightly longer on declivity, slightly confused on 2 and 3.

FEMALE.— Similar to male except setae on declivital interstriae 2 and 3 less obviously confused.

DISTRIBUTION.— Morelia.

MEXICO: **Morelia**: Las Piedras, Moyotepec, 17-VII-80, 1060 m, No. S-077, *Bursera*, T. H. Atkinson.

NOTES.— The above treatment was based on the type series of five specimens.

### 2. *Microborus limatus* Wood

*Microborus limatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):13 (Holotype, male; Finca Gromaco on Río Coto Brus, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species may be distinguished by characters summarized in the above key.

MALE.— Length 1.3–1.5 mm, 2.7 times as long as wide; body color dark brown, elytra medium brown.

Frons narrow and feebly convex between eyes, protruding very slightly just above antennal bases; surface smooth and polished, with a few scattered, minute punctures; almost glabrous. Eyes very large, almost touching below; anterior margin very broadly emarginate; very coarsely faceted. Antennal scape short, about twice as long as pedicel; funicle 6-segmented; club subglobular, sutures obscurely marked by rows of setae.

Pronotum 1.25 times as long as wide; sides almost straight and parallel on basal three-fourths, rather broadly rounded in front; anterior angles not narrowed; surface shining, weakly reticulate, punctures rather small, shallow, separated from one another by one to two diameters of a puncture. Glabrous.

Elytra 1.9 times as long as wide; sides almost straight and parallel on basal three-fourths, narrowly (subangulately) rounded behind; striae 1 moderately, 2 weakly impressed, narrow, punctures small, separated by distances equal to their own diameters; interstriae distinctly wider than striae, smooth, brightly shining, each with a sparse row of minute punctures. Declivity rather steep, not precipitous; striae and interstriae about as on disc, except interstrial punctures very finely granulate; interstriae 7 and 9 acutely elevated from declivital base to point of fusion, acute elevation continuing to apex. Vestiture short, sparse, almost entirely

restricted to declivity; each hairlike seta about equal to half width of an interstriae, and separated from one another by about one and one-half to two times length of a setae.

FEMALE.— Similar to male except more finely sculptured; declivital granules scarcely visible.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 87, S. L. Wood.

BIOLOGY.— This species was taken in series with a species of *Gnatholeptus* from thick bark of recently cut limbs 20 cm in diameter.

NOTES.— The above treatment was based on the type series of 13 specimens.

### 13. *Microborus ambitus* Wood

*Microborus ambitus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):13 (Holotype, female; 25 km E Coatzocoalcos, Veracruz, Mexico; Wood Coll.)

DIAGNOSIS.— This species may be distinguished by characters summarized in the above key.

FEMALE.— Length 1.3–1.4 mm, 2.9 times as long as wide; color of head and pronotum very dark brown, posterior areas and legs reddish brown.

Head, pronotum, and elytral disc as in *limatus* Wood except as noted in the key. Pronotal punctures slightly deeper. Elytral declivity convex, steep; striae slightly impressed, punctures coarse, deep; interstriae slightly narrower than striae, very slightly convex, each bearing a uniseriate row of fine granules; interstriae 7 very acutely, strongly elevated, joining 9 and continuing but declining in height slightly along costal margin to sutural apex, 9 narrowly, not strongly elevated from level of hind coxae to junction with 7. Vestiture confined to declivity, consisting of interstrial rows of fine, short, almost hairlike bristles.

MALE.— Both sexes probably represented in series at hand but sexual differences not apparent.

DISTRIBUTION.— Veracruz and Tabasco.

MEXICO: Veracruz: 25 km E Coatzocoalcos, 26-VI-67, 30 m, No. 110. Tabasco: 22 km W Cárdenas, 26-VI-67, 30 m, No. 106, all by S. L. Wood.

BIOLOGY.— Both series were taken from the same host species in cut limbs and boles 10–20 cm in diameter. It was taken in series with a species of *Pityophthorus*.

NOTES.— The above treatment was based on the type series of six specimens.

### 4. *Microborus boops* Blandford

*Microborus boops* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):175 (Holotype, female; Tamahú, Alta Verapaz, Guatemala; British Mus. Nat. Hist.)

*Pseudocrypturgus camerunus* Eggers, 1919, Ent. Blätt. 15:236 (Sex ?: Kamerun; Schreiner Coll., destroyed with Hamburg Mus.). *New synonymy*

DIAGNOSIS.— This species may be distinguished by characters summarized in the above key.

FEMALE.— Length 1.2–1.4 mm, 2.7 times as long as wide; color dark reddish brown.

Head, pronotum, and elytral disc as in *limatus* except as noted in key. Elytral declivity steep, convex; striae slightly impressed, punctures deep, rather coarse; interstriae as wide as striae, weakly convex, shining, most minute punctures finely granulate; interstriae 7 and 9 acutely elevated, converging posteriorly and continuing to apex, about as high as thick. Vestiture consisting of moderately abundant long hair on declivity, each seta about equal in length to twice width of an interstriae.

MALE.— Similar to female except striae more strongly impressed on disc, interstriae on disc more coarsely sculptured; declivital interstriae more convex, 2 usually slightly elevated and frequently armed by one to six small teeth, granules on other interstriae slightly larger than in female; lateral costa on declivity slightly higher, often scalloped or subserrate; vestiture coarser. Declivity, particularly interstriae 2, variable within and between series, left and right sides of same specimen may differ strikingly.

DISTRIBUTION.— Guatemala to Panama, Jamaica, and Africa.

GUATEMALA: Tamahú, Alta Verapaz, G. C. Champion. HONDURAS: La Ceiba, 29-V-49, and Olanchito, 19-V-49, both at light, E. C. Becker. COSTA RICA: Turrialba, Cartago, 9-III-64, 700 m, No. 469, woody vine; Río Damitas, Dota Mts., San José, 18-II-64, 250 m, No. 434, *Rheedia edulis*, both by me. PANAMA: Barro Colorado Island, Canal Zone, 16-IV-67, H. Hespenheide.

HOSTS.— *Rheedia edulis* and a woody vine (liana).

BIOLOGY.— As described for the genus.

NOTES.— More than 60 specimens of this species were examined, including the female holotype from Guatemala, 7 specimens from Africa (including a male cotype of *Pseudocrypturgus camerunus*), 2 from Jamaica, 2 from Honduras, and 56 from Costa Rica. The females are relatively constant in anatomical features, but the males present a surprising degree of variation.

In two males from Río Damitas, declivital interstriae 2 is armed by two pairs of pointed denticles; the declivital setae are almost as coarse and only slightly longer than on males from Africa and Honduras. Of the 12 males from Turrialba, Cartago Prov., the declivital interstriae 2 is unarmed by denticles on 7 specimens, but on the 5 remaining specimens there are from one to five denticles on each side (the total number on both sides varying from one to seven). In addition, declivital interstriae 1 to 7 bear rounded granules in all specimens; these granules vary from minute in some specimens to moderately large, rounded nodules in others. The transition is gradual within the series and is not related to the presence or absence of teeth on interstriae 2. The vestiture is rather coarse and is about equal in length to twice the distance between rows of bristles. Some specimens clearly are the same as the African and Honduras specimens, others are like the Río Damitas specimens. Because the entire Turrialba series came from the same small piece of host material, it is clear that only one species is represented. In view of this, it appears that *camerunus* (Eggers), from Africa and Honduras, represents only one variation of a widely distributed, variable species.

## GENUS *PYCNARTHRUM* EICHHOFF

*Pycnarthrum* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:41, 104 (Type-species: *Pycnarthrum gracile* Eichhoff =*P. hispidum* Ferrari, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:128)

*Nemobius* Chapuis, 1869 (nec. Serville, 1839), Synopsis des Scolytides, p. 41 (Type-species: *Nemobius lambottei* Chapuis =*P. hispidum* Ferrari, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:128). *Preoccupied*

*Monebius* Hopkins, 1914, Proc. U.S. Nat. Mus. 48:125 (Replacement name)

*Nomebius* Navas, 1915, Bol. Soc. Aragonesa Cienc. Nat. 14:34 (Replacement name)

DIAGNOSIS.— This genus is distinguished by the large, very coarsely faceted eyes, by the 6-segmented funicle, by the asymmetrical, flattened antennal club, with two or three suboblique sutures, by the dense, short vestiture, and by other characters summarized in the above key.

DESCRIPTION.— Length 1.3–2.1 mm, 2.2 times as long as wide; color pale yellow to black.

Frons dimorphic, flattened to convex in female, flattened to concave in male; eye elongate, approximate below, separated above by a distance as great or greater than width of eye, rather coarsely faceted. Antennal scape long; funicle 6-segmented; club flattened, asymmetrical, sutures 1 and 2 clearly marked by setae, 1 partly septate. Pronotum quadrate, unarmed, punctured; lateral margins acutely elevated. Scutellum small, oval; elytra striate, declivity rather steep, flattened or convex; unarmed; vestiture short, rather abundant. Tibiae characteristic of tribe.

DISTRIBUTION.— S Florida and Mexico to Brazil. More than a dozen names have been proposed in the genus, but there is a great deal of synonymy; seven species occur in North and Central America.

BIOLOGY.— These monogamous species construct biramous parental galleries in the cambium region of the host tree, where they deposit eggs individually in specially prepared niches as in other bark beetle groups. The larval mines wander at random. Populations frequently are so dense that gallery patterns are completely obliterated.

### Key to the Species of *Pycnarthrum*

1. Interstriae completely devoid of all traces of median rows of bristles; bristles or long hair also absent on head, thorax, or other parts of body; interstrial

punctures confused, uniformly minute; male frons flattened; Honduras; 1.6 mm ..... 1. ***inornatum*** **Wood**

— Interstriae each with a median row of closely set, longer, stouter setae in addition to ground cover; longer setae also present on anterior or lateral areas of thorax and other areas; a median row of interstrial punctures usually evident in addition to fine, confused punctures ..... 2

2(1). Interstrial ground cover scalelike or subplumose on both disc and declivity; erect bristles on anterior half of disc stout, usually less than four times as long as wide, each shorter in length than width of an interstriae ..... 3

— Interstrial ground cover on anterior half of disc very fine, hairlike; erect bristles on anterior half of disc slender, at least six times as long as wide, each equal in length to width of an interstriae ..... 5

3(2). Male frons rather deeply concave from upper level of eyes to epistoma, female frons convex, very finely granulate; mature color yellow; elytral declivity more narrowly convex, strial punctures less deeply impressed, somewhat confluent toward apex; Chiapas to Venezuela; *Ficus*; 1.6–1.7 mm ..... 2. ***reticulatum*** **Schedl**

— Male frons flattened; female frons convex, reticulate, clearly punctured; color darker ..... 4

4(2). Striae not impressed, punctures rather small, shallow, distinct; setae in elytral ground vestiture more slender, scarcely if at all subplumose; pronotum more finely punctured; color black; Honduras; 1.3–1.4 mm ..... 3. ***furnerium*** **Wood**

— Striae often weakly impressed, punctures rather coarse, deep; setae in elytral ground vestiture stouter, more nearly subplumose; pronotal punctures coarser; color dark brown, elytra often lighter; S Texas and Florida to Panama and British Guiana; *Ficus*; 1.5–2.1 mm ..... 4. ***hispidum*** **(Ferrari)**

5(2). Male frons flattened; pronotal punctures moderately coarse, not as close; strial punctures on disc deeper, those toward base wider than long; elytral declivity steeper, strial punctures smaller, not as deep, vestiture shorter, more abundant; color very dark brown; Honduras; 1.3–1.6 mm ..... 5. ***perditum*** **Wood**

— Male frons either flattened or concave; pronotal punctures rather dense, fine; strial punctures not as deep or as crowded, circular; elytral declivity not as steep, strial punctures larger, deeper, vestiture less abundant, longer; color yellowish to light brown ..... 6

6(5). Male frons flattened; declivity more evenly convex, including central area; punctures on male striae 1 smaller, as on 2, granules on male interstriae 2 minute; elytral setae averaging stouter, slightly shorter; Costa Rica; *Cedrela*; 1.5–1.9 mm ..... 6. ***lucidum*** **Wood**

— Male frons moderately concave; declivity distinctly impressed in central area; punctures on male striae 1 much larger than those on 2; granules on male discal interstriae 2 larger; elytral setae more slender, slightly longer; Costa Rica to Colombia and Venezuela; *Brosimum*; 1.9–2.2 mm ..... 7. ***brosimi*** **Wood**

### 1. *Pycnarthrum inornatum* Wood

*Pycnarthrum inornatum* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):11 (Holotype, female; Olanchito, Honduras; Wood Coll.)

DIAGNOSIS.— This species, at least superficially, is very similar to *hispidum* (Ferrari) except that all long setae or bristles are absent from the entire body; the vestiture consists only of the very short ground cover of scales.

FEMALE.— Length 1.6 mm, about 2.2 times as long as wide (elytra of type spread slightly); color very dark brown, elytra lighter.

Frons weakly convex except indistinctly concave on central third; eyes separated above by distance greater than width of an eye; surface reticulate, punctures moderately coarse, rather close, sharply, not deeply impressed; vestiture of minute hair and scales, each not longer than twice diameter of a puncture. Antennal club and flagellum missing on type.

Pronotum about equal in length and width; widest at middle, sides weakly arcuate, broadly rounded in front; surface shining, subreticulate on anterior surface, with minute points moderately abundant, punctures moderately coarse, deep, close, interspaces not wider than distance equal to diameter of a puncture. Vestiture inconspicuous, consisting of short, slender hair and on anterior half some equally short, stout setae intermixed.

Elytra about 1.4 times as long as wide; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae 1 moderately, others not impressed, punctures coarse, deep, rather close; interstriae as wide as striae, subshining, very obscurely subreticulate, punctures small, moderately abundant, confused. Declivity steep, broadly convex; interstriae 2 somewhat impressed, narrower than others. Vestiture consisting of minute strial hair on disc only, and short, confused, subplumose, narrow scales equally abundant on disc and declivity; rows of erect bristles found in other species of this genus entirely absent.

DISTRIBUTION.— Honduras.

HONDURAS: Olanchito, Yoro, 7-X-49, at light, E. C. Becker.

NOTES.— The above treatment was based on the holotype.

### 2. *Pycnarthrum reticulatum* Schedl

*Pycnarthrum reticulatum* Schedl, 1940, An. Esc. Nac. Cienc. Biol. (Mexico) 1:355 (Lectotype, female; Tonalá, Chiapas, Mexico; Schedl Coll., designated by Wood, 1974, Great Basin Nat. 34:287)

*Pycnarthrum fici* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):11 (Holotype, male; 5 km W El Pino, Merida, Venezuela; Wood Coll.); Wood, 1974, Great Basin Nat. 34: 287. *Synonymy*

DIAGNOSIS.— This species superficially resembles *hispidum* (Ferrari), but it may be distinguished by the deeply concave male frons, by the pale yellow, mature body color, by the more narrowly convex elytral declivity, and by the shorter elytral vestiture.

FEMALE.— Length 1.6–1.7 mm, 2.2 times as long as wide; color pale yellow.

Frons moderately convex to near epistoma; surface reticulate to very finely subrugulose, punctures minute, indistinct; eyes rather narrowly separated above, separated by distance equal to 1.5 times width of an eye; vestiture of rather fine, short, moderately abundant setae. Antennal club 1.6 times as long as wide; sutures 1 and 2 distinct, 3 obscurely indicated.

Pronotum proportions and outline as in *hispidum*; surface reticulate on anterior third, obscurely subreticulate behind, punctures uniformly rather small, shallow, close. Vestiture very short, of fine and stout setae intermixed.

Elytra 1.4 times as long as wide; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae weakly impressed, punctures very shallow, obscurely impressed, of moderate size; interstriae about one and one-half times as wide as striae, surface not regular, evidently very minutely rugose, punctures minute, many very minutely elevated, particularly along median row. Declivity rather steep, convex; striae and interstriae slightly narrower, striae more distinctly impressed, punctures less distinct. Vestiture consisting of short, stout, moderately abundant ground cover mostly in indefinite marginal rows on each interstriae, not subplumose, and interstrial rows of erect, stout bristles, each bristle about one and one-third times as long as ground setae, very slightly shorter in length than width of an interstriae, at least six times as long as wide.

MALE.— Similar to female except frons rather deeply concave from upper level of eyes to epistoma; frontal surface perhaps a little more granulate.

DISTRIBUTION.— Chiapas to Venezuela.

MEXICO: Chiapas: Tonalá, 30-VII-32, Dampf. GUATEMALA: Cuyotenango, Suchitepiquez, 10-IV-65, J. M. Campbell. HONDURAS: La Ceiba, Atlántida, 15-V, 26-VIII-49, at light, E. C. Becker; Olanchito, Yoro, 21-VI, 8-IX-49, at light, E. C. Becker. OTHER COUNTRIES: Venezuela, Jamaica.

HOST.— *Ficus* spp.

BIOLOGY.— In Venezuela this species attacked limbs and bole of the host. Parental galleries were biramous and transverse; larval mines so completely riddled the inner bark that a pattern could not be ascertained.

NOTES.— The above treatment was based on the lectotype of *reticulatum*, on the type series of *fici*, and on five specimens from Honduras.

### 3. *Pycnarthrum funerium* Wood

*Pycnarthrum funerium* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):11 (Holotype, female; La Ceiba, Atlántida, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *hispidum* (Ferrari) by the very small size, by the black color, by the small, shallowly impressed strial punctures, and by the more slender, less plumose setae in the elytral ground vestiture.

FEMALE.— Length 1.3–1.4 mm, 2.2 times as long as wide; color black.

Frons rather strongly, evenly convex to epistoma; surface reticulate, becoming subrugulose below, punctures fine, shallow, obscure; eyes separated by distance greater than width of an eye; vestiture of rather sparse, stout, erect, moderately long, white bristles. Antennal club 2.0 times as long as wide; two sutures indicated.

Pronotum 0.93 times as long as wide; widest at or slightly in front of middle, sides weakly arcuate, very broadly rounded in front; surface strongly reticulate on anterior third, obscurely reticulate behind, subshining, punctures small, close, moderately deep. Vestiture of fine hair and stout bristles intermixed over entire surface, moderately long.

Elytra about 1.4 times as long as wide; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures rather small, distinct, very shallow; interstriae almost twice as wide as striae, evidently obscurely subreticulate, median row of punctures uniseriate, very small but almost twice as large as confused supplementary punctures. Declivity rather steep, rather narrowly convex, not at all impressed; essentially as on disc, except strial punctures very slightly deeper. Vestiture consisting of short ground cover of rather fine (anteriorly) to stout (posteriorly), semirecumbent, hairlike bristles, a few exhibit indications of being subplumose; and longer, erect, uniseriate rows of stout, almost scalelike setae, each slightly less than twice as long as ground vestiture and about four to six times as long as wide; not longer on declivity.

DISTRIBUTION.— Honduras.

HONDURAS: La Ceiba, 27,29-V, 10-VI-49, at light, E. C. Becker.

NOTES.— The above treatment was based on the four females in the type series.

### 4. *Pycnarthrum hispidum* (Ferrari)

Fig. 140

*Hypoborus* (?) *hispidus* Ferrari, 1867, Die Forst- und Baumzuchtschädlichen Borkenkäfer, p. 19 (Sex?; Cuba; lost, missing from its pin at Vienna Mus.)

*Nemobius lambottei* Chapuis, 1869, Synopsis des Scolytides, p. 42 (Lectotype, female; Teapa, Mexico; Brussels Mus., designated by Wood, 1973, Great Basin Nat. 33:183). *Synonymy*

*Pycnarthrum gracile* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:41, 104 (Lectotype, male; Cuba; U.S. Nat. Mus., designated by Wood, 1973, Great Basin Nat. 33:183). *Synonymy*

*Pycnarthrum quadraticolle* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2):8:41, 106 (Lectotype, male; Mexico; U.S. Nat. Mus., designated by Wood, 1973, Great Basin Nat. 33:183). *Synonymy*

*Pycnarthrum transversum* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):177 (Lectotype, female; Mirandilla, Guatemala; British Mus. Nat. Hist., designated by Wood, 1973, Great Basin Nat. 33:183). *Synonymy*

*Pycnarthrum reimoseri* Schedl, 1934, Ent. Blätt. 30:208 (Female syntypes; Jimenez on Osa Peninsula, and Volcán Irazu, Costa Rica; Vienna Mus. and Schedl Coll.); Wood, 1973, Great Basin Nat. 33:183. *Synonymy*

DIAGNOSIS.— This very abundant species is taken or seen by almost anyone who collects insects at light within its range for any length of time. The above key summarizes the distinguishing characters.

FEMALE.— Length 1.5–2.1 mm, 2.2 times as long as wide; color very dark brown, elytra, legs, and antennae somewhat lighter, vestiture light yellowish white.

Frons moderately convex to epistoma; surface reticulate, punctures moderately coarse, distinctly impressed, rather close; eyes widely separated; vestiture of fine and stout setae of moderate length intermixed. Antennal club 1.5 times as long as wide, two sutures indicated.

Pronotum 0.94 times as long as wide; widest at or in front of middle, sides weakly arcuate, broadly rounded in front; surface reticulate on anterior third, subshining, with rather numerous, very minute points behind, punctures irregular in size, moderately coarse, close, deep. Vestiture of rather short, fine, and stout setae intermixed.

Elytra 1.3 times as long as wide; sides almost straight and parallel on basal two-thirds, broadly rounded behind; striae usually weakly impressed, punctures coarse, deep, rather close; interstriae as wide as striae, almost smooth, punctures fine, confused, an indefinite median row (bearing erect bristles) indistinctly larger. Declivity rather steep, broadly flattened; striae more distinctly impressed, punctures slightly smaller; interstriae weakly convex, 1 slightly elevated, median rows of punctures more conspicuous. Vestiture of moderately abundant, short, subplumose scales in ground cover, and median rows of erect, stout bristles, each bristle slightly less than twice as long as ground setae, at least six times as long as wide, about equal in length to width of an interstriae.

MALE.— Similar to female except frons flat from upper level of eyes to epistoma, feebly concave near center; frontal vestiture distinctly longer.

DISTRIBUTION.— S Texas and Florida to Panama and British Guiana.

USA: S Florida, S Texas. MEXICO: Chiapas, Colima, Jalisco, Michoacán, Oaxaca, Puebla, Tabasco, Tamaulipas, Veracruz, Yucatán. OTHER COUNTRIES: Costa Rica, Guatemala, Honduras, Panama, El Salvador, Cuba, Guadeloupe, Jamaica, Puerto Rico, Virgin Islands, British Guiana.

HOST.— *Ficus* spp.

BIOLOGY.— This abundant species occurs in fig trees from sea level to an elevation of about 1300 m; it is rather uncommon at higher elevations. It infests almost any area of bark on cut or injured limbs or bole larger than 5 cm in diameter. Parental galleries are biramous, transverse, and almost entirely in the bark. Larval mines wander aimlessly and usually completely obliterate parental mines. Development evidently is very rapid, thus permitting more than one generation to attack the same felled tree.

NOTES.— The holotype of *hispidum* is missing from its pin and is presumed lost. Eichhoff (1878:105) appears to have examined

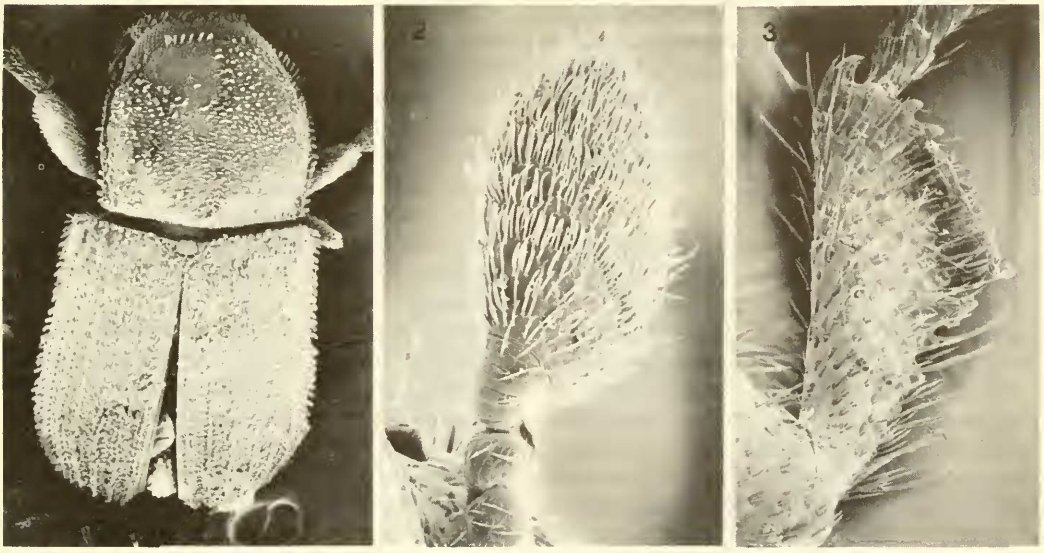



Fig. 140. *Pycnarthrum hispidum* female: 1, dorsal aspect; 2, antenna; 3, metatibia.

Ferrari's specimen and considered it to be synonymous with his *gracile*. If Eichhoff's generic placement of *hispidum* is correct, then the synonymy is acceptable because it is the only representative of the genus known from Cuba.

The above treatment was based on the lectotypes of *lambottei*, *gracile*, *quadraticole*, and *transversum*, on at least 2 syntypes of *reimoseri*, and on more than 1000 other specimens.

This very common species is attracted to light, where it is often collected in large numbers.

### 5. *Pycnarthrum perditum* Wood

*Pycnarthrum lucidum* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):12 (Holotype, male; Finca Gromaco on Río Coto Brus, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species and *lucidum* Wood have the small setae on the basal half of the elytra much more slender, and the erect bristles longer than in other representatives of the genus. From *lucidum* this species is distinguished by the larger, more widely spaced pronotal punctures, by the more abrupt slope of the elytral declivity, and by the less strongly impressed male frons.

FEMALE.— Length 1.3–1.6 mm, 2.3 times as long as wide; color very dark brown, elytra, legs, and antennae lighter, vestiture pale yellowish white.

Frons convex from upper level of eyes to epistoma; surface reticulate, rather finely, shallowly punctured, a conspicuous median fovea at center; eyes separated above by 1.4 times width of an eye. Antennal club 2.0 times as long as wide; sutures 1 and 2 indicated.

Pronotum proportions, outline, and sculpture as in *hispidum* except punctures uniformly rather large, deep, not as close; vestiture of fine hair except intermixed with stouter setae on margins and on anterior fifth.

Elytra 1.5 times as long as wide; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae 1 feebly, others not impressed, punctures moderately large, rather deep; interstriae as wide as striae, punctures of two sizes, a median row of small punctures and less abundant very minute punctures on margins of interstriae. Declivity rather steep, convex; striae distinctly impressed, narrower than on disc; interstriae weakly convex. Vestiture of fine strial hair and equally fine, short, recumbent, sparse interstrial hair, and interstrial rows of longer, erect, slender bristles, each bristle one and one-half times as long as ground vestiture, equal in length to width of an interstriae, more than eight times as long as wide.

MALE.— Similar to female except frons more weakly convex, flattened on median area on lower half; frontal fovea present; interstrial bristles slightly stouter.

DISTRIBUTION.— Honduras.

HONDURAS: La Ceiba, Atlántida, 26-VIII-49, at light, E. C. Becker.

NOTES.— The type series of two specimens was used to prepare the above treatment.

### 6. *Pycnarthrum lucidum* Wood

*Pycnarthrum lucidum* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):12 (Holotype, male; Finca Gromaco on Río Coto Brus, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *perditum* Wood by the concave male frons, by the closer, finer, pronotal punctures, by the more gradual elytral declivity, by the larger, deeper strial punctures, and by the less abundant, finer pronotal and elytral vestiture.

FEMALE.— Length 1.5–1.9 mm, 2.3 times as long as wide; color brown, elytra somewhat lighter, vestiture pale.

Frons convex from upper level of eyes to epistoma, a feeble, transverse impression near center; surface shining, obscurely reticulate; punctures rather fine, deep, rather close; eyes separated by distance equal to width of an eye. Antennal club 1.6 times as long as wide, sutures 1 and 2 distinct, 3 obscurely indicated.

Pronotum proportions and outline as in *perditum*; surface brightly shining except obscurely reticulate on anterior third; minute impressed points present, punctures rather small, deep, close. Vestiture mostly abraded, very fine, a few coarse setae in anterolateral areas.

Elytra 1.4 times as long as wide; sides straight and parallel on basal two-thirds,

rather narrowly rounded behind; striae weakly impressed, punctures coarse, close, moderately deep; interstriae slightly wider than striae, almost smooth, shining, punctures very fine, in three obscure ranks, median row very slightly larger. Declivity rather steep, convex; striae narrowly impressed, narrower than on disc; interstriae twice as wide as striae, rather weakly convex. Vestiture consisting of fine, short, strial hair and interstrial short ground cover of very fine hair on disc becoming scalelike on declivity, and interstrial rows of erect bristles, each bristle almost twice as long as ground cover, equal in length to width of an interstriae, about six to eight times as long as wide.

MALE.— Similar to female except frons moderately concave from upper level of eyes to epistoma, a shining, transverse callus on median half of epistoma, an additional pair of calluses in lateral areas of concavity just above level of antennal insertion.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Playón, San José, 9-VIII-63, 20 m, No. 117, Cedro amarga, S. L. Wood; Finca Gromaco on Río Coto Brus, 14-VII-63, No. 60, S. L. Wood.

HOST.— *Cedrela mexicana.*

BIOLOGY.— Large limbs and branches of cut or broken trees were attacked. The biramous, transverse, parental galleries were almost entirely in the phloem tissues. Larval mines were not oriented in any particular direction, but wandered.

NOTES.— The above treatment was based on the type series of 15 specimens.

### 7. *Pycnarthrum brosimi* Wood

*Pycnarthrum brosmii* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):14 (Holotype, male; 9 km S Barrancas, Barinas, Venezuela; Wood Coll.). *Lapsis calami*

DIAGNOSIS.— This species is distinguished from *lucidum* Wood by the much finer pronotal and elytral discal punctures, the more strongly impressed elytral declivity, and the flattened male frons.

MALE.— Length 1.9–2.1 mm, 2.3 times as long as wide; color reddish brown.

Frons flattened from just below upper level of eyes to epistoma; surface shining, obscurely reticulate, punctures fine, moderately close; vestiture rather sparse, fine, erect, moderately long.

Pronotum about as in *hispidum* (Ferrari), except surface shining but subreticulate on anterior third; a few minute points, punctures fine, rather deep, moderately close; vestiture of fine, short bristles, a few longer setae on marginal areas.

Elytra 1.3 times as long as wide; outline as in *hispidum*; striae 1 slightly, others not impressed, punctures rather small, moderately close; interstriae twice as wide as striae, almost smooth, median row of punctures uniseriate, fine, becoming finely then rather conspicuously granulate in progressing from anterior to posterior areas, supplementary punctures on margins of each interstriae minute, irregularly spaced. Declivity rather steep, broadly flattened; strial punctures conspicuously larger and deeper than on disc; interstriae slightly wider than striae, 1 moderately elevated, 2 distinctly impressed, all interstriae with upper half uniseriately, rather finely granulate. Vestiture consisting of ground cover of fine, short, moderately abundant strial and interstrial hair, strial setae absent on declivity, interstrial ground cover on declivity of subplumose scales; and interstrial rows of erect bristles, each bristle slightly more than twice as long as ground cover, about equal in length to width of an interstriae, each at least eight times as long as wide.

FEMALE.— Similar to male except frons moderately convex from upper level of eyes to epistoma.

DISTRIBUTION.— Costa Rica to Venezuela.

COSTA RICA: Isla del Coco, IV-1980, *Brosimum*, G. Stevens. VENEZUELA: 9 km S Barrancas, Barinas; 8 km SW Bumbum and 10 km SE Miri, Barinas. COLOMBIA: 27 km NE Montoya, Santander; 24 km S Colonia, Valle de Cauca.

HOST.— *Brosimum* sp.

BIOLOGY.— Specimens were taken from large limbs and boles of felled or broken trees.

NOTES.— The above treatment was based on the type series of 54 specimens and 8 other specimens. A printing error in a reference work consulted for the name of the host for this species resulted in a lapsis calami that is corrected above.

## GENUS *GYMNOCHILUS* EICHHOFF

*Gymnochilus* Eichhoff, 1868, Berliner Ent. Zeitschr. 11:399 (Type-species: *Gymnochilus zonatus* Eichhoff, monobasic)

*Problechilus* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:46, 167 (Replacement for *Gymnochilus* Eichhoff)

*Meringopalpus* Hagedorn, 1905, Bull. Mus. Paris 10:547 (Type-species: *Meringopalpus fallax* Hagedorn = *Gymnochilus zonatus* Eichhoff, monobasic); Eggers, 1932, Wiener Ent. Zeit. 49:226. *Synonymy*

DIAGNOSIS.— This genus is allied to *Scolytodes* Ferrari, but it may be distinguished by the 7-segmented antennal funicle, by the larger, broader antennal club, which usually has sutures indicated, by the different type of sexual dimorphism on the frons, by the abundant hairlike ground vestiture on the elytra, and (usually) by the abundant, coarse, pronotal asperities.

DESCRIPTION.— Length 1.5–2.3 mm, 1.8–2.2 times as long as wide; color light brown or more commonly bicolored.

Frons in male broadly flattened to shallowly concave, in female convex; vestiture scanty; eye elongate, entire, finely faceted; antennal funicle 7-segmented, club rather large, broad, sutures procurved if present. Pronotum sharply margined at sides and base, asperate, summit well behind middle. Scutellum present. Elytral bases obscurely margined; weakly if at all striate; ground vestiture hairlike, abundant; finely sculptured; declivity rather steep, convex. Tibiae typical of tribe.

DISTRIBUTION.— Neotropical realm; 17 species have been named from Mexico to Brazil and Bolivia; 4 of them occur in North and Central America.

BIOLOGY.— The species are monogamous phloem inhabiting bark beetles. They attack cut, broken or unthrifty limbs and boles, where they construct biramous parental galleries in the cambium region, engraving the wood moderately. The eggs are placed individually in niches along the margins of the tunnel. The larvae mine entirely in the phloem tissues, where they wander more or less without specific direction. Apparently they are highly host specific.

NOTES.— Although originally presented in 1867 as *Gymnochilus*, Eichhoff (1878:167) changed this name to *Problechilus* because of possible homonymy with *Gymnochila* Klug, 1834. The two names differ in gender, however; consequently, the name *Gymnochilus* Eichhoff is valid under the Code of Nomenclature.

## Key to the Species of *Gymnochilus*

1. Body stout, about 1.8 times as long as wide; antennal club with two conspicuous, strongly bisinuate, procurved sutures marked by rows of setae; male frons flattened to below upper level of eyes; female frons more strongly convex; strial punctures usually rather coarse, clearly impressed (variable) elytral bristles very coarse, blunt; very common; Durango to Panama; *Ficus* 1.5–2.3 mm ..... 1. ***reitteri* Eichhoff**

— Body more slender, 2.0 times as long as wide; antennal club with sutures obscure or absent, not marked by rows of setae; male frons distinctly impressed to well above eyes, female frons weakly convex; erect interstrial bristles slender, usually pointed ..... 2

2(1). Body more slender, 2.2 times as long as wide; male frons moderately concave to upper level of eyes; strial punctures minute, interstriae five or more times as wide as interstriae; Mexico to Puebla; *Alnus*; 2.0–2.2 mm ..... 2. ***alni* Wood**

— Body stouter, 2.0 times as long as wide; male frons subconcave to well above upper level of eyes; strial punctures larger, interstriae about two to three times as wide as striae ..... 3

3(2). Smaller; asperate area of pronotum rather strongly reticulate on surface between asperities, punctures usually not evident; asperate area of pronotum occupying anterior two-thirds (67 percent), distance from base to asperities greater in lateral areas than behind summit; erect elytral setae moderately stout; "Mexico" to Costa Rica; *Ficus*; 1.5–1.9 mm ..... 3. ***minor* (Blandford)**

— Larger; surface between pronotal asperities smooth, shining, with very fine, deep punctures; asperate area of pronotum occupying anterior three-fourths (75 percent), distance from base to asperities equal in lateral and median areas; Guatemala and Venezuela; *Ficus*; 2.0–2.8 mm ..... 4. ***consocius*** **(Blandford)**

### 1. *Gymnochilus reitteri* Eichhoff

*Gymnochilus reitteri* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:169 (Lectotype, male; Mexico; U.S. Nat. Mus., present designation)

*Problechilus striatus* Eggers, 1932, Wiener Ent. Zeit. 49:227 (Holotype, male; Canelas, probably Durango, Mexico; U.S. Nat. Mus., 60237); Wood, 1979, Great Basin Nat. 39:135. *Synonymy*

*Problechilus bicolor* Eggers, 1932, Wiener Ent. Zeit. 49:228 (Holotype, male; Nicaragua; U.S. Nat. Mus., 60231); Wood, 1979, Great Basin Nat. 39:135. *Synonymy*

DIAGNOSIS.— This abundant species is commonly attracted to light; it is extremely variable in size, proportions, and sculpture, but it may be distinguished from the other Central American species by the distinct, procurved sutures 1 and 2 on the antennal club, by the stouter body form, by the larger, deeper strial punctures, and by the frontal characters.

MALE.— Length 1.8–2.3 mm, 1.8 times as long as wide; color usually dark brown to black, with basal third of pronotum and occasionally areas of elytra abruptly lighter.

Frons irregularly flattened from just below upper level of eyes to epistoma, convex above; surface strongly reticulate, subrugulose, punctures fine, rather shallow, moderately close; epistomal lobe large, broad, impressed medially; vestiture fine, sparse. Antennal club rather large, 1.3 times as long as wide; sutures 1 and 2 strongly, bisinuately procurved, conspicuously marked by rows of setae.

Pronotum 0.82 times as long as wide; widest on basal third, sides moderately arcuate from base to rather narrowly rounded anterior margin; lateral and basal margins marked by a fine, raised line; summit one-third length from base, anterior area and anterior margin rather coarsely, closely asperate; transition from asperate to granulate areas gradual, on a recurved transverse line; posterior area rather finely, closely granulate. Vestiture of fine, abundant, recumbent hair, a few coarse bristles in lateral and anterior areas.

Elytra 1.05 times as long as wide; sides almost straight and parallel on basal half, broadly rounded behind; striae weakly, distinctly impressed, punctures moderately large, rather shallow; interstriae about one and one-half times as wide as striae, very weakly convex, densely, rather finely punctured; sutural striae and interstriae impressed near base and to a lesser extent on declivity. Declivity commencing at or slightly anterior to middle, moderately steep, broadly convex; striae more strongly impressed, punctures deeper, occasional specimens with 1 or 3 or both weakly elevated. Vestiture of short, recumbent, very abundant hair; and, on odd-numbered interstriae, erect, rather widely spaced, rather long interstrial bristles; bristles stout, blunt, easily abraded.

FEMALE.— Similar to male except frons distinctly convex; sutural striae and interstriae not impressed.

DISTRIBUTION.— Durango to Panama.

MEXICO: **Durango**: Canelas, G. C. Champion. **Islas Tres Marías**: Arroyo Hondo, María Madre, 17-V-25, H. H. Kiefer. **Michoacán**: Zirimicuaro, 2-XI-80, 1350 m, T. H. Atkinson. GUATEMALA: Cerro Zunil, Quezaltenango, G. C. Champion; Volcán de Agua, Esquintla, 19-V-64, 1000 m, No. 606, *Ficus*, S. L. Wood. NICARAGUA: "Nicaragua." COSTA RICA: Escasu, San José, 2-X-63, 1300 m, No. 217, *Ficus*, S. L. Wood; Tapantí, Cartago, 24-X-63, 1300 m, No. 246, *Ficus*, S. L. Wood. PANAMA: Barro Colorado Island, Canal Zone, XI-40, 4669, Zetek.

HOSTS.— *Ficus* spp.

BIOLOGY.— Unthrifty, cut, or damaged limbs and bole of fig were selected for attack. Parental galleries were biramous, largely but not always transverse. Egg niches were large and were placed alternately on sides of the tunnel. Parental galleries engraved the wood lightly; larval mines, which were more or less longitudinal, were entirely in the phloem.

NOTES.— The above treatment was based on 4 Eichhoff syntypes of *reitteri*, on Eggers's specimen that was compared to Eichhoff's syntypes, on the holotypes of *striatus* and

*bicolor*, and on 44 other specimens. The 4 Eichhoff syntypes in the U.S. National Museum are all mounted on one card on one pin. These specimens bear labels with Eichhoff's No. "61," "Mex," and "Problechilus reitteri Eichh., Type." Of the 2 males, one is marked by the word *type* and is here designated as the lectotype of *reitteri*.

### 2. *Gymnochilus alni* Wood

*Gymnochilus alni* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):14 (Holotype, male; 10 km NE Teziutlan, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *reitteri* Eichhoff by the concave male frons, by the elongate body, by the absence or near absence of sutures on the antennal club, and by the obsolescent strial punctures on the disc.

MALE.— Length 2.0–2.2 mm, 2.2 times as long as wide; color light brown to bicolored.

Frons rather shallowly, broadly concave from well above eyes to epistoma; surface strongly reticulate, a transverse, arcuate callus at and slightly above level of antennal insertion, punctures fine, shallow, moderately abundant; vestiture fine, very short, sparse. Antennal club 1.3 times as long as wide, sutures not clearly evident except basal portion slightly sclerotized to point where suture 1 normally located.

Pronotum 0.86 times as long as wide; outline, sculpture, and vestiture as in *reitteri* except posterior area finely, densely punctured.

Elytra 1.3 times as long as wide; sides almost straight and parallel on more than basal half, narrowly rounded behind; striae 1 distinctly, others feebly or not at all impressed, punctures small, scarcely distinguishable from those of interstriae; interstriae three to four times as wide as striae, obscurely subreticulate, rather finely, densely punctured. Declivity commencing at middle, moderately steep, convex; strial punctures small, distinct; interstriae 1 weakly elevated. Vestiture of short, recumbent, very abundant, fine hair; and sparse interstrial rows of erect bristles, those on even numbered interstriae only slightly longer than ground vestiture, on disc only, those on odd interstriae slender, equal in length to width of an interstriae on both disc and declivity.

FEMALE.— Similar to male except frons weakly convex, callus present; short interstrial bristles on even-numbered interstriae slightly longer, extending to declivity.

DISTRIBUTION.— Mexico to Puebla.

MEXICO: **Mexico**: Amecameca, 26-IX-1980, 2700 m, *Alnus*, T. H. Atkinson. **Puebla**: 10 km (6 miles) NE Teziutlán, 2-VII-67, 1600 m, No. 141, *Alnus*, S. L. Wood.

BIOLOGY.— Specimens were recovered from stacked cordwood cut from the bole of a tree 40 cm in diameter. The galleries were largely obliterated, but were similar to those of *reitteri*.

NOTES.— The above treatment was based on the type series of 26 specimens.

### 3. *Gymnochilus minor* (Blandford)

Fig. 141

*Problechilus minor* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):172 (Lectotype, male; Guatemala City, Guatemala; British Mus. Nat. Hist., present designation)



Fig. 141. *Gymnochilus minor*, antenna.

*Problechilus varius* Schedl, 1951, Dusenia 2:86 (Holotype, female; Mexico; Schedl Coll.); Wood, 1974, Great Basin Nat. 34:281. *Synonymy*

DIAGNOSIS.— This species is distinguished from the closely allied *alni* Wood by the smaller size, by the less strongly impressed male frons, and by other characters mentioned in the above key. It is more likely to be confused with *reitteri* Eichhoff, from which it is distinguished by the smaller size, by the more slender body form, and by the more elongate antennal club with sutures almost obsolete and much more broadly, evenly procurved.

MALE.— Length 1.5–1.9 mm, 2.0 times as long as wide; color as in *reitteri*.

Frons planoconcavely, irregularly impressed from epistoma to well above eyes, lateral margins slightly, acutely elevated; surface sculpture as in *reitteri*. Antennal club 1.5 times as long as wide, smaller, flatter, more slender than in *reitteri*, with sutures almost obsolete, more evenly procurved, not marked by rows of setae.

Pronotum as in *reitteri* except asperities less numerous and averaging slightly larger, ending posteriorly rather abruptly on an almost straight transverse line (gradual and obtuse in *reitteri*); surface of posterior areas closely, clearly punctured.

Elytra 1.2 times as long as wide; surface features variable, essentially as in *reitteri* except strial punctures usually more distinct and erect interstrial bristles much more slender.

FEMALE.— Similar to male except frons distinctly convex on upper two-thirds, flattened below, lateral margins not elevated, rounded; short bristles on even-numbered interstriae often present (occasionally in male also).

DISTRIBUTION.— "Mexico" to Costa Rica.

MEXICO: "Mexico." GUATEMALA: Guatemala City, G. C. Champion; San Geronimo, Baja Verapaz, G. C. Champion; Volcán de Agua, 19-V-64, 1000 m, No. 606, *Ficus*, S. L. Wood. HONDURAS: La Lima, Cortez, 5-V-64, 200 m, No. 583, *Ficus*, S. L. Wood. COSTA RICA: Escasú, San José, 2-X-63, 1300 m, No. 217, *Ficus*, S. L. Wood; Tapantí, Cartago, 24-X-63, 1300 m, No. 246, *Ficus*, S. L. Wood; Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, No. 85, *Ficus*, S. L. Wood.

HOST.— *Ficus* spp.

BIOLOGY.— As in *reitteri*. The two species may occur in the same branches and have similar galleries. Ecological specialization probably occurs, but was not noted.

NOTES.— The above treatment was based on 8 syntypes and on 69 other specimens. I here designate the male syntype, from near Guatemala City, on the first pin in the Blandford series now in the British Museum (Natural History), as the lectotype of *Problechilus minor* Blandford. The card on this pin is shared by a female paralectotype of this species.

### 4. *Gymnochilus consocius* (Blandford)

*Problechilus consocius* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):171 (Holotype, male; Cerro Zunil, Guatemala; British Mus. Nat. Hist.)

*Problechilus trimaculatus* Schedl, 1935, Arch. Instit. Biol. Veget. 2:91 (Holotype, female; Venezuela, probably Colonia Tovar; Schedl Coll.); Wood, 1974, Great Basin Nat. 34: 281. *Synonymy*

DIAGNOSIS.— This species is distinguished from *minor* (Blandford) by the much larger average size, by the smooth, shining, punctured surface between asperities on the anterior slope of the pronotum, and by other characters mentioned in the above key.

MALE.— Length 2.0–2.8 mm, 1.9–2.0 times as long as wide; color as in *reitteri* Eichhoff.

Frons as in *minor*.

Pronotum as in *minor* except asperate area occupying anterior three-fourths, its posterior margin forming a straight, transverse line, as close to basal margin in lateral areas as behind summit; surface between asperities almost smooth and shining, with moderately abundant, small, deep punctures; posterior areas with dense, very small punctures, evidently somewhat deeper and closer than in *minor*.

Elytra essentially as in *minor*, impression of striae and strial punctures probably averaging slightly deeper, punctures indistinctly larger; dense interstrial punctures averaging deeper than in *minor*, interstrial ground vestiture distinctly finer, erect bristles more slender and averaging slightly longer.

FEMALE.— Similar to male except lower frons less strongly impressed, upper half convex; pronotum more strongly convex, asperities averaging slightly larger.

DISTRIBUTION.— Guatemala and Venezuela.

GUATEMALA: Cerro Zunil, 4000 ft, (1300 m), C. C. Champion. VENEZUELA: La Carbonera Expt. For., 50 km NW Merida, Merida, 16-IX-69, 2500 m, No. 20, *Ficus*, S. L. Wood; Merida, Merida, 12-IX-69, No. 8, 7-X-69, No. 42, 1700 m, *Ficus*, S. L. Wood.

HOST.— *Ficus* spp.

BIOLOGY.— Essentially as in *reitteri*.

NOTES.— The above treatment was based on the holotypes of *consocius* and *trimaculatus*, and on 102 other specimens.

The male frons, in the Venezuelan material, in the area above the upper level of the eyes, is more broadly impressed, with the lateral margins more acutely rounded than in the type of *consocius*. The type has this area as in *minor*. The difference is slight and, at the present time, is not regarded as significant. Perhaps at a future date the difference may be used to characterize geographical races.

The male type of *fallax* Hagedorn (3.2 mm) was examined; it was also compared by Eggers to the type of *zonatus* Eichhoff (3.3 mm) and declared to be synonymous. Since all type material of *zonatus* apparently is lost, Eggers's synonymy is accepted as being correct. *Gymnochilus zonatus* is very similar to *consocius* and could easily be confused with it, but it may be distinguished by the larger size, the finely reticulate pronotal surface both in the asperate and nonasperate areas, the larger punctures on the basal fourth of the pronotum, and the much less strongly impressed male frons, which is 1.5 times as long as wide (1.6–1.8 times in *consocius*).

## GENUS *SCOLYTODES* FERRARI

*Scolytodes* Ferrari, 1967, Die Forst- und Baumzuchtschädlichen Borkenkäfer, p. 77 (Type-species: *Scolytodes laevigatus* Ferrari, monobasic)

*Hexacolus* Eichhoff, 1868, Berliner Ent. Zeitschr. 11:399 (Type-species: *Hexacolus glaber* Eichhoff, monobasic); Wood, 1971, Great Basin Nat. 31:141. *Synonymy*

*Ctenophorus* Chapuis, 1869, Synopsis des Scolytides, p. 49 (Type-species: *Ctenophorus laevigatus* Chapuis = *Hexacolus levis* Blackman, monobasic); Wood, 1977, Great Basin Nat. 37:207. *Synonymy*

*Prionosceles* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):177 (Type-species: *Prionosceles atratus* Blandford, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:128); Wood, 1971, Great Basin Nat. 31:141. *Synonymy*

*Epomadius* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):179 (Type-species: *Epomadius culcitatus* Blandford, monobasic); Wood, 1977, Great Basin Nat. 37:384. *Synonymy*

*Erinecphilus* Hopkins, 1902, Proc. Ent. Soc. Washington 5:34 (Type-species: *Erinecphilus schwarzi* Hopkins, monobasic); Schedl, 1952, Dusenia 3:346. *Synonymy?*

*Hylocurosoma* Eggers, 1940, Arb. Morph. Taxon. Ent. Berlin-Dahlem 7:138 (Type-species: *Hylocurosoma striatum* Eggers, monobasic); Schedl, 1952, Dusenia 3:346. *Synonymy*

DIAGNOSIS.— This large and potentially important genus is closely related to *Gymnochilus* Eichhoff, from which it may be distinguished by the (usually) sparse vestiture, by the small antennal club that is usually devoid of sutures, by the pronotal summit that is either at or in front of the middle, and by the 6-segmented antennal funicle.

DESCRIPTION.— Length 0.9–3.5 mm, 1.9–2.9 times as long as wide; color yellowish or reddish brown to black; vestiture hairlike.

Frons sexually dimorphic, males usually simply convex, not ornamented, female concave to convex or variously grooved, usually ornamented by conspicuous tufts or brushes of hair. Eye elongate-oval, entire; finely faceted. Antennal scape moderately long; funicle 6-segmented; club small, sutures if marked either straight or feebly procurved. Scutellum rather small, surface even with that of elytra. Pronotum large, lateral margins acutely marked by a raised line, basal margin usually with a less conspicuous raised line; surface variable, smooth to asperate anteriorly, variously punctured. Elytral bases transversely straight or weakly sinuate, with a finely raised margin; disc usually striate; declivity rather steep, convex, sculpture very conservative; vestiture usually sparse, hairlike. Tibiae as defined for tribe.

DISTRIBUTION.— Florida and Mexico to Argentina; more than a hundred species have been named in this genus; about half of them occur north of Panama.

BIOLOGY.— These usually monogamous species ordinarily construct a simple cave-type egg chamber entirely in phloem tissues, where eggs are deposited in clusters at the margins or in large, irregular niches or pockets. In some species this chamber is elongate,

definitely oriented, and with distinct, oversized egg niches that may contain one to several eggs each. Larval mines may be individual and wander indiscriminately in the phloem, or communal. In at least two species the parent beetle bored into the pith while larval development proceeded through the first and second instars; then third instar larvae invaded the pith through the parent tunnel, where they passed the remaining stages of development. Many species are very aggressive and regularly kill living branches, where a life cycle can be completed in less than 20 days. A very few species appear to be polygynous, form radiate parental galleries, and deposit their eggs in individual niches.

NOTES.— Seven generic names have been proposed for species now included in this group. This is an indication of the unusual variation found in the genus. Intergradation between groups within the genus, however, makes a workable subdivision impossible. Although there is considerable overlap between them, three subgenera were tentatively retained as indicated in the following key.

## Key to the Species of *Scolytodes*

1. Pronotum punctured from base to anterior margin, a few minute asperities sometimes intermixed with punctures on anterior fourth ..... 2
— Pronotum punctured only on basal half, finely to coarsely asperate on anterior area, with no punctures intermixed (see also couplet 8) (*Hexacolus*) ..... 29

2(1). Anterior tibiae broad, with a very thin, semitransparent extension of lateral margin between lateral teeth 2 and 3 and often between 3 and 4, etc.; stout species, 1.6–3.4 mm; in fallen *Cecropia* leaf petioles (*Prionoscelcs*) ..... 3
— Anterior tibiae with outer margin rounded, lateral teeth free to their bases; stout to slender species, variable in size and habits (*Scolytodes*) ..... 6

3(2). Strial and interstrial punctures small, confused from base to apex; Costa Rica to Colombia and Venezuela; 2.4–3.4 mm ..... 1. ***glabrescens*** **Wood**
— Striae weakly impressed, punctures in rows, distinctly larger than those of interstriae ..... 4

4(3). Smaller; elytral declivity convex, steeper; female frons uniformly concave, male frons evenly convex above, becoming flattened below; pronotum strongly reticulate, dull; Oaxaca and Veracruz to Panama and Venezuela; 1.6–2.1 mm .. ..... 2. ***maurus*** **(Blandford)**
— Larger; elytral declivity flattened between third interstriae; female frons with large epistomal callus, male frons irregularly inflated on lowerhalf; pronotum subreticulate, subshining ..... 5

5(4). Average size larger; anterior third of pronotum less strongly reticulate, shining; interstrial granules on declivity averaging distinctly smaller; Veracruz to Honduras; 2.4–3.3 mm ..... 3. ***atratus atratus*** **(Blandford)**
— Average size smaller; anterior third of pronotum reticulate, subshining; interstrial granules averaging distinctly larger; Costa Rica to Panama; 2.0–3.0 mm .. ..... 4. ***atratus panamensis*** **(Wood)**

6(2). Interstriae 10 elevated or narrowly convex at least to base of declivity; anterior tibiae devoid of a minute tooth on posterior face (except *perditus*, *amoenus*) ..... 7
— Interstriae 10 narrowly convex only on basal third, elevation not extending posterior to level of hind coxae; anterior tibiae armed on posterior face by a small tooth just behind tarsal insertion and between inner terminal mucro and lateral tooth 1 or 2 (see also couplet 11) ..... 18

7(6). Interstrial punctures numerous, confused (usually uniseriate in *levis*); female frons flattened, with lower part of lateral margins at most only slightly raised, with a large, central, shining, impunctate area; body stout, 1.9–2.0 (2.2 in *amoenus* and *levis*) times as long as wide; larger, 1.9–2.7 mm ..... 8

— Interstrial punctures uniseriate; female frons armed by a pair of longitudinal carinae (except *pseudopiceus*, *venustus*); rather slender species, 2.1–2.4 times as long as wide; smaller, 1.4–1.9 mm ..... 12

8(7). Anterior third of pronotum totally devoid of asperities ..... 9

— Anterior third of pronotum armed by numerous, fine asperities ..... 10

9(8). Pronotum smooth, shining, punctures coarse, deep; female frontal vestiture shorter, less abundant, extending little if at all above upper level of eyes, glabrous central area occupying less than central third of frons; Guatemala to Costa Rica; *Plumeria*; 1.9–2.7 mm ..... 5. ***plumeriae*** **Wood**

— Pronotum reticulate, dull, punctures very fine, shallow; female frontal vestiture extending higher on vertex, much longer, more abundant, glabrous area occupying much more than central half; Costa Rica; *Phoebea*; 2.0–2.6 mm (see also 7. ***minutissimus*** **Schedl**, 1.2 mm and 8. ***levis*** **Blackman**) ..... 6. ***phoebeae*** **Wood**

10(8). Pronotum longer than wide, anterior margin armed by a continuous costa; female frons rather elaborately sculptured and ornamented by a fringe of long hair; Jalisco to Tamaulipas; *Ficus*; 1.9–2.3 mm (see also 10. ***lepidus*** **Wood**, 11. ***genialis*** **Wood**) ..... 9. ***amoenus*** **Wood**

— Pronotum distinctly wider than long, anterior margin unarmed; female frons simple, glabrous or with a small patch of fine hair on median half ..... 11

11(10). Smaller, more slender body; elytra glabrous; strial and interstrial punctures fine, shallow; female frons flat, finely pubescent on narrow flattened area; Panama; *Cecropia*; 1.6–2.0 mm ..... 12. ***perditus*** **Wood**

— Larger, stouter body; elytra with fine, rather short strial and interstrial hair; strial and interstrial punctures rather coarse, deep; female frons impressed on median third of lower half, glabrous; Costa Rica; *Cecropia* branches; 1.9–2.2 mm ..... 13. ***cecropicolens*** **Wood**

12(7). Female frons armed by a pair of longitudinal carinae; pronotum smooth, not distinctly asperate anteriorly, punctures not obscured in either sex ..... 13

— Female frons broadly flattened, with no indication of longitudinal carinae; anterior area of male pronotum usually finely asperate, intermixed punctures sometimes attaining anterior margin only in lateral areas ..... 17

13(12). Strial and interstrial punctures distinctly impressed throughout; female frons armed by two widely spaced or diverging carinae ..... 14

— Strial punctures feebly impressed on basal half, obscure toward declivity; interstrial punctures obscurely indicated; male frons reticulate, dull, a few very obscure punctures; female frons armed by two closely placed, longitudinal carinae, separated by a distance about equal to thickness of one carina; elytra narrowly, but more broadly rounded behind (female of *blandfordi* not seen) ..... 15

14(13). Anterior third of pronotum finely asperate, disc coarsely, rather shallowly punctured; female frons on lower half with lateral thirds bearing a pair of oblique, diverging carinae, upper half bearing a strong, median carina, vestiture on lateral and upper margins long, rather sparse; Guatemala; 1.7 mm (see also 14. ***costabilis*** **Wood**) ..... 15. ***melanocephalus*** **(Blandford)**

– Anterior third of pronotum devoid of asperities, punctures very fine; female frons bearing a pair of parallel longitudinal carinae dividing frons into approximately equal thirds, vestiture on lateral and upper margins long, rather sparse; Costa Rica to Panama; *Cecropia* petioles; 1.4–1.8 mm (see also subspecies ..... 16. ***cecropiavorus*** **Wood**

15(12). Color black; pronotal punctures moderately large but very shallow; interstrial punctures uniseriate, minute; declivital interstriae 2 strongly narrowed on lower half and depressed; female frons with antennal insertion dorsad of normal position, lower half of frons flattened, yellow, appearing spongy and finely pubescent, with a large, median, black, strongly elevated process from epistoma to center of spongy area occupying median fourth; Guatemala; 1.8 mm ... 17. ***unipunctatus*** **(Blandford)**

– Color brown; pronotal punctures rather deep; interstrial punctures moderately to very coarse; declivital interstriae 2 not depressed or narrowed; female frons devoid of spongy area or elevated median process ..... 16

16(15). Punctures on elytral declivity poorly defined, not impressed; Costa Rica; *Cecropia* petioles; 1.7–2.0 mm ..... 18. ***cecropii*** **(Schedl)**

– Declivital striae and strial punctures feebly but distinctly impressed; Costa Rica; *Cecropia* petioles; 1.4 mm ..... 19. ***blandfordi*** **(Schedl)**

17(12). Female frons rather coarsely, not closely punctured, pubescence fine, uniformly distributed, rather sparse; punctures coarse, deep; Guatemala to Costa Rica; *Plumeria*, etc.; 1.4–1.8 mm (see also 21. ***striatus*** **(Eggers)**) ..... 20. ***venustus*** **Wood**

– Female frons rather finely, closely punctured, pubescence uniformly distributed, rather abundant; striae not at all impressed, punctures rather fine, shallow; Costa Rica; *Ficus*; 1.4–1.9 mm ..... 22. ***pseudopiceus*** **Wood**

18(6). Elytral vestiture abundant, long, confused; meso- and metathoracic tibiae rather broad, each armed by seven socketed, marginal teeth on distal half ..... 19

– Elytral vestiture sparse, short, in uniseriate strial and/or interstrial rows, often entirely absent on disc; meso- and metathoracic tibiae usually more slender, with three to six socketed, marginal teeth confined to distal fourth ..... 21

19(18). Interstrial punctures on 1 and 2 confused, others uniseriate, interstrial setae particularly on and near declivity coarse, blunt, somewhat flattened; surface of pronotum reticulate, with moderately coarse punctures; striae clearly evident, punctures distinctly larger than those of interstriae; Guatemala; 1.6 mm ..... 23. ***setosus*** **(Blandford)**

– All interstrial punctures confused, interstrial setae fine, pointed ..... 20

20(18). Pronotum shining, obscurely reticulate, punctures deep, coarse, interspaces between punctures about equal in width to diameter of a puncture; elytral punctures rather coarse, deep, strial punctures clearly larger, closer; Costa Rica; *Oreopanax*; 1.6 mm ..... 24. ***punctiferus*** **Wood**

– Pronotum surface dull, strongly reticulate, punctures fine, shallow, separated by distances averaging at least twice diameter of a puncture; elytral punctures fine, strial and interstrial punctures distinguished with difficulty; Costa Rica; vine; 1.7 mm ..... 25. ***hirsutus*** **Wood**

21(18). Body stout, 1.9 times as long as wide; pronotum convex, wider than long (0.90 times as long as wide); interstrial bristles on alternate, odd-numbered interstriae of declivity, sparse, widely spaced, rather strongly flattened; Panama; 1.0 mm ..... 26. ***crassus*** **Wood**

— Body more slender, 2.2 or more times as long as wide; pronotum at least 1.03 times as long as wide; elytral bristles, when present, more slender, not strongly flattened ..... 22

22(21). Female frons weakly convex to broadly, shallowly concave, vestiture rather uniformly distributed, usually rather inconspicuous; striae usually weakly impressed, punctures much deeper, coarser than those of interstriae ..... 23

— Female frons longitudinally, broadly grooved, lateral margins rather abruptly elevated to conspicuously carinate, vestiture largely confined to tuft at upper limits of sulcus; striae not impressed, strial and interstrial punctures both obscure or of subequal size and not clearly distinguishable ..... 27

23(22). Elytra stouter, 1.3 times as long as wide; mature body color dark reddish brown; strial and interstrial punctures on declivity, rather coarse, deep, subequal in size, confused; Panama; 1.3–1.5 mm ..... 27. ***venustulus*** **Wood**

— Elytra slender, at least 1.5 times as long as wide; mature body color black; strial punctures on declivity in rows, distinctly larger than those of interstriae (all declivital punctures obsolete in most *clusiae*) ..... 24

24(23). Pronotal and interstrial punctures obsolete, strial punctures very small; pronotum very strongly reticulate, dull; Costa Rica; *Clusia*; 1.7–1.9 mm ..... 28. ***clusiae*** **Wood**

— Pronotal and interstrial punctures clearly impressed ..... 25a

25a(24). Elytra almost glabrous, two or three setae on odd-numbered interstriae; frons convex in both sexes, almost glabrous; anterior fourth of pronotum without indications of asperities, punctures on posterior areas rather coarse; Costa Rica; *Quercus*; 1.6–1.9 mm ..... 29. ***radiatus*** **Wood**

— Elytra with more abundant vestiture (only on odd-numbered interstriae in *volcanus*); pronotal punctures smaller; anterior fourth of pronotum with weak asperities (except *volcanus*) ..... 25b

25b(25a). Striae moderately impressed, strial and pronotal punctures equally coarse, strongly impressed; interstrial punctures oftne subvulcanate or feebly granulate; female frons convex, usually almost flat on lower half, vestiture fine, sparse, rather short, only slightly more conspicuous than in male; Michoacán to Honduras; *Clusia*; 1.8–2.9 mm ..... 30. ***clusiacolens*** **Wood**

— Smaller; striae feebly or not at all impressed; interstrial punctures never vulcanate or granulate; female frons concavely impressed, more conspicuously pubescent ..... 26

26(25). Elytra with erect interstrial setae placed at regular intervals on alternate odd interstriae, strial setae minute but present; female frons shallowly concave, concavity ending well below upper level of eyes, a rather large, impunctate callus just above epistoma; Veracruz to Guatemala; *Clusia*; 1.3–1.6 mm (see also 32. ***amabilis*** **Wood** and 33. ***canalis*** **Wood**) ..... 31. ***clusiavorus*** **Wood**

— Elytra subglabrous, rarely with more than five erect setae on declivity, strial hair always absent; female frons more strongly concave, concavity extending to well above upper level of eyes, punctured throughout to epistoma, pubescence on upper margins more conspicuous; Costa Rica: 1.2–1.4 mm ..... 34. ***volcanus*** **Wood**

27(22). Larger; pronotum strongly reticulate, dull; pronotal and elytral punctures somewhat larger, more distinctly impressed; female frontal carinae extending from slightly below level of antennal insertion to upper level of eyes; brush of hair near vertex poorly developed; Costa Rica; *Oreopanax*; 1.5–1.9 mm ..... 35. ***irazuensis*** **Wood**

— Smaller; pronotum subshining, rather obscurely reticulate; pronotal and elytral punctures fine; female frons with lateral ridges or carinae extending well below level of antennal insertion, brush of hair rather well developed; in *Cecropia* petioles ..... 28

28(27). Pronotal punctures very slightly smaller; lateral margins of female frons abruptly elevated, not sharply carinate, crests converging toward a point just below upper level of eyes, tuft of hair occupying upper half of impressed area comparatively small; Veracruz to Costa Rica; *Cecropia*; 0.9–1.1 mm ..... 36. ***parvulus*** **Wood**

— Pronotal punctures very slightly larger; lateral margins of female frons acutely carinate, carinae parallel, tuft of hair dense, large, tips of some setae attaining level of antennal insertions; Guatemala to Panama; *Cecropia*; 0.9–1.1 mm ..... 37. ***acares*** **Wood**

29(1). Anterior tibiae devoid of a minute tooth on posterior face ..... 30

— Anterior tibiae armed on posterior face by one or two small teeth just behind tarsal insertion and between inner terminal mucro and first or second lateral tooth ..... 39

30(29). Interstriae 10 narrowly convex on basal third only, not extending behind level of metacoxae; interstriae almost devoid of punctures; female frons concavely impressed on lower half, concavity densely, coarsely, almost granulately punctured, smooth and shining in central area above, a brush of hair usually overhanging polished area; Costa Rica; *Ochroma*; 1.3–1.5 mm .. 38. ***ochromae*** **Wood**

— Interstriae 10 narrowly convex at least to base of declivity ..... 31

31(30). Anterior half of lateral margins of pronotum concavely impressed on a large, subcircular area and ornamented by a dense brush of moderately long, yellow hair; Panama; 2.4 mm ..... 39. ***culcitatus*** **(Blandford)**

— Anterior half of lateral margins of pronotum normal, devoid of unusual pubescence ..... 32

32(31). Stout, 2.1 times as long as wide; minute, sparse punctures on posterior pronotal disc, mostly granulate; female frons with a median elevation; 1.3–1.9 mm ..... 33

— More slender, 2.3 or more times as long as wide (except 2.1 times in *obesus*) punctures on pronotal disc not at all granulate; female frons flattened on median area; 1.3–3.5 mm, except *schwarzi* smaller ..... 35

33(32). Male carina not attaining epistomal margin; punctures on pronotal disc larger, deep, close; strial punctures rather coarse, deep; Guatemala; *Swietenia* 1.8 mm ..... 40. ***spadix*** **(Blackman)**

— Male frontal carina variable; punctures on pronotal disc minute or replaced by granules; strial punctures fine, rather shallow ..... 34

34(33). Both male and female with a median carina acutely elevated (broad above) from just above level of antennal insertion to epistomal margin, a coarsely reticulate area above its highest point; female brush on vertex dense, rather long; elytral striae 1 impressed; granules on pronotal disc larger, more numerous; Costa Rica; *Swietenia, Cedrela*; 1.7–1.9 mm ..... 41. ***swieteniae*** **(Blackman)**

— Neither sex with a carina attaining epistomal margin; female median carina low (often double), beginning well above epistoma, evidently ending near upper level of eyes, devoid of coarse reticulation above carina; elytral striae not impressed; granules on pronotal disc sparse, fine; Costa Rica; *Cedrela, Vismia*; 1.3–1.5 mm ..... 42. ***cedrelae*** **Wood**

35(32). Interstrial punctures uniseriate, distinctly smaller than those of striae ..... 36

— Interstrial punctures confused, often also confused with striae ..... 38

36(35). Pronotal disc shining, punctures coarse, deep; both strial and interstrial punctures moderately large, deep; S Florida to Veracruz; *Ficus*; 1.3–1.6 mm ..... 43. ***schwarzi*** **(Hopkins)**

— Punctures of pronotum and elytra very fine, shallow ..... 37

37(36). Pronotum and elytra reticulate, dull; elytral punctures moderately large, obscurely impressed; Guatemala; *Ficus*; 1.4–1.6 mm ..... 44. ***facetus*** **Wood**

— Pronotum reticulate; elytra brightly shining, without trace of reticulation; elytral punctures fine, sharply defined; Costa Rica to Panama; *Phoebea*; 1.9–2.1 mm ..... 45. ***piceus*** **(Blandford)**

38a(37). Body stout, 2.1 times as long as wide; female frons armed by a pair of longitudinal carinae extending from epistomal margin to level of antennal insertion, carinae divided epistomal area into equal thirds; Panama; 1.8 mm ..... 46. ***obesus*** **Wood**

— Body 2.4–2.5 times as long as wide; female frons without longitudinal carinae ..... 38b

38b(38a). Larger; all strial punctures small but in definite rows; punctures on disc of pronotum minute, almost obsolete; Costa Rica; *Miconia*; 3.5 mm ..... 47. ***immanis*** **Wood**

— Smaller; punctures of striae 1 and 2 small, more or less in rows, all others confused with those of interstriae; Costa Rica; *Alnus*; 2.4–2.9 mm ..... 48. ***alni*** **Wood**

39(29). Interstriae 10 acutely convex at least to base of declivity ..... 40

— Interstriae 10 acutely convex only on basal third, carina not extending beyond level of hind coxae ..... 43

40(39). Pronotum wider than long, its anterior margin unarmed ..... 41

— Pronotum longer than wide, its anterior margin armed by a transverse, serrated elevation ..... 42

41(40). Elytra elongate, 1.5 times as long as wide; strial and interstrial hair conspicuous; Costa Rica; *Ficus*; 1.4–1.6 mm ..... 49. ***erineophilus*** **Wood**

— Elytra stout, 1.2 times as long as wide; elytra essentially glabrous; Guatemala; *Ficus*; 1.5–1.7 mm ..... 50. ***ficivorus*** **Wood**

42(40). Pronotum 1.02 times as long as wide; striae not at all impressed; elytral surface strongly reticulate, dull; elytra almost glabrous; Michoacán and Puebla to Morelos; *Ficus*; 1.5–2.0 mm ..... 51. ***reticulatus*** **(Wood)**

— Pronotum 1.2 times as long as wide; striae rather narrowly, deeply impressed; elytral surface smooth, shining; elytral vestiture fine, long; Chiapas to Costa Rica; 1.5–1.7 mm ..... 52. **marginatus Wood**

43(39). Anterior margin of pronotum sharply elevated, subserrate; pronotum more slender, at least 1.1 times as long as wide ..... 44

— Anterior margin of pronotum unarmed; pronotum as wide or wider than long ..... 52

44(43). Striae on disc and declivity strongly impressed, punctures large, deep; interstrial punctures small, distinct, uniseriate; elytral vestiture consisting entirely of uniseriate rows of erect, spatulate, blunt, interstrial bristles; Costa Rica; 1.3–1.7 mm (see also 54. ***pelicipennis*** **Schedl,** 1.2 mm) ..... 53. ***impressus*** **Wood**

— Striae not impressed; vestiture rather fine, elytral bristles not flattened ..... 45

45(44). Body rather slender to stout, not more than 2.4 times as long as wide; sides of pronotum straight or weakly, arcuately inflated on basal half ..... 46

— Body very slender, 2.8 times as long as wide; sides of pronotum conspicuously constricted on basal half ..... 50

46(45). Pronotal asperities exceedingly broad, some a fifth as broad as pronotum, costa arming anterior margin usually an unbroken ridge ..... 47

— Pronotal asperities normal, rather narrow, usually not more than one-tenth as broad as pronotum, armature on anterior margin serrate or broken ..... 48

47(46). Strial and interstrial punctures on disc and declivity small, shallow; female frons with a conspicuous, procurved callus near center occupying median two-thirds, vestiture above callus rather sparse, short; Costa Rica; *Ficus*; 1.5–1.8 mm ..... 55. ***rugicollis*** (Schedl)

— Strial and interstrial punctures larger, deeper; female frons flattened on a large, circular area, flattened area minutely pilose, margins with a dense row of long hair; Honduras; 1.5–1.7 mm ..... 56. ***pannuceus*** **Wood**

48(47). Larger; declivital striae in obscure rows, interstriae marked by distinct, uniseriate granules; strial and interstrial punctures on disc large, deep, in rows, those of interstriae almost as large as strial punctures; Puebla; 1.7–2.2 mm (see also 58. ***pelicerinus*** **Schedl**, 1.3–1.5 mm) ..... 57. ***multistriatus*** (Wood)

— Smaller; declivital punctures confused, devoid of granules; strial and interstrial punctures on disc smaller, not as deep ..... 49

49(48). Pronotum smooth, shining, with very deep, close punctures separated by distances about equal to one-fourth diameter of a puncture; female frons abruptly concave on central half, impression continuing as a broad trough to epistoma, central area pilose, hair in dense marginal fringe short; Costa Rica; 1.5–1.8 mm ..... 59. ***pubescens*** **Wood**

— Pronotum reticulate, dull, punctures rather deep, moderately close, separated by distances averaging about half diameter of a puncture; female frons shallowly, evenly concave, pilose in central area, hair in marginal fringe long; Nayarit; *Inga*; 1.3–1.7 mm ..... 60. ***ingavorus*** **Wood**

50(45). Pronotum reticulate, subshining, punctures on disc minute; elytral vestiture finer, shorter; female frontal vestiture fine, sparse, uniformly distributed; Panama; *Clusia*; 1.7–1.9 mm ..... 61. ***proximus*** **Wood**

— Pronotum smooth or reticulate, punctures on disc moderately coarse; elytral vestiture longer, conspicuous; female frontal vestiture abundant, long, in *Ficus* ..... 51

51(50). Interstrial bristles widely spaced within each row, developed only on alternate, odd-numbered interstriae; interstrial punctures moderately large; central area of female frons pubescent; Jalisco to Honduras; 1.0–1.4 mm ..... 62. ***tenuis*** (Wood)

— Interstrial bristles closely set, on all interstriae; interstrial punctures very fine; central area of female frons glabrous, shining, Oaxaca to Guatemala; 1.2–1.4 mm ..... 63. ***micidus*** **Wood**

52(43). Body stout, 2.0 times as long as wide; pronotal disc smooth, shining, punctures rather coarse; interstrial bristles coarse, long, spatulate; Costa Rica; *Ficus*; 1.2–1.3 mm ..... 64. ***exiguus*** **Wood**

— Body slender, 2.4 times as long as wide; pronotal disc reticulate, punctures fine, interstrial bristles fine, not flattened ..... 53

53(52). Strial and interstrial punctures rather coarse, deep; female frontal vestiture rather sparse; Costa Rica; *Drimys*, *Miconia*; 1.4–1.6 mm ..... 65. ***pumilus*** **Wood**

— Strial punctures fine, shallow, interstrial punctures minute to obsolete; female vestiture abundant on upper margins of frons ..... 54

54(53). Larger; punctures of pronotum and elytra shallow, not always clearly defined; declivital punctures on elytra minute, in definite rows, interstrial punctures sometimes obsolete; female frons flat; Veracruz; 1.0–1.3 mm ..... 66. ***obscurus*** **(Wood)**

— Smaller; punctures of pronotum and elytra more sharply impressed; declivital punctures more numerous, not always in rows; female frons impressed, lateral margins distinctly elevated; Panama; 0.9–1.0 mm ..... 67. ***nanellus*** **Wood**

### 1. *Scolytodes glabrescens* Wood

*Prionosceles glaber* Wood, 1961 (nec Eichhoff, 1867), Great Basin Nat. 21:102 (Holotype, male; Summit, Canal Zone, Panama; U.S. Nat. Mus.)

*Scolytodes glabrescens* Wood, 1971, Great Basin Nat. 31:152 (Replacement name)

DIAGNOSIS.— This species is allied to *atratus* (Blandford), but it is easily distinguished by the glabrous pronotum and elytra, and by the confused strial and interstrial punctures.

MALE.— Length 2.4–3.4 mm, 2.1 times as long as wide; color black, antennae and legs somewhat lighter.

Frons broadly, uniformly convex, with a slight transverse impression just above epistomal margin; surface reticulate, punctures rather fine, deep, moderately close, finer and more abundant on impressed area; vestiture fine, short, inconspicuous except for a rather dense brush of moderately long yellow hair directed orad. Eye elongate, entire; finely granulate. Antennal club small, with two weakly procurved sutures indicated by rows of setae.

Pronotum about as long as wide; sides straight and parallel, then abruptly narrowed to rather narrowly rounded anterior margin; basal and lateral margins marked by a conspicuous fine raised line; rather strongly arched from basal to anterior margin; surface subshining, obscurely, very finely reticulate; punctures very fine, deep, moderately abundant, appearing subcrenulately wrinkled on anterior fourth. Glabrous.

Elytra 1.3 times as long as wide, about 1.4 times as long as pronotum; sides straight and parallel on basal two-thirds, rather abruptly, broadly rounded behind; striae obscurely indicated on base of disc, punctures very fine and confused posteriorly, with abundant, confused, interstrial punctures. Interstriae 10 costiform to declivity, interstriae 9 elevated near declivital base. Declivity steep, convex; positions of striae 1 and 2 impressed, interstriae 1, 2, and 3 convex on middle third; all punctures minute, deep, confused. Elytra entirely glabrous.

FEMALE.— Similar to male except frons broadly flattened on lower two-thirds, impressed just above epistoma, and bearing a conspicuous brush of rather abundant, moderately long, fine, yellow hair uniformly distributed over entire flattened area from just below upper level of eyes to epistomal margin; impressions and elevations of elytral declivity obscure.

DISTRIBUTION.— Costa Rica to Colombia and Venezuela.

COSTA RICA: Turrialba, Cartago, 5-VII-63, 700 m, No. 19, S. L. Wood. PANAMA: Cerro Campana, Panama, 26-VII-66, 1000 m, No. 33, S. L. Wood; Ft. Clayton, Canal Zone, 22-XII-63, 30 m, No. 322, S. L. Wood; Gatún Dam, Canal Zone, 31-XII-63, 15 m, No. 362, S. L. Wood; Limon Bay, Canal Zone, 30-XII-63, No. 356, S. L. Wood; Summit, Canal Zone, X-46, No. 937 and IX-46, No. 810, N. L. H. Krauss. All from petioles of fallen *Cecropia* leaves. OTHER COUNTRIES: Colombia, Venezuela.

HOST.— *Cecropia* spp.

BIOLOGY.— This monogamous species infests recently fallen *Cecropia* leaf petioles where adult and larval mines are made in the large, soft pith. As with many other species in this genus eggs are scattered in the frass of the irregular parent gallery. The larvae extend the parental chamber. At times the greater portion of pith in the basal half of a petiole is almost entirely consumed.

NOTES.— The above treatment was based on the holotype of *glaber* (Wood) and 37 other specimens.

### 2. *Scolytodes maurus* (Blandford)

*Prionosceles maurus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):178 (Lectotype, male; Pantaleon, Guatemala; British Mus. Nat. Hist., present designation)

*Hexacolus ellipticus* Eggers, 1934, Ent. Blätt. 30:80 (Holotype, male; Turrialba, Costa Rica; Institut für Phlanzenaschutzforschung Kleinmachnow); Wood, 1975, Great Basin Nat. 35:22. *Synonymy*

DIAGNOSIS.— This species is allied to *atratus* (Blandford), but it is distinguished by the much smaller size, the habits, and other characters summarized in the above key.

MALE.— Length 1.6–2.1 mm, 2.0 times as long as wide; color very dark brown.

Frons weakly convex; surface coarsely subreticulate, punctures coarse, deep, moderately close; vestiture inconspicuous except on epistomal area.

Pronotum 0.94 times as long as wide; widest at base, sides feebly arcuate, converging slightly on basal two-thirds, rather broadly rounded in front; anterior third minutely asperate, asperities low, rather widely spaced; surface reticulate, punctures rather fine, spaced by distances equal to about two to four diameters of a puncture, much smaller in asperate area. Glabrous.

Elytra 1.2 times as long as wide; sides almost straight and parallel on basal half, rather broadly rounded behind; striae 1 weakly, others not impressed, punctures small, moderately deep, mostly in definite rows; interstriae almost three times as wide as striae, almost smooth, punctures almost uniseriate to moderately confused, irregular in size within a row, fine to moderately coarse. Declivity convex, rather steep; striae slightly impressed, strial and interstrial punctures more definitely uniseriate; interstrial punctures often indefinitely, very feebly granulate. Vestiture consisting of interstrial rows of erect bristles, spacing of bristles between rows and within a row about equal to length of a bristle.

FEMALE.— Similar to male except frons shallowly to rather deeply concave on lower two-thirds (variable within a series), size and density of frontal punctures varying within series; frontal vestiture of moderately long, sparse, yellow hair.

DISTRIBUTION.— Veracruz and Oaxaca to Panama and Venezuela.

MEXICO: Chiapas, Oaxaca, Veracruz. GUATEMALA: Quezaltenango, Esquintla. HONDURAS: Cortez, Morazán. COSTA RICA: Limon, Puntarenas, San José. PANAMA: Panama (Cerro Campana). VENEZUELA: Miranda (El Laurel near Caracas).

HOST.— *Cecropia* spp.

BIOLOGY.— The petioles of fallen *Cecropia* leaves are selected for attack. The entrance holes commonly were found on the petiole surface that attached the leaf to the tree; the tunnels usually were in the hardened basal portion, rarely more than 5 cm from the base. The habits evidently were typical of the genus.

NOTES.— The above treatment was based on the three syntypic specimens in Blandford's original series and on 122 other specimens. Because a type has not been designated, I here designate the first male in Blandford's series, from Pantaleon, as the lectotype for his *Prionosceles maurus*; this specimen previously was labeled as the type and has been regarded as the type of the species.

### 3. *Scolytodes atratus atratus* (Blandford)

*Prionosceles atratus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):178 (Lectotype, male; Senahú, Vera Paz, Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is allied to *glabrescens* Wood, but it is easily distinguished by the regularly striate elytra, the vestiture and other characters.

MALE.— Length 2.4–3.3 mm, 2.0 times as long as wide; color black.

Frons convex above, impressed on lower half except median third above level of antennal insertions; surface shining, coarsely, deeply punctured, punctures moderately close above, dense on lower half; pubescence restricted to epistomal area.

Pronotum 1.02 times as long as wide; outline and asperities as in *maurus*; surface finely reticulate, subshining, punctures fine, deep, moderately close, obsolete in asperate area. Glabrous.

Elytra 1.2 times as long as wide; sides almost straight and parallel on basal two-thirds, very broadly rounded behind; striae 1 strongly, others moderately impressed, punctures fine, close, rather shallow; interstriae at least twice as wide as striae, almost smooth, shining, punctures very fine, uniseriate except slightly confused on 2, becoming finely granulate near declivity. Declivity broadly convex, rather steep; essentially as on disc, interstriae 1 indistinctly impressed; interstriae uniseriately granulate, granules fine, rounded. Vestiture confined to declivity, consisting of uniseriate rows of fine, interstrial hair; each hair slightly shorter than distance between rows or between setae in a row.

FEMALE.— Similar to male except frons abruptly, transversely, strongly impressed just below upper level of eyes to epistoma, a median callus on lower half of impressed area, impressed area clothed by moderately abundant, fine, long, yellow hair.

DISTRIBUTION.— Veracruz to Honduras.

MEXICO: Chiapas, Oaxaca, Veracruz. GUATEMALA: Quezaltenango, Vera Paz. HONDURAS: Cortez, Morazán.

HOSTS.— *Cecropia* spp.

BIOLOGY.— Recently fallen petioles were selected for attack. The tunnels most commonly were found in the basal half of the petiole, although occasional petioles were almost completely consumed. The male beetle evidently always constructed the entrance tunnel to the soft pith, where an irregular cavity was formed. The female then excavated one or more tunnels from a few millimeters in length up to half the length of the petiole. She distributed a few eggs at random, often mixed with frass, along the tunnel. The larvae extended the parental galleries, often consuming almost the entire pith region.

NOTES.— The above treatment was based on Blandford's seven syntypes and on 126 other specimens. Because a type has not been selected, I here designate a male from Senahú as the lectotype of *Prionosceles atratus* Blandford. This specimen was labeled "type" and has been regarded as the type for many years.

As indicated in the above key, this species is divided into northern and southern geographical races on the bases of distinct differences in average size, in surface sculpture of the pronotum, and in very slight differences in sculpture of the elytral declivity. The minute differences between specimens from these areas and the absence of specimens from Nicaragua (due to lack of collecting) suggest the advisability of recognizing subspecies, at least until intergradation can be demonstrated and studied.

### 4. *Scolytodes atratus panamensis* (Wood)

*Prionosceles panamensis* Wood, 1961, Great Basin Nat. 21:103 (Holotype, male; Summit, Canal Zone, Panama; U.S. Nat. Mus.)

DIAGNOSIS.— Although intergradation of this taxon with *atratus* (Blandford) has not been found, the geographical distribution, host, and habits very strongly suggest they are subspecies. They may be distinguished by characters mentioned in the above key.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Cartago, Limón, Puntarenas, San José provinces. PANAMA: Canal Zone and Panama.

HOST.— *Cecropia* spp.

BIOLOGY.— Similar to *a. atratus* above. It is very abundant.

NOTES.— The above treatment was based on the type series of 14 specimens, and on 115 other specimens.

### 5. *Scolytodes plumeriae* Wood

Figs. 17, 26

*Scolytodes plumeriae* Wood, 1969, Brigham Young University Sci. Bull., Biol. Ser. 10(2):17 (Holotype, female, Playa del Coco, Guanacaste, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *phoebeae* Wood by the pronotal surface being smooth and shining, by the pronotal punctures being coarse and deep, and by the female frontal vestiture extending higher on the vertex, more abundant and longer.

FEMALE.— Length 1.9–2.7 mm, 2.0 times as long as wide; color very dark brown, almost black.

Frons flattened from vertex to epistoma, lateral margins feebly raised below level of antennal insertion; surface densely, rather closely punctured, central area impunctate and very weakly elevated, punctures decreasing in size toward this impunctate area; vestiture very fine, moderately abundant, except glabrous in impunctate area, pubescent area scarcely extending above upper level of eyes.

Pronotum 1.0 times as long as wide; sides almost straight and parallel on basal half, rather narrowly rounded in front; surface smooth and shining, with minute points and with coarse, deep, close punctures, many punctures separated by distances less than diameter of a puncture; lateral and anterior surface somewhat wrinkled; glabrous.

Elytra 1.2 times as long as wide, 1.2 times as long as pronotum; sides almost straight and parallel on basal half, rather broadly rounded behind; striae feebly impressed, punctures small, impressed; interstriae about three times as wide as striae, surface smooth, with minute points, punctures almost as large as

those of striae but not as deep, confused. Declivity steep, convex; striae 1 impressed, all punctures reduced in size, punctures on interstriae 1 and 2 uniseriate, punctures lateral to striae 2 confused. Glabrous.

MALE.— Similar to female except frons convex, with a transverse impression along epistoma and continuing dorsad in lateral areas to level of antennal bases; frontal punctures fine, sparse, vestiture scanty, inconspicuous.

DISTRIBUTION.— Guatemala to Costa Rica.

GUATEMALA: Rodeo, Esquintla, 4-VI-64, 150 m, No. 677, *Plumeria*, S. L. Wood. COSTA RICA: Playa del Coco, Guanacaste, 11-VII-66, 1 m, No. 20, *Plumeria rubra*, S. L. Wood.

HOST.— *Plumeria rubra*.

HABITS.— This aggressive species is capable of killing healthy branches of its host, although cut or unthrifty material is usually selected for attack. The habits are essentially as in *phoebeae*. The entire life cycle can be completed in less than 20 days.

NOTES.— The above treatment was based on the type series of 79 specimens and on 17 other specimens.

### 6. *Scolytodes phoebeae* Wood

*Scolytodes phoebeae* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):16 (Holotype, female, Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— Allied to *cecropicolens* Wood, but larger, the anterior third of pronotum entirely devoid of asperities, and the female frons ornamented by long hair. It is much more closely related to *plumeriae* Wood.

FEMALE.— Length 2.0–2.6 mm, 2.0 times as long as wide; color dark brown.

Frons flattened from vertex to epistoma; lateral margins below level of antennal bases weakly elevated; central area on lower half impunctate, very slightly raised, marginal areas from near epistoma to vertex closely, finely punctured and ornamented by a dense brush of long, yellow hair, hair longer and more abundant above, tips of longest setae on vertex attaining level of antennal bases; premandibular epistomal lobe well developed.

Pronotum 0.95 times as long as wide; widest at base, sides almost straight on basal half and converging slightly, then rounded toward the narrowly rounded anterior margin; entire surface reticulate, finely punctured, punctures separated from one another by 2 or more times their own diameters.

Elytra 1.3 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal half, rather narrowly rounded behind; striae not impressed, punctures moderately coarse, not deep; interstriae about three times as wide as striae, punctures almost as large as those of striae, confused. Declivity rather steep, convex; strial punctures slightly smaller and deeper than on disc; interstrial punctures much smaller than those of striae, almost uniseriate on 2; 10 acutely convex from base to level of basal margin of sternum 5. Glabrous, except a few minute hairs on costal margin.

MALE.— Similar to female except frons convex above, becoming irregularly flattened below, a weakly transverse impression just above epistoma, glabrous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 24-X-63, 1300 m, No. 241, *Phoebea mexicana*, S. L. Wood.

BIOLOGY.— As in most other *Scolytodes* species, this species is monogamous. The adult male constructs an entrance tunnel and begins a nuptial chamber. Both male and female enlarge the oval cavity to about 3–5 mm wide and about 5–8 mm or more long. It is entirely within the thin bark, not engraving the wood at all; only the paper-thin, smooth, outermost layer of bark remains to conceal the tunnel. Eggs are scattered indiscriminately in the chamber; the young larvae feed along the margins of the chamber through the first and second instars, enlarging it somewhat. While the young larvae feed, the parent beetles bore from the phloem through the woody tissues to the large pith area. In the pith they construct a new chamber that is usually slightly larger than the first. Third instar larvae (as judged by their size) migrate to the pith chamber, where they feed until pupation occurs. Young adults may occur in pith, xylem, or phloem tissues, but most of them remain in the pith until it is entirely consumed. The infested branch studied was cut by me on 17 September; attack occurred after that date, and most of the brood had matured by 24 October.

NOTES.— The above treatment was based on the type series of 153 specimens.

### 7. *Scolytodes minutissimus* Schedl

*Scolytodes minutissimus* Schedl, 1952, Dusenia 3:355 (Holotype, female; Hamburgfarm on Río Reventazon, Limón, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *phoebeae* Wood by the much smaller size, by the minute pronotal and elytral punctures, and by the different female frons.

FEMALE.— Length 1.2 mm, 2.1 times as long as wide; yellowish brown (probably not fully colored).

Frons with eyes separated by 1.7 times width of an eye, broadly convex, median fourth with a longitudinal, smooth, shining callus from level of antennal insertion two-thirds distance to upper level of eyes, marginal areas surrounding callus weakly impressed and obscurely punctured, impressed area occupying about half of distance from callus to inner margin of eye; remaining area smooth, shining, with very sparse, fine punctures; vestiture confined to impressed area, of moderately abundant, rather short hair; longest setae about equal in length to half width of eye.

Pronotum 0.88 times as long as wide; widest at base, sides feebly converging on basal half, rather broadly rounded in front; surface shining, almost smooth, very obscurely subreticulate near obscure summit; punctures minute, shallow, widely spaced. Glabrous.

Elytra 1.3 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on slightly more than basal half, rather narrowly rounded behind, surface smooth, shining; striae not impressed, punctures minute, close, in irregular rows; interstriae more than six times as wide as striae, punctures sparse, minute, uniseriate on basal half, confused on 1 and 2 toward declivity. Declivity convex, rather steep; punctures on lower half deeper than on disc and uniseriate. Very minute interstrial setae sparsely scattered on declivity.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Hamburgfarm on Río Reventazon, Limón, im nest von *Citon hamatum,* F. Nevermann.

NOTES.— The above treatment was based on the holotype.

### 8. *Scolytodes levis* (Blackman)

*Ctenophorus laevigatus* Chapuis, 1869 (nec Ferrari, 1867), Synopsis des Scolytides, p. 49 (Syntypes, males; Colombie; Brussels Mus.). *Preoccupied*

*Hexacolus levis* Blackman, 1943, Proc. U.S. Nat. Mus. 94(3174):382 (Holotype, female; Paraiso, Canal Zone, Panama); Wood, 1977, Great Basin Nat. 37:517. *Synonymy*

*Scolytodes chapuisi* Wood, 1977, Great Basin Nat. 37:210 (Replacement name for *laevigatus* Chapuis); Wood, 1977, Great Basin Nat. 37:517. *Synonymy*

DIAGNOSIS.— This species is distinguished from the remotely allied *phoebeae* Wood by the smaller, more slender form, by the uniseriate interstriae, and by numerous other characters described below.

FEMALE.— Length 1.7–2.2 mm, 2.2–2.3 times as long as wide; color dark reddish brown.

Frons moderately convex; median fourth from epistoma on lower two-thirds below upper level of eyes a smooth, brightly shining, weakly elevated callus, its outline moderately constricted just above epistoma; median three-fourths (except for callus) finely, rather closely punctured form epistoma to vertex (one-fourth of punctured area above eyes); vestiture of rather long, moderately abundant, reddish yellow hair; lateral and dorsal areas reticulate.

Pronotum 1.0 times as long as wide; about as in *cecropii* Schedl except less strongly convex, less strongly reticulate, with no indication of asperities on anterior slope.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; very similar to *cecropii* except strial punctures slightly larger, more distinct, interstrial punctures almost uniseriate, rather indistinct, declivity smoother, with punctures more distinct. Glabrous.

MALE.— Similar to female except frons uniformly convex and reticulate, without special sculpture or setae.

DISTRIBUTION.— Panama to Venezuela.

PANAMA: Paraiso, Canal Zone, 26-I-11, E. A. Schwarz. VENEZUELA: Colonia Tovar, El Laurel (12 km SW Caracas), and Rancho Grande (Pittier National Park) in Aragua.

HOST.— *Cecropia* sp.

BIOLOGY.— All specimens from Venezuela were removed from the petioles of fallen *Cecropia* leaves.

NOTES.— The holotype and 113 other specimens were examined.

### 9. *Scolytodes amoenus* Wood

*Scolytodes amoenus* Wood, 1967, Great Basin Nat. 27:128 (Holotype, female; 35 km N Juchitlán, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— Superficially, this species resembles *multistriatus* Wood, but it is brightly shining, the declivity is more gradual, the female frons is entirely different, and interstriae 10 is acutely elevated to the declivity. Among species with an asperate anterior slope of the pronotum, continued 10th elytral interstriae, and a tubercle on the posterior face of the front tibiae, this species is unique. The large size, the multistriate elytra, and the unique female frons also help to distinguish this unusual species.

FEMALE.— Length 1.9–2.3 mm, 2.2 times as long as wide; color of basal third of pronotum, most of elytra, and most of body yellowish brown, with head, anterior two-thirds of pronotum, all margins of each elytron, and some parts of meso- and metasternum dark brown (variable in series).

Frons flattened from just above upper level of eyes to epistoma; most of area between eyes occupied by a very finely granulate, perfect circle extending from upper level of eyes to epistoma; lower half of circle bearing on its lower half a smooth, shining, transverse, procurved band with small, median, orad extension, this area about equal to half width of circle; area outside of circle rather coarsely, very closely punctured; vestiture consisting of equally long, fine, plumose setae on a continuous band surrounding circular area, numerous additional setae along epistoma; central area glabrous.

Pronotum 1.1 times as long as wide; widest at base, sides very feebly arcuate, almost straight, converging anteriorly very slightly on basal two-thirds, rather narrowly rounded in front; indefinite summit near middle, anterior fourth finely asperate; anterior margin armed by a continuous ridge; posterior areas obscurely subreticulate, coarsely, deeply, closely punctured, punctures separated by slightly less than their own diameters. Glabrous except near lateral and anterior margins.

Elytra 1.3 times as long as wide, 1.2 times as long as pronotum; sides almost straight and parallel on basal half, rather narrowly rounded behind; elytra with basal margin marked by a fine, raised line; striae 1 weakly, others not impressed, punctures rather fine, deep; interstriae shining, one and one-half times as wide as striae, punctures rather fine, deep, rather abundant, confused. Declivity convex, steep; striae 1 strongly impressed; all punctures reduced, those of striae little larger than abundant interstrial punctures. Glabrous except at sides.

MALE.— Similar to female except frons convex, with a transverse impression just above epistoma, surface reticulate with coarse deep punctures above, a few granules below.

DISTRIBUTION.— Jalisco to Tamaulipas.

MEXICO: **Jalisco**: 35 km N Juchitlán, 3-VII-65, 1300 m, No. 177 *Ficus*, S. L. Wood. **Tamaulipas**: Bocatoma, 7 km SE Gómez Farías, 25-III-78, E. G. Riley.

BIOLOGY.— This species infested the phloem tissues of unthrifty and cut branches of a native fig tree.

NOTES.— The above treatment was based on the type series of 68 specimens.

### 10. *Scolytodes lepidus* Wood

*Scolytodes lepidus* Wood, 1975, Great Basin Nat. 35:27 (Holotype, female; 33 km or 21 miles N Juchitlán, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *amoenus* Wood by the slightly larger average size, by the slightly larger elytral punctures, by the presence of a few elytral setae, particularly along sides, and by the very different female frons.

FEMALE.— Length 1.8–2.3 mm, 2.2 times as long as wide; color dark brown, base of pronotum usually pale.

Frons broadly flattened from epistoma to vertex, almost smooth, upper half and sides below coarsely, closely punctured and pubescent, median third on lower half slightly elevated, smooth, shining, impunctate, glabrous; vestiture long, moderately abundant, more widely distributed than in *amoenus*.

Pronotum 1.0 times as long as wide; as in *amoenus* except discal area reticulate (smooth to subreticulate in *amoenus*) and moderately pubescent at lateral margins (almost glabrous in *amoenus*).

Elytra 1.2 times as long as wide, 1.3 times as long as pronotum; as in *amoenus* except

strial and interstrial punctures larger, more completely confused, and lateral areas with sparse setae (entirely glabrous in *amoenus*).

MALE.— Similar to female, with frons similar to male *amoenus* except more coarsely punctured, more protuberant in median area, with no granules.

DISTRIBUTION.— Jalisco.

MEXICO: Jalisco: 33 km or 21 miles N Juchitlán, 3-VII-65, 1300 m, No. 177, *Ficus*, S. L. Wood.

BIOLOGY.— Specimens were taken from the same branches as the type series of *amoenus*.

NOTES.— The above treatment was based on the type series of 27 specimens.

### 11. *Scolytodes genialis* Wood

*Scolytodes genialis* Wood, 1975, Great Basin Nat. 35:27 (Holotype, female; Laguna Santa María, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *lepidus* Wood by the absence of punctures in the asperate area of the pronotum and by the much finer punctures on the pronotal disc and on the elytra.

FEMALE.— Length 1.8–2.1 mm, 2.3 times as long as wide; color light brown, anterior half of pronotum darker.

Frons as in *lepidus* except vestiture finer, very slightly shorter. Pronotum as in *lepidus* except punctures very fine, shallow. Elytra as in *lepidus* except strial punctures fine, shallow, in definite rows, interstrial punctures very small, confused, striae 1 not impressed on declivity, vestiture on sides of elytra minute.

MALE.— Similar to female except frons as in male *lepidus*.

DISTRIBUTION.— Nayarit to Jalisco.

MEXICO: Jalisco: 24 km S Mazamitla, 22-VI-65, *Ficus*, S. L. Wood. Nayarit: Laguna Santa María, 7-VII-65, 900 m, No. 197, *Ficus*, S. L. Wood.

BIOLOGY.— All specimens were taken from branches of a *Ficus* with yellowish bark.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 12. *Scolytodes perditus* Wood

*Scolytodes perditus* Wood, 1967, Great Basin Nat. 27:123 (Holotype, female; Fort Clayton, Canal Zone, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *cecropicolens* Wood by the more slender body form, by the less deeply impressed, finer punctures on pronotum and elytra and, in the female, by the dense, long brush of frontal hair arising above the eyes.

FEMALE.— Length 1.6–2.1 mm, 2.1 times as long as wide; color yellowish brown, anterior fourth of prothorax darker.

Frons flattened from well above upper level of eyes to epistoma, with low, submarginal, longitudinal carinae extending from epistoma about half distance to upper level of eye; central area minutely granulate, lateral areas with a few punctures; vestiture consisting of abundant, coarse, long, subplumose setae mostly arising above eyes, none as low as level of antennal bases, some setae sufficiently long to reach epistoma.

Pronotum 1.1 times as long as wide; widest at base, sides almost straight, converging very slightly anteriorly, rather narrowly rounded in front; slightly less than anterior half very finely, closely asperate; posterior area reticulate, punctures rather fine, shallow. Glabrous.

Elytra 1.2 times as long as wide, 1.2 times as long as pronotum; sides straight and parallel on slightly more than basal half, rather narrowly rounded behind; striae not impressed, punctures small, sharply but not deeply impressed, punctures almost indistinguishable from similar, abundant, confused, interstrial punctures; surface almost smooth, shining. Declivity convex, rather steep; strial punctures deeper than on disc, not reduced; interstrial punctures distinctly smaller, uniseriate except near upper area. Vestiture restricted to a few setae on sides.

MALE.— Similar to female except frons convex, with a transverse impression just above epistoma but interrupted by a small subcarinate median elevation; surface smooth, shining, punctures rather coarse, deep; strial punctures on disc deeper and somewhat larger than those of striae.

DISTRIBUTION.— Panama.

PANAMA: Fort Clayton, Canal Zone, 22-XII-63, 30 m, No. 321, *Cecropia*, S. L. Wood.

BIOLOGY.— Phloem tissues in the branch terminals were infested by this species within a few centimeters of the tip in a broken limb.

NOTES.— The above treatment was based on the type series of 18 specimens.

### 13. *Scolytodes cecropicolens* Wood

*Scolytodes cecropicolens* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):16 (Holotype, female; Peralta, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— In size and proportions this species is more nearly similar to *maurus* (Blandford) than to other species known to me, but tibial and other characters are very different.

FEMALE.— Length 1.9–2.2 mm, 1.9 times as long as wide; color dark brown or medium brown, with marginal areas darker.

Frons rather narrowly flattened below upper level of eyes, median third on lower two-thirds of flattened area rather abruptly impressed, impression wider below and less definite; lateral margins indefinitely elevated below level of antennal insertion; surface reticulate above, subreticulate in impressed area, punctures coarse, sparse, sharply defined but not very deep; vestiture minute, inconspicuous, a few longer hairlike setae on epistoma.

Pronotum 0.96 times as long as wide; widest at base, sides very slightly arcuate, converging slightly to subabrupt anterolateral angles, rather narrowly rounded in front; anterior third feebly asperate; surface reticulate, punctures rather coarse and separated by more than their own diameters, much finer anteriorly, continuing to anterior margin. Vestiture minute, appearing glabrous.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae feebly if at all impressed, punctures rather coarse, moderately deep; interstriae slightly more than twice as wide as striae, weakly convex, punctures almost as large as those of striae, those on 2 and 4 confused on basal half, almost uniseriate elsewhere. Declivity convex, rather steep; punctures of striae and interstriae smaller, not as deep, and less sharply defined than on disc. Vestiture consisting of rows of short interstrial hair; very minute strial setae visible toward base of elytra.

MALE.— Similar to female except frons convex, with a slight transverse impression just above epistoma.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Peralta, Cartago, 10-III-64, 500 m, No. 464, *Cecropia*, S. L. Wood.

BIOLOGY.— This species infested phloem tissues in the terminal ends of branches of a cut tree.

NOTES.— The above treatment was based on the type series of 28 specimens.

### 14. *Scolytodes costabilis* Wood

*Scolytodes costabilis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):13 (Holotype, female; Lago Catemaco, Veracruz, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *melanocephalus* Blandford by the different female frontal sculpture, by the very fine punctures on the pronotal disc, and by the very small strial punctures.

FEMALE.— Length 1.8–2.0 mm, 2.6 times as long as wide; color brown.

Frons rather broadly flattened from epistoma to vertex; a pair of low, subparallel, longitudinal carinae from level of antennal insertion to epistomal margin; surface smooth and shining above level of antennal insertion, a row of punctures around margin; feebly bisulcate between carinae, finely reticulate-punctate in sulci, smooth and shining between; vestiture of long, yellow hair on margins above, tips of longest setae reach level of antennal insertion, sulci on lower third with fine, short hair.

Pronotum 1.1 times as long as wide; sides straight on basal two-thirds, converging very slightly to anterolateral angles, broadly rounded in front; surface reticulate, anterior fourth rather strongly declivous and finely asperate, fine, almost obsolete punctures behind each asperity; punctures on posterior areas very small, shallow, moderately close. Glabrous.

Elytra 1.4 times as long as wide, 1.2 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; basal margins not carinate, abrupt; striae not impressed, punctures very fine, distinctly impressed, spaced within a row by about twice diameter of a puncture; interstriae smooth, shining, punctures very fine, three or more times as wide as striae, uniseriate except moderately confused in some specimens. Declivity steep, convex; sculpture essentially as on disc.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: Lago Catemaco, 16–20-VI-69, 1–3-V-69, D. E. Bright.

NOTES.— The above treatment was based on the type series of five females.

### 15. *Scolytodes melanocephalus* (Blandford)

*Hexacolus melanocephalus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):181 (Lectotype, female; Cerro Zunil, Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species was placed in the key near *cecropiavorus* Wood, although it might just as easily have been placed near *schwarzi* Hopkins or perhaps even *amoenus* Wood. Although the true relationships of this species are not entirely clear, it is easily recognized by the very distinctive sculpture of the female frons.

FEMALE.— Length 1.7 mm, 2.25 times as long as wide; color brown.

Frons flattened, lateral thirds armed by a pair of carinae beginning just below level of antennal insertion, obliquely diverging to near lateral margin, ending midway between level of antennal insertion and upper level of eye, a strong, rather short median carina extending from this level to vertex; surface obscured by glue on type but evidently smooth and finely punctured; lateral margins rather sparsely pubescent much as in *cecropiavorus*.

Pronotum about 1.0 times as long as wide; sides almost straight and parallel on basal half, rather broadly rounded in front; anterior third very finely asperate, but with punctures intermixed to anterior margin; posterior areas reticulate, dull, coarsely, rather deeply, closely punctured. Evidently glabrous.

Elytra 1.4 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on slightly more than basal half, rather broadly rounded behind; striae not impressed, punctures moderately large, rather deep; interstriae twice as wide as striae, almost smooth, punctures slightly smaller and not as deep as those of striae, uniseriate, as closely spaced as those of striae. Declivity convex, rather steep; striae 1 and 2 slightly impressed; all punctures slightly smaller, but similar to declivity. Glabrous.

DISTRIBUTION.— Guatemala.

GUATEMALA: Cerro Zumil, 4–5000 ft (1300–1700 m), G. C. Champion.

NOTES.— The above treatment was based on two syntypes. This species was based on three syntypes from Cerro Zunil; of these, one is missing from its pin. The first syntype, a female, is here designated as the lectotype of *Hexacous melanocephalus* Blandford. For many years it has borne a type label and has been considered to be the type.

### 16. *Scolytodes cecropiavorus* Wood

*Scolytodes cecropiavorus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):17 (Holotype, female; San Ignacio de Acosta, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *cecropii* Schedl by the distinctly impressed strial and interstrial punctures, by the shining male frons with fine punctures, and by the more widely separated female frontal carinae.

FEMALE.— Length 1.4–1.8 mm, 2.2 times as long as wide; color very dark brown.

Frons flattened from vertex to epistoma, divided on lower half into almost equal thirds by a pair of prominent, subparallel, longitudinal carinae; surface finely, rather closely punctured, and punctures somewhat sparse between carinae; lateral and upper areas ornamented by a rather sparse tuft of fine, long, yellow hair.

Pronotum 1.0 times as long as wide; widest near base, sides weakly arcuate, converging very slightly to anterior fourth, then rather narrowly rounded in front; surface reticulate, with fine, rather sparse punctures. Glabrous.

Elytra 1.3 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae 1 feebly, others not at all impressed, punctures small, shallow; interstriae almost three times as wide as striae, obscurely marked by minute points and lines, punctures fine, obscure, uniseriate. Declivity moderately steep, convex; strial and interstrial punctures obscurely indicated. Glabrous, except for a few setae along costal margin.

MALE.— Similar to female except frons evenly, rather weakly convex, with a weak transverse impression just above epistomal process, surface subreticulate above, subshining below, glabrous, except a few setae near epistoma.

DISTRIBUTION.— Costa Rica.

COSTA RICA: San Ignacio de Acosta, San José, 5-VII-63, 1500 m, No. 36; Río Damitas, Dota Mts., San José, 22-VII-63, 250 m, No. 130; Rincón de Osa, Puntarenas, 11-VIII-66, No. 58; all from the same host, by S. L. Wood.

HOST.— *Cecropia peltata.*

BIOLOGY.— This species infested recently fallen leaf petioles of the host tree. The tunnels were immediately below the epidermal layer.

NOTES.— The above treatment was based on the type series of 33 specimens. Two distinct geographical races of this species are known.

*Scolytodes c. acuminatus* Wood (Brigham Young Univ. Sci. Bull., Biol. Ser., vol. 10, pt. 2:17, 1969, female holotype, Tapantí, Cartago, Costa Rica, 24-X-63, 1300 m, No. 207, S. L. Wood) was taken from the same host and has similar habits. In this race the elytral apex is strongly acuminate and the male frons is more strongly convex. Intergradation between the two forms could not be demonstrated with the limited material at hand.

*Scolytodes c. punctifer* Wood (Brigham Young Univ. Sci. Bull., Biol. Ser., vol. 10, pt. 2:18, 1969; male holotype, Gatun Dam Canal Zone Panama, 31-XII-63, 15 m, No. 361, S. L. Wood) was taken from a different species of *Cecropia* and has similar habits. This subspecies is of the same size and proportions as *c. cecropiavorus*, but the elytral apex is more broadly rounded, the declivital punctures are strongly impressed, and the male frons is sparsely, minutely punctured below and shining. Intergradation between the two forms could not be demonstrated from the limited material at hand.

### 17. *Scolytodes unipunctatus* (Blandford)

*Hexacolus unipunctatus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):182 (Lectotype, female; Cubilguitz, Alta Verapaz, Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— The point of insertion of the antennae, the odd frontal elevation of the female, and the constricted, depressed declivital interstriae 2 are all unique in this genus. The over-all surface sculpture is also unmatched in this genus.

FEMALE.— Length 1.75–1.85 mm, 2.5 times as long as wide; color black.

Frons very weakly, broadly concave from epistoma to upper level of eyes; median fourth of lower third occupied by a large, black, subpyriform, abruptly elevated process increasing in height dorsally, its upper limit projecting slightly; surface of concavity on lower half yellow, evidently somewhat spongy, becoming minutely granulate-punctate above; vestiture of uniformly distributed, very fine, moderately abundant, rather long hair. Antennal insertion immediately above middle of distance from epistomal margin to upper level of eyes; scape with a small tuft of hair near apex.

Pronotum 1.1 times as long as wide; widest near base, sides almost straight, converging very slightly on basal two-thirds, rather broadly rounded in front; anterior fifth slightly more declivous and very feebly asperate; surface subreticulate, with a bright sheen, punctures moderately large near base, small anteriorly, very shallow, continuing to anterior margin. Glabrous.

Elytra 1.4 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal half, rather narrowly rounded behind; striae 1 impressed, others feebly impressed toward declivity, punctures moderately coarse, rather deep; interstriae three times as wide as striae, very smooth, brightly shining, punctures uniseriate, very fine, shallow. Declivity rather gradual, convex; striae impressed, punctures small, shallow; interstriae 2 rather strongly narrowed, impressed, 1, 3, and 9 convex, slightly elevated. Glabrous.

MALE.— Similar to female except frons convex, smooth, with an opalescent sheen, finely, sparsely punctured; scape without tuft of hair; punctures on pronotum not reduced in size anteriorly.

DISTRIBUTION.— Guatemala.

GUATEMALA: Cubilguitz, Alta Verapaz, G. C. Champion.

NOTES.— The above treatment was based on six syntypes. The first female syntype bears a type label but has never been officially designated as such. I here designate that female syntype, from Cubilguitz, as the lectotype of *Hexacolus unipunctatus* Blandford.

### 18. *Scolytodes cecropii* (Schedl)

*Hexacolus cecropii* Schedl, 1937, Arb. Morph. Taxon. Ent. Berlin-Dahlem 4:66 (Holotype, female; La Hondura, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is very closely related to *blandfordi* (Schedl). Because females of *blandfordi* are unknown, it can be stated only that the two known males are distinguished from *cecropii* males only by slight differences in punctation of the elytral declivity as noted in the above key. More material could very well indicate the existence of only one species.

FEMALE.— Length 1.7–2.0 mm, 2.3 times as long as wide; color dark brown to black.

Frons flattened on a somewhat narrow area from upper level of eyes to epistoma; lower three-fifths with a pair of subcontiguous, almost parallel, median, shining, longitudinal carinae, diverging very slightly toward epistoma; surface reticulate, largely obscured by a dense brush of long, yellow hair arising from margins of upper third to well above eyes, tips of longest hair reaching epistomal margin.

Pronotum 1.0 times as long as wide; widest at base, sides feebly arcuate, converging slightly, rather broadly rounded in front; surface finely reticulate, dull, punctures fine, shallow, rather widely spaced, attaining anterior margin, asperities entirely absent. Glabrous.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on slightly less than basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures small, shallow, scarcely evident; interstriae about three times as wide as striae, obscurely wrinkled, subshining, punctures obscure, very shallow. Declivity convex, moderately steep; punctures small, shallow, obscure. Glabrous.

MALE.— Similar to female except frons weakly convex above, a slight transverse impression just above epistoma, glabrous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 24-X-63, 1300 m, No. 267, *Cecropia peltata*, S. L. Wood. The type series was labeled "La Palma, 1450 m, La Hondura, Costa Rica, F. Nevermann, 5-VI-36, *Cecropia mexicana*." It is presumed this locality is in the La Palma area between Volcán Barba and Volcán Irazu in San José Province, because Nevermann lived nearby in a suburb of San José.

BIOLOGY.— Five specimens of this species were taken as they walked on or were beginning entrance tunnels in a fallen *Cecropia* leaf petiole. None of the entrance tunnels indicated the location of brood chambers.

NOTES.— The above treatment was based on a male paratype, on two male and two female topotypic homotypes, on 28 other topotypes bearing identical data to the type, and on 5 other specimens.

### 19. *Scolytodes blandfordi* (Schedl)

*Hexacolus blandfordi* Schedl, 1936, Arch. Inst. Biol. Veg. Río de Janeiro 3:104 (Holotype, male; Hamburgfarm on Río Reventazón, Limón, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is doubtfully distinct from *cecropii* (Schedl).

MALE.— Length 1.4–1.5 mm, 2.4 times as long as wide; color dark reddish brown.

As in *cecropii* except frons more coarsely reticulate, transverse impression above epistoma lacking a feeble median elevation; punctures on elytral declivity very slightly larger, deeper.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Hamburgfarm on Río Reventazón, Limón, F. Nevermann; Pandora, Limón, 23-VIII-63, 50 m, No. 146, *Cecropia* petiole, S. L. Wood.

BIOLOGY.— One male was taken from a new tunnel in a *Cecropia* leaf petiole.

NOTES.— The above treatment was based on a male that was compared directly to the unique holotype by me.

### 20. *Scolytodes venustus* Wood

*Scolytodes venustus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):18 (Holotype, female; Rodeo, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *pseudopiceus* Wood by the more finely punctured female frons, with the pubescence more abundant and evenly distributed, and by the striae, which are not impressed, their punctures are fine and shallow.

FEMALE.— Length 1.4–1.8 mm, 2.3 times as long as wide; color very dark brown, almost black.

Frons flattened from upper level of eyes to epistoma (rather narrowly above); surface subreticulate and finely punctured above eyes, subshining and rather coarsely punctured on flattened area, a small, shining,

impunctate, central area on lower half; epistomal lobe not evident; vestiture consisting of fine, sparse, moderately long hair.

Pronotum 1.0 times as long as wide; widest at base, sides of basal half almost straight and parallel, rather broadly rounded in front; entire surface reticulate, punctures coarse, deep, rather close, becoming somewhat smaller in anterior area; not at all asperate anteriorly. Glabrous except at sides.

Elytra 1.3 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae 1 rather strongly, others rather weakly impressed, punctures moderately large, deep, very close; interstriae about one and one-half times as wide as striae, almost smooth, with a few fine points, punctures more than half as large as those of striae, deep, rather close, uniseriate. Declivity steep, convex, about as on disc, except all punctures smaller. Glabrous, except for sparse, short hair on sides and marginal areas behind.

MALE.— Similar to female except frons convex, reticulate, finely, sparsely punctured, subglabrous; anterior fourth of pronotum finely asperate, punctures in this area obscured.

DISTRIBUTION.— Guatemala to Costa Rica.

GUATEMALA: Rodeo, Esquintla, 4-VI-64, 200 m, No. 20, *Plumeria* and No. 678, *Ficus*, No. 677, S. L. Wood. COSTA RICA: Playa del Coco, Guanacaste, 11-VII-66, 1 m, No. 20, *Plumeria rubra*, S. L. Wood.

HOST.— *Plumeria rubra*, *P.* sp., *Ficus* sp.

BIOLOGY.— This species was taken from the same branches as *plumeriae* and evidently has similar habits. Mature, fully colored brood was found 20 days after one branch was cut.

NOTES.— The above treatment was based on the type series of 82 specimens.

### 21. *Scolytodes striatus* (Eggers)

*Hexacolus striatus* Eggers, 1934, Ent. Blätt. 30:79 (Holotype, male; Turrialba, Costa Rica; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from *venustus* Wood by the slightly stouter form, by the total absence of asperities on the pronotum, by the slightly larger strial punctures and the more strongly convex interstriae on the declivity, and by the different elytral vestiture.

MALE.— Length 1.7 mm, 2.0 times as long as wide; color very dark brown.

As in male *venustus* except differing as indicated above. Elytral vestiture, particularly on declivity, of stout, erect, short, rather abundant setae; each seta slightly longer than distance equal to diameter of a strial puncture.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Turrialba.

NOTES.— The above treatment was based on the holotype.

### 22. *Scolytodes pseudopiceus* Wood

*Scolytodes pseudopiceus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):18 (Holotype, female; San Isidro del General, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is closely related to *venustus* Wood, but it is distinguished by characters summarized in the above diagnosis and key.

FEMALE.— Length 1.4–1.9 mm, 2.1 times as long as wide; color very dark brown, almost black.

Frons flattened from just above upper level of eyes to epistoma, evidently feebly convex near center; rather coarsely, closely punctured; ornamented by a rather scanty brush of fine, long hair, distribution about uniform, except reduced or absent toward center.

Pronotum 1.04 times as long as wide; widest near base, sides weakly arcuate, converging slightly to anterior third, then rather narrowly rounded in front; summit indefinite, near middle; anterior third appearing weakly crenulate from above, but only feebly wrinkled from other aspects; surface subreticulate, rather coarsely, deeply, closely punctured from base to anterior margin. Glabrous.

Elytra 1.3 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures rather fine, deep; interstriae more than twice as wide as striae, almost smooth, punctures subequal to those of striae, in almost regular, uniseriate rows. Declivity steep, convex; striae 1 slightly impressed; all punctures smaller than on disc. Glabrous.

MALE.— Similar to female except frons convex, with a slight transverse impression

just above epistomal margin, surface reticulate and sparsely, rather deeply punctured.

DISTRIBUTION.— Costa Rica.

COSTA RICA: San Isidro del General, San José, 5-XII-63, 1000 m, No. 278, *Ficus* sp., S. L. Wood.

BIOLOGY.— Small, unthrifty twigs in living trees are selected for attack. The habits apparently are similar to most other species in the genus.

NOTES.— The above treatment was based on the type series of 19 specimens.

### 23. *Scolytodes setosus* (Blandford)

*Hexacolus setosus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):181 (Holotype, female?; Cerro Zunil, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species evidently is intermediate in its relationships between *hirsutus* Wood and *crassus* Wood, but it is distinguished by the elytral vestiture and by other characters mentioned in the above key.

FEMALE.— Length 1.6 mm, about 2.1 times as long as wide; color brown, anterior half of pronotum darker.

Frons broadly convex, a slight transverse impression on lower third; surface smooth, rather coarsely, sparsely, deeply punctured; vestiture of sparse, fine, long, uniformly distributed hair.

Pronotum 0.94 times as long as wide; widest on basal half, sides very weakly arcuate on posterior two-thirds, then converging rather abruptly to broadly rounded anterior margin; surface weakly reticulate, punctures moderately fine, spaced within a row by one to two diameters of a puncture, moderately deep, smaller and less strongly impressed on anteromedian area. Vestiture rather abundant, of fine, long hair.

Elytra about 1.4 times as long as wide (slightly spread on type); outline as in allied species; striae not impressed, punctures moderately fine, rather deep, close; interstriae two to three times as wide as striae, smooth, shining, punctures very fine, deep, moderately confused on 1 and 2, uniseriate on 3–9. Declivity convex, rather steep; sculpture about as on disc. Vestiture consisting of rows of fine, moderately long, semirecumbent strial hair; interstrial setae of two types, some similar to strial setae and alternating in rows with bristles, others form rows of erect bristles each as long as distance between rows, slightly closer to one another within a row, their tips blunt, slightly flattened.

DISTRIBUTION.— Guatemala.

GUATEMALA: Cerro Zunil, 4000 ft (1300 m), G. C. Champion.

NOTES.— The above treatment was based on the holotype.

### 24. *Scolytodes punctiferus* Wood

*Scolytodes punctifer* Wood, 1971, (nec. Wood 1969) Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):15 (Holotype, male; Volcán Irazu, Cartago, Costa Rica; Wood Coll.)

*Scolytodes punctiferus* Wood, 1976, Great Basin Nat. 36:348. *Replacement name*

DIAGNOSIS.— This pubescent species is distinguished from *punctatus* Eggers by the much smaller strial punctures, with the interstrial punctures much smaller than those of the striae, by the smooth pronotal surface, with smaller punctures, and by the more abundant elytral hair.

MALE.— Length 1.5 mm, 2.0 times as long as wide; color very dark brown, elytra slightly lighter, abundant vestiture pale.

Frons convex, a slight transverse impression just above epistoma; surface obscurely reticulate, punctures rather small, deep, moderately close; vestiture fine, sparse, short. Sutures of antennal club almost obsolete.

Pronotum 0.95 times as long as wide; sides parallel, feebly arcuate on basal half, broadly rounded in front; surface obscurely reticulate behind, distinctly reticulate toward anterior margin, punctures coarse, deep, close. Vestiture fine, abundant, moderately long.

Elytra 1.3 times as long as wide; sides almost straight and parallel on basal two-thirds; striae 1 feebly, others not impressed, punctures rather coarse, deep; interstriae smooth, about one and one-half times as wide as striae, punctures rather large, uniseriate except slightly confused on 2. Declivity convex, rather steep; all punctures distinctly smaller, otherwise similar to disc. Vestiture of rather abundant, fine, erect, strial and interstrial hair, and slightly longer, uniseriate rows of slightly coarser, interstrial hair; each long hair about one and one-half times as long as distance between rows.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Irazu, Cartago, 26-IX-63, 2300 m, No. 207, *Oreopanax nubigenus*, S. L. Wood.

BIOLOGY.— One male specimen was taken from a twig of a broken limb.

NOTES.— The above treatment was based on the holotype.

### 25. *Scolytodes hirsutus* Wood

*Scolytodes hirsutus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):16 (Holotype, male; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *punctiferus* Wood by the fine, confused, elytral punctures, by the strongly reticulate, dull pronotal surface, and by the much finer pronotal punctures.

MALE.— Length 1.7 mm, 2.1 times as long as wide; color black.

Frons moderately convex, surface strongly reticulate, punctures fine, deep, moderately abundant; vestiture inconspicuous.

Pronotum 0.95 times as long as wide; outline as in *punctiferus*; surface strongly reticulate, dull, punctures fine, rather shallow, moderately abundant. Vestiture fine, rather abundant, moderately long.

Elytra 1.2 times as long as wide; outline as in *punctiferus*; strial and interstrial punctures equal in size, small, rather shallow, interstrial punctures confused, those of striae distinguished with difficulty. Declivity convex, rather steep; punctures minute, confused. Vestiture of fine, long strial and interstrial hair, and slightly longer uniseriate rows of interstrial hair; each longer hair slightly longer than distance between rows.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 2-VII-63, 2300 m, No. 8, S. L. Wood.

BIOLOGY.— The holotype was removed from an old section of cut vine (somewhat similar to *Clematis*) that was completely riddled by this species.

NOTES.— The above treatment was based on the holotype.

### 26. *Scolytodes crassus* Wood

*Scolytodes crassus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):16 (Holotype, male; Barro Colorado Island, Canal Zone, Panama; Wood Coll.)

DIAGNOSIS.— The position of this small, stout species is problematical, but the rows of very fine strial and interstrial hair suggest a possible relationship to *hirsutus* Wood.

MALE.— Length 1.0 mm, 1.9 times as long as wide; color yellowish brown, apparently not fully colored.

Frons convex, surface obscurely reticulate, shining, punctures rather large, deep, not close; fine, moderately abundant toward epistoma.

Pronotum 0.94 times as long as wide; widest at base, sides indistinctly arcuate, converging very slightly on basal two-thirds, rather narrowly rounded in front; surface smooth and shining, punctures small, rather shallow, moderately close, irregularly spaced. Vestiture of short, very fine, moderately abundant, recumbent hair.

Elytra 1.2 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae feebly if at all impressed, punctures large, moderately deep, close; interstriae almost as wide as striae, smooth, shining, punctures very fine, uniseriate, close. Declivity convex, rather steep; strial punctures gradually reduced to about two-thirds size on disc; interstriae slightly wider than striae, very feebly convex. Vestiture consisting of uniseriate rows of very fine, recumbent, moderately long strial and interstrial hair; in addition, odd-numbered interstriae on posterior half of elytra bear widely spaced, erect, spatulate bristles of moderate length, about six such bristles on each interstriae.

DISTRIBUTION.— Panama.

PANAMA: Barro Colorado Island, Canal Zone, XI-52 to III-53, J. Zetek.

BIOLOGY.— Unknown. The type evidently was taken at light.

NOTES.— The above treatment was based on the unique holotype.

### 27. *Scolytodes venustulus* Wood

*Scolytodes venustulus* Wood, 1967, Great Basin Nat. 27:124 (Holotype, male; Cerro Punta, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species appears to be closely related to *venustus* Wood, but it is distinguished by the smaller size, by the reticulate, less closely punctured posterior area of the pronotum, by the unimpressed elytral striae, and by the almost equal size of strial and interstrial punctures.

MALE.— Length 1.3–1.5 mm, 2.3 times as long as wide; color dark brown, with a slight reddish cast.

Frons convex, with a transverse impression just above epistoma; surface smooth and shining to a level above eyes, punctures very fine; vestiture fine, hairlike, largely confined to epistomal area.

Pronotum 1.0 times as long as wide; widest just behind middle, sides rather weakly arcuate on basal two-thirds, rather narrowly rounded in front; dorsal profile arched from base, a little more strongly declivous on anterior fourth; surface reticulate, with rather coarse, deep, moderately close punctures on basal two-thirds, finely, closely asperate in median area in front, punctures reaching anterior margin in lateral areas; punctures on disc separated by distances about equal to their own diameters. Glabrous.

Elytra 1.5 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on slightly more than basal half, rather narrowly rounded behind; base of suture just behind scutellum acutely but not strongly elevated; striae not impressed, punctures moderately large, deep; interstriae slightly wider than striae, smooth and shining, punctures fine, distinct. Declivity convex, rather steep; strial punctures reduced; interstriae 2 narrow, not wider than diameter of a strial puncture (noticeably wider on one paratype). Vestiture consisting of minute strial and interstrial hair, and longer, erect bristles on declivital interstriae 1, 3, 5, and 7. Interstriae 10 ending before level of hind coxa.

DISTRIBUTION.— Panama.

PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, No. 407, S. L. Wood.

HOST.— *Oreopanax* probably *xalapense*.

BIOLOGY.— This species infested the phloem tissues of cut seedlings of its host about 5 cm in diameter.

NOTES.— The above treatment was based on the type series of five specimens.

### 28. *Scolytodes clusiae* Wood

*Scolytodes clusiae* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):14 (Holotype, female; Volcán Poas, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— Evidently not closely related to previously known species. It has interstriae 10 ending before level of metacoxae, the protibiae armed by a small tooth on posterior face just before the tarsal insertion and between the terminal mucro and first or second marginal tooth; the female frons is broadly, shallowly concave.

FEMALE.— Length 1.7–1.9 mm, 2.4 times as long as wide; color black.

Frons broadly, shallowly concave from upper level of eyes to level of antennal insertion; surface closely, deeply, somewhat coarsely punctured over entire frontal area in and out of concavity; median epistomal lobe conspicuous, broad, short, continuous with surface of frons; vestiture very fine, not abundant, longer above, not evident along epistoma.

Pronotum 1.0 times as long as wide; widest at base, very slightly constricted one-third pronotum length from base, weakly arcuate on anterior half, then broadly rounded in front; surface reticulate, with fine, obscure, rather widely spaced punctures on posterior half, equally fine, sparse, minute granules on anterior third. Almost glabrous.

Elytra 1.4 times as long as wide, 1.7 times as long as pronotum; widest one-third from base, sides feebly arcuate, abruptly rounded at declivital base, narrowly rounded behind; striae not impressed, punctures very small, not deep; interstriae about twice as wide as striae, shining, irregular due to obscure surface lines, punctures not evident. Declivity convex, rather steep; striae 1 weakly impressed above, punctures on all striae obscurely indicated. Vestiture consisting of a few rather short hairs and, on lower half, more numerous, very short, semirecumbent hair.

MALE.— Similar to female except frons rather strongly convex, finely, obscurely punctured, surface reticulate, vestiture sparse, short, inconspicuous; strial punctures rather obscure.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Poas, Heredia, 19-VIII-66, 2600 m, No. 96, *Clusia*, S. L. Wood.

BIOLOGY.— This species infests the phloem and outer bark in unthrifty twigs of living *Clusia* trees.

NOTES.— The above treatment was based on the type series of 18 specimens.

### 29. *Scolytodes radiatus* Wood

*Scolytodes radiatus* Wood, 1977, Great Basin Nat. 37:218 (Holotype, female; La Georgiana, 79 km SE San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *clusiae* Wood and *volcanus* Wood by the slightly larger size, by the much coarser pronotal punctures, and by the very different female frons.

FEMALE.— Length 1.6–1.9 mm, 2.4 times as long as wide; color almost black.

Frons convex and virtually glabrous as in males of allied species.

Pronotum much as in *volcanus* except punctures much larger, each equal to from half to full diameter of a strial puncture (variable).

Elytra about as in *amabilis* Wood except punctures larger and vestiture less abundant; striae not impressed, punctures rather coarse, deep; interstriae slightly wider than striae, smooth, shining, punctures uniseriate, less than half diameter of those of striae. Subglabrous, a few fine setae on odd-numbered interstriae on posterior half.

MALE.— Similar to female in all respects.

DISTRIBUTION.— Costa Rica.

COSTA RICA: La Georgiana, 79 km SE San José, 31-VII-65, *Quercus*, L. S. Otvos.

NOTES.— The above treatment was based on the type series of 15 specimens.

### 30. *Scolytodes clusiacolens* Wood

*Scolytodes clusiacolens* Wood, 1967, Great Basin Nat. 27:121 (Holotype, female; 10 km E Volcán Parícutin, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is more closely allied to *clusiae* Wood than to other known species, but it may be distinguished by the larger size, by the coarsely, deeply punctured pronotum and elytra and, in the female, by the weakly convex frons.

FEMALE.— Length 1.8–2.9 mm, 2.5 times as long as wide; color black.

Frons planoconvex from a point well below upper level of eyes to epistoma, convex above that point, transition rather abrupt; surface reticulate, finely, deeply, rather closely punctured; vestiture inconspicuous, consisting of very fine, moderately abundant, uniformly distributed hair.

Pronotum 1.1 times as long as wide; sides almost straight or very feebly constricted on basal two-thirds, broadly rounded in front; dorsal profile weakly arched from base, more strongly declivous on anterior fifth; surface reticulate, with rather coarse deep punctures from base to near anterior margin, gradually replaced by smaller punctures laterally and minute asperities medially on anterior fifth. Glabrous except near lateral and anterior margins.

Elytra 1.5 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae impressed, punctures rather large, deep; interstriae slightly narrower than striae, convex, shining, punctures fine, sharply but not deeply impressed, uniseriate, some of them slightly subgranulate on anterior margins (variable in series). Declivity convex, rather steep; striae 1 only distinctly impressed, punctures distinctly smaller than on disc; interstrial punctures minute, clearly impressed. Vestiture fine, hairlike in regular strial and interstrial rows on teneral specimens.

MALE.— Similar to female except frons convex to transverse impression just above epistoma, punctures larger, deeper, vestiture almost confined to epistomal area; more nearly subgranulate interstrial punctures.

DISTRIBUTION.— Michoacán to Honduras.

MEXICO: Michoacán: 10 km E Volcán Parícutin, 19-VI-65, 2500 m, No. 85, *Clusia*, S. L. Wood. Chiapas: 32 km N Bochil, 10-VI-69, D. E. Bright. GUATEMALA: Volcán Pacaya, 1-VI-64, 1300 m, No. 659, *Clusia*, S. L. Wood. HONDURAS: Cerro Peña Blanca, F. Morazán, 23-V-64, 2000 m, No. 530, *Clusia*, S. L. Wood.

HOST.— *Clusia* sp.

BIOLOGY.— This species infested phloem tissues in unthrifty twigs and branches of its living host.

NOTES.— The above treatment was based on the type series of 83 specimens.

### 31. *Scolytodes clusiavorus* Wood

*Scolytodes clusiavorus* Wood, 1967, Great Basin Nat. 27:122 (Holotype, female; Volcán de Agua, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *clusiae* Wood by the smaller size, by the more sharply, somewhat more deeply punctured pronotum and elytra, particularly the elytral declivity, and, in the female, by the less deeply, less extensively concave frons.

FEMALE.— Length 1.3–1.6 mm, 2.6 times as long as wide; color black.

Frons shallowly, broadly planoconcave from just below upper level of eyes to epistoma; surface subshining, closely, finely, deeply, uniformly punctured from vertex to epistoma; vestiture consisting of rather coarse, moderately long, uniformly but rather sparsely distributed hair.

Pronotum 1.1 times as long as wide; sides almost straight or very feebly constricted on posterior two-thirds, broadly rounded in front; surface reticulate, punctures rather fine, deep, moderately close; anterior fifth more strongly declivous, with a few minute asperities in median area, punctures attaining anterior margin only in lateral areas. Vestiture confined to anterior and lateral areas.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, narrowly rounded behind; striae not impressed, punctures moderately large, deep; interstriae slightly narrower than striae, almost smooth, with some irregular lines, punctures minute, almost uniseriate, not at all granulate. Declivity convex, rather steep; strial punctures smaller and shallower than on disc. Vestiture consisting of rows of minute strial hair and longer, erect rows of coarser interstrial hair.

MALE.— Similar to female except frons strongly convex, reticulate, punctures rather coarse, sparse, vestiture restricted to epistomal margin.

DISTRIBUTION.— Guatemala.

MEXICO: Veracruz: Matías Romero, 29-VI-67, *Clusia*, S. L. Wood. GUATEMALA: Volcán de Agua, Esquintla, 19-V-64, 1000 m, No. 593, *Clusia*, S. L. Wood.

BIOLOGY.— This species infests phloem tissues of unthrifty twigs and branches of its living host.

NOTES.— The above treatment was based on the type series of five specimens.

### 32. *Scolytodes amabilis* Wood

*Scolytodes amabilis* Wood, 1975, Great Basin Nat. 35:26 (Holotype, female; Mt. Tzontehuitz, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— In general body features, this species is very similar to *clusiavorus* Wood, but the female frons is much more similar to *volcanus* Wood. It is distinguished from those species as indicated below.

FEMALE.— Length 1.4–1.6 mm, 2.5 times as long as wide; color very dark brown, almost black.

Frons essentially convex, with a very shallow, subconcave area on median third just below upper level of eyes, this impression continued on median fifth as an abrupt, shallow sulcus to epistoma, median half of lateral areas bordering sulcus with numerous beadlike granules, remaining areas somewhat dull, with fine punctures; surface of sulcus shining, almost smooth; rather sparse vestiture limited to margins, of fine, long hair, those on dorsal margin attaining level of antennal insertion, shorter laterally and below.

Pronotum and elytral outlines as in *clusiacolens* Wood; pronotum surface reticulate, punctures as in *clusiavorus*; strial and interstrial punctures similar to but slightly larger than in *clusiavorus*. Strial setae almost obsolete; interstrial setae almost obsolete on even-numbered interstriae, fine, rather short, and widely spaced on odd-numbered interstriae.

MALE.— Similar to female except frons convex, reticulate, vestiture very sparse, short, inconspicuous.

DISTRIBUTION.— Chiapas.

MEXICO: Chiapas: Mt. Tzontehuitz, 29-V-69, 3000 m, 23-VI-69, *Quercus*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 38 specimens.

### 33. *Scolytodes canalis* Wood

*Scolytodes canalis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):13 (Holotype, female; Mt. Tzontehuitz, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from the allied *parvulus* Wood by the slightly protuberant, lower female frons, which has a narrow, shallow, median sulcus, with frontal vestiture confined to the upper margins; the discal interstrial punctures are obsolete; and the pronotal and strial punctures are moderately course.

FEMALE.— Length 1.4–1.7 mm, 2.5 times as long as wide; color black.

Frons rather broadly convex, slightly protuberant on lower half, median fourth just below upper level of eyes shallowly concave, impression continued on median sixth as a shallow sulcus to epistoma; surface of upper half almost smooth, rather finely, deeply

punctured, becoming finely granulate on lower half except reticulate in impressed area; vestiture apparently restricted to margins of upper half, tips of some long, yellow, hairlike setae arising on vertex reaching to epistoma.

Pronotum 1.1 times as long as wide; sides almost straight on more than basal two-thirds, converging slightly to anterolateral angles, broadly rounded in front; anterior third weakly declivous; surface reticulate, subshining, punctures on posterior half moderately coarse, deep, not close, decreasing in size on anterior half, most of them replaced by minute granules on anterior sixth or obsolete. Glabrous.

Elytra 1.6 times as long as wide; sides straight on basal two-thirds, very slightly wider at base of declivity, rather narrowly rounded behind; striae not impressed, punctures moderately deep; interstriae as wide as striae, smooth, shining, punctures obsolete, some with one to three minute granules. Declivity steep, convex; strial punctures smaller than on disc; a few minute interstrial punctures usually present. Vestiture of fine sparse, erect, interstrial hair of moderate length on odd-numbered interstriae, much shorter to obsolete on even-numbered interstriae.

MALE.— Similar to female except frons evenly, more strongly convex, surface reticulate, with scattered punctures, subglabrous.

DISTRIBUTION.— Chiapas.

MEXICO: Chiapas: Mt. Tzontehuitz, 26, 29-V-69, 12-VI-69, 3100 m, D. E. Bright.

NOTES.— The above treatment was based on the type series of 22 specimens.

### 34. *Scolytodes volcanus* Wood

*Scolytodes volcanus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):14 (Holotype, female; Volcán Poas, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *clusiae* Wood by the smaller size, by the small tooth on the posterior face of the protibiae, by the larger strial punctures, and by the female frons being more narrowly impressed to the vertex.

FEMALE.— Length 1.2–1.4 mm, 2.3 times as long as wide; color very dark brown, almost black.

Frons narrowly, shallowly concave from epistomal margin to above upper level of eyes; surface finely, shallowly but distinctly, densely punctate, epistomal lobe mostly shining; vestiture largely confined to margin of impressed area, fine, short below, somewhat longer above, moderately abundant, minute in concavity.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on basal half, then somewhat arcuate and rather narrowly rounded in front; surface reticulate, punctures fine, sparse, rather obscure, devoid of granules. Glabrous.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, narrowly rounded behind; striae not impressed, punctures moderately large, deep; interstriae slightly wider than striae, shining, with very few impressed lines, punctures obscure, mostly obliterated. Declivity rather steep, convex; an occasional deep interstrial puncture present; shining. Glabrous.

MALE.— Similar to female except frons convex, reticulate, obscurely punctured, vestiture greatly reduced, inconspicuous; a few interstrial punctures clearly impressed.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Poas, Heredia, 14-VII-63, 2900 m, Nos. 44, 48, S. L. Wood.

BIOLOGY.— This species was collected from the phloem tissues of a recently cut woody vine (liana) and from cut tree seedlings.

NOTES.— The above treatment was based on the type series of 26 specimens.

### 35. *Scolytodes irazuensis* Wood

*Scolytodes irazuensis* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):15 (Holotype, female; Volcán Irazu, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— Rather closely related to *parvulus* Wood but larger, the female frons only shallowly impressed with setae on vertex extending half the distance to the antennal insertion, and the general sculpture coarser.

FEMALE.— Length 1.5–1.9 mm, 2.4 times as long as wide; color very dark brown.

Frons rather broadly, longitudinally impressed from upper level of eyes to epistoma; lateral margins above level of antennal insertion subcarinately elevated almost to upper level of eyes; surface finely, closely, deeply punctured; vestiture mostly confined to vertex, rather long, moderately abundant

(largely abraded in type), none of setae long enough to reach half distance to level of antennal insertion; only a few setae arise below upper level of eyes.

Pronotum 1.0 times as long as wide; sides weakly arcuate and converging slightly on basal two-thirds, rather broadly rounded in front; surface reticulate, rather coarsely, shallowly, not closely punctured, punctures intermixed with very minute asperities on rather strongly declivous anterior fourth. Glabrous.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures small, not sharply defined; interstriae almost twice as wide as striae, punctures small, deep, almost uniseriate. Declivity convex, steep; strial and interstrial punctures smaller than on disc, rather deep. Vestiture consisting of less than a dozen widely scattered, erect, hairlike bristles on disc and declivity, mostly on interstriae 3.

MALE.— Similar to female except frons convex with a slight impression above epistoma, obscurely reticulate, indistinctly punctured; strial and interstrial punctures much less clearly defined on disc and declivity.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Irazu, Cartago, 26-IX-63, 2300 m, No. 207, *Oreopanax nubigenus*, and 28-VI-63, 2800 m, No. 4 *Oreopanax xalapense*, and 13-VII-63, No. 41, S. L. Wood.

HOSTS.— *Oreopanax nubigenus* and *O. xalapense.*

BIOLOGY.— This species infests phloem tissues in unthrifty and cut or damaged branches and boles of at least four host species. The egg cavity has the long axis transverse. There were several niches resembling over-sized egg niches in which groups of eggs were loosely packed. An occasional beetle bored through the wood to the pith in the smaller branches.

NOTES.— The above treatment was based on the type series of 101 specimens.

### 36. *Scolytodes parvulus* Wood

*Scolytodes parvulus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):14 (Holotype, female; Pandora, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— Similar to *volcanus* Wood but smaller, the female frons is armed by a pair of longitudinal carinae, the strial punctures are reduced in size, and the female frontal vestiture is uniformly distributed.

FEMALE.— Length 0.9–1.1 mm, 2.3 times as long as wide; color rather dark brown.

Frons flattened from upper level of eyes to epistoma; median half of each side just inside of lateral margin armed by a shining longitudinal carina; this pair of carina beginning at level of antennal insertion and ending before upper level of eyes; surface finely, rather closely punctured in impressed and lateral areas, reticulate above eyes; vestiture fine, moderately long around margin, somewhat shorter in central area, moderately abundant.

Pronotum 1.0 times as long as wide; sides very weakly arcuate and feebly converging anteriorly on basal two-thirds, broadly rounded in front; surface reticulate, with sparse, minute punctures extending from base to anterior margin. Glabrous.

Elytra 1.3 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal half, rather narrowly rounded behind; striae 1 weakly impressed, others not at all impressed, punctures fine, shallow, rather obscure; interstriae wider than striae, not entirely smooth, punctures sparse, fine, obscure. Declivity convex, steep; essentially as on disc but interstriae narrower and punctures smaller, features not sharply defined. Vestiture consisting of less than a dozen moderately long, erect interstrial bristles.

MALE.— Similar to female except frons convex, with a slight transverse impression just above epistoma, surface obscurely reticulate, shining, sparsely punctured, vestiture very sparse, mostly near epistoma; pronotum obscurely reticulate, subshining.

DISTRIBUTION.— Veracruz to Costa Rica.

MEXICO: Veracruz: Lago Catemaco, 16–20-VI-69, D. E. Bright; 16 km NW Sontecomepan, 18-VI-69, D. E. Bright. Chiapas: 8 km SW El Bosque, 3-VII-69, D. E. Bright; Palenque Ruins, 9-V-69, D. E. Bright. COSTA RICA: Pandora, Limón, 23-VIII-63, 50 m, No. 146, *Cecropia*, S. L. Wood.

HOST.— *Cecropia* sp.

BIOLOGY.— This species infests the petioles of fallen *Cecropia* leaves.

NOTES.— The above treatment was based on the type series of 14 specimens and on 91 other specimens.

### 37. *Scolytodes acares* Wood

*Scolytodes acares* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):15 (Holotype, female; Río Damitas, Dota Mts., San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— Allied to *parvulus* Wood, but the female frontal vestiture is longer and much more abundant near the vertex, and the pronotal punctures are more coarsely, deeply impressed in the posterior area.

FEMALE.— Length 0.9–1.1 mm, 2.4 times as long as wide; color dark brown.

Frons narrowly flattened from well above upper level of eyes to epistoma, margined at sides by a pair of shining, longitudinal carinae extending almost from epistoma (halfway between level of antennal insertion and epistoma! margin) to near upper level of eyes; surface sculpture obscure between carinae, evidently smooth and finely punctured; vestiture largely confined to vertex, above upper level of eyes, consisting of a dense, long brush of subplumose, yellow hair, its tips extend to a point below level of antennal bases.

Pronotum and elytra as in *parvulus* except pronotum more narrowly rounded in front and its punctures somewhat larger.

MALE.— Similar to female except frons convex, with a slight transverse impression just above epistoma, surface reticulate, sparsely punctured, vestiture reduced to a few setae near epistoma.

DISTRIBUTION.— Guatemala to Panama.

GUATEMALA: Palin, Esquintla, 19-V-64, 350 m, No. 585. COSTA RICA: Río Damitas, Dota Mts., San José, 22-VII-63, 250 m, No. 130; Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 58. PANAMA: Barro Colorado Island, 27-XII-63, 70 m, No. 339. All were collected by me from the same host.

HOST.— *Cecropia* sp.

BIOLOGY.— This species infests the petioles of recently fallen *Cecropia* leaves. A somewhat transverse egg chamber is formed immediately under the thin outer bark; larval mines follow the grooves between the longitudinal fibers.

NOTES.— The above treatment was based on the type series of 44 specimens.

### 38. *Scolytodes ochromae* Wood

*Scolytodes ochromae* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):19 (Holotype, female; Playon, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *swieteniae* (Blackman), by interstriae 10 not extending behind the level of the metacoxae, by the interstriae being almost devoid of punctures, and by the absence of a frontal carina.

FEMALE.— Length 1.3–1.5 mm, 2.1 times as long as wide; color rather dark brown.

Frons almost flattened above to upper level of eyes, shallowly concave below, epistoma somewhat elevated; central area on upper half smooth, impunctate, remaining areas coarsely, densely, deeply punctured; lateral area above level of antennal insertion ornamented by a scanty tuft of long, yellow hair, a few scattered setae on lower third.

Pronotum 0.95 times as long as wide; widest at base, sides feebly arcuate and slightly converging anteriorly on basal two-thirds, then rather abruptly converging toward very narrowly anterior margin; summit indefinite, near middle; anterior three-fourths armed by broad, rather coarse crenulations; basal fourth subreticulate, shining. Glabrous.

Elytra 1.3 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal half, obtusely angulate behind; striae 1 weakly, others not at all impressed, punctures rather coarse, shallow, rows not entirely straight; interstriae almost twice as wide as striae, almost smooth, punctures not evident. Declivity steep, convex; strial punctures evidently smaller than on disc; occasional interstrial punctures obscurely indicated; apex turned or protruding very slightly posteriorly. Vestiture consisting of sparse flattened bristles, mostly on declivity, not more than about six or seven on any one interstriae. Interstriae 10 acutely elevated only to level of hind coxae.

MALE.— Similar to female except frons convex above level of antennal insertions, transversely impressed between that level and epistomal process, sparsely punctured.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Playón, San José, 9-VIII-63, 50 m, No. 120, balsa, S. L. Wood.

HOST.— *Ochroma velutina*.

BIOLOGY.— This species was taken from newly formed, oval nuptial chambers in the phloem tissues of recently cut balsa limbs. Eggs were scattered indiscriminately in the chamber; larvae were not present.

NOTES.— The above treatment was based on the type series of 39 specimens.

### 39. *Scolytodes culcitatus* (Blandford)

*Epomadius culcitatus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):179 (Lectotype, female?; Peña Blanca, Chiriquí, Panama; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This unique species has the anterior half of the lateral margins of the pronotum concavely impressed on a large, circular area that is densely pubescent. Except for this unique character, this species is a normal representative of this genus.

FEMALE (?).— Length 2.4 mm, 2.1 times as long as wide; color dark reddish brown. Sex not determinable in specimens at hand.

Frons weakly concave, surface evidently subreticulate, minutely punctured, and almost devoid of vestiture, as in most males of this genus; frons not fully visible in specimens at hand.

Pronotum 1.1 times as long as wide; widest at middle, apparently very strongly constricted on anterior half, constriction filled by dense pubescence, anterior margin broadly rounded; anterior half declivous, rather strongly asperate; posterior area strongly reticulate, punctures minute, most of them minutely asperate; lateral margin on posterior half marked by a raised line, anterior half concavely impressed on a large subcircular area invading tergum and pleuron equally, concavity filled by dense, fine, long, yellow hair. Vestiture on dorsal areas fine, short, rather abundant.

Elytra 1.4 times as long as wide, 1.6 times as long as pronotum; sides straight on basal half, diverging slightly to base of declivity, rather narrowly rounded behind; striae not impressed, obscure but discernible, punctures rather small, deep, slightly irregular; interstriae about three or four times as wide as striae, smooth, punctures as large as those of striae, rather abundant, confused. Declivity rather steep, convex; punctures very small, close, completely confused, striae entirely obsolete. Vestiture of very fine, rather abundant, moderately long hair.

DISTRIBUTION.— Panama.

PANAMA: Peña Blanca, Chiriquí, 3000–4000 ft (1000–1300 m), G. C. Champion.

NOTES.— The above treatment was prepared from the syntypic series of two specimens of the same sex, presumably females. The first of these syntypes is here designated as the lectotype of *Epomadius culcitatus* Blandford. This specimen bears a type label and has been regarded as the type for many years, although it has not previously been so designated.

### 40. *Scolytodes spadix* (Blackman)

*Prionosceles spadix* Blackman, 1943, Proc. U.S. Nat. Mus. 94:384 (Holotype, male; intercepted at New York in log from Guatemala; U.S. Nat. Mus., 56562)

DIAGNOSIS.— Apparently rather closely allied to *swieteniae* Blackman, but differing as indicated below.

MALE.— Length 1.9 mm, 2.1 times as long as wide; color reddish brown.

Frons as in male *swieteniae*, except less strongly reticulate.

Pronotum 1.06 times as long as wide; slightly more elongate than *swieteniae*, posterior two-fifth devoid of asperities and granules, punctures rather close, coarse, surface mostly smooth, shining. Glabrous.

Elytra 1.1 times as long as wide, 1.1 times as long as pronotum; outline similar to *swieteniae* except more broadly rounded behind; disc occupying basal half; striae distinctly impressed, punctures rather small, deep; interstriae 1 constricted near base causing striae to appear sinuate, surface smooth, shining, punctures rather small, close, confused. Declivity rather broadly convex, striae 1 moderately impressed; interstrial punctures smaller than on disc, less strongly confused. Vestiture confined to odd-numbered declivital interstriae, consisting of rather widely spaced, slender bristles, each about equal in length to width of an interstriae.

DISTRIBUTION.— Guatemala?

GUATEMALA: Intercepted at New York, 26-V-41, No. 89860 in hybrid mahogany log from Guatemala.

NOTES.— The above treatment was based on the unique holotype.

### 41. *Scolytodes swieteniae* (Blackman)

*Hexacolus swieteniae* Blackman, 1943, Proc. US. Nat. Mus. 94(3174):381 (Holotype, female; Costa Rica; U.S. Nat. Mus., 56559)

DIAGNOSIS.— This species is doubtfully distinct; possibly it is a geographical race of *guyanensis* (Schedl); it is distinguished in the female by the more strongly elevated frontal prominence, with the coarsely reticulate area above the prominence not carinate or sharply defined laterally; the male carina just above the epistoma is more sharply defined.

FEMALE.— Length 1.7–1.8 mm, 1.9 times as long as wide; color reddish brown.

Frons flattened from epistoma to vertex, with a fine, sharply elevated median carina from epistomal margin to level of antennal insertion, carina ascends abruptly and ends at level of antennal insertion in a central prominence occupying central fourth to a point slightly below upper level of eyes, prominence sharply rugose-reticulate, remaining surface shining, obscurely reticulate, with a few very fine punctures; area above eyes ornamented by a dense brush of long, yellow hair, tips of some hairs attaining level of antennal insertion.

Pronotum 1.0 times as long as wide; widest at base, very feebly, arcuately converging on posterior two-thirds, rather broadly rounded in front; anterior half rather coarsely, closely asperate, asperities in central area decreasing in size and number but extending to base; surface shining, obscurely reticulate, sparse, fine punctures in lateral areas becoming subasperate toward median area. Glabrous.

Elytra 1.2 times as long as wide, 1.2 times as long as pronotum; sides feebly arcuate, almost parallel on basal half, rather narrowly rounded behind; striae 1 moderately, others not impressed, punctures rather fine, deep; interstriae three to four times as wide as striae, smooth, brightly shining, punctures minute, deep, irregularly uniseriate. Declivity convex, rather steep; striae 1 strongly impressed; interstriae slightly narrower. Almost glabrous, a few very minute hairs somtimes occuring on declivity.

MALE.— Similar to female except frons moderately convex above level of antennal insertion, central prominence absent, median carina on lower third as in female; pronotal asperities slightly larger and more abundant; strial punctures much smaller, equal in size to those of interstriae in one specimen.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Intercepted in mahogany logs from Costa Rica at the New York Quarantine Station, 18-V-41, and from cedar logs 3-IX-41.

HOSTS.— *Swietenia* sp., *Cedrela* sp.

NOTES.— The above treatment was based on the holotype and on four specimens from cedar logs. Blackman's type is a female, not a male as stated in the original description.

### 42. *Scolytodes cedrelae* Wood

*Scolytodes cedrelae* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):19 (Holotype, female; Rincón de Osa, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— Very closely related to *swieteniae* (Blackman), but the frontal carina does not attain the epistomal margin in either sex, and the female carina (somtimes double) begins well above the epistoma; in addition, the female of this species has the lower frons more distinctly punctured and ornamented by sparse hair; the tuft of hair on the vertex also extends ventrad to a point in line with the anterior margin of the eye; this tuft in *swieteniae* ends well above that point.

FEMALE.— Length 1.3–1.5 mm, 2.2 times as long as wide; color yellowish brown, with anterior and posterior ends and elytral suture dark.

Frons flattened from vertex to epistoma; middle half between upper level of eyes bearing a low median carina of uniform height; epistomal margin and sides near antennal bases rather coarsely, deeply punctured; vestiture consisting of a dense brush of long, yellow hair on vertex extending downward laterally to anteromesal angle of eye; sparse hair scattered on lower area.

Pronotum 1.1 times as long as wide; sides subparallel on basal half, converging slightly to anterior fourth, then broadly rounded in front; summit indefinite, near middle; anterior half armed by numerous, close, shining, narrow crenulations; posterior half reticulate, dull, with very fine, obscure punctures, and in discal area with small, transverse, shining granules extending to base.

Elytra 1.2 times as long as wide, 1.1 times as long as pronotum; sides almost straight and parallel on slightly more than basal half, rather narrowly rounded behind; striae not impressed, punctures moderately large, shallow; interstriae almost twice as wide as

striae, almost smooth, subshining, punctures obscure, uniseriate. Declivity steep, convex; striae 1 and possibly 2 weakly impressed, punctures of striae and interstriae small and deeper than on disc. Vestiture consisting of a few flattened bristles on alternate odd interstriae, mostly on declivity.

MALE.— Similar to female except frons convex, with a weak transverse impression just above epistoma, surface reticulate and sparsely punctured.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 100 m, No. 48, Cedro macho; Río Damitas, Dota Mts., San José, 22-VII-63, 250 m, No. 131, *Vismia guianensis*; both by me.

HOST.— *Cedrela mexicana*, *Vismia guianensis*.

BIOLOGY.— This species was collected from the phloem tissues of large logs of three host species, one of which was cedro amargo. The old tunnels were primarily transverse, but were too dense to definitely determine a pattern.

NOTES.— The above treatment was based on the type series of 63 specimens.

### 43. *Scolytodes schwarzi* (Hopkins)

Figs. 27, 142

*Erincophilus schwarzi* Hopkins, 1902, Proc. Ent. Soc. Washington 5:36 (Holotype, male; Coconut Grove, Dade Co., Florida; U.S. Nat. Mus., 7394)

DIAGNOSIS.— This species is very closely related to *facetus* Wood, but it may be distinguished by the much coarser punctures and shining surfaces of pronotum and elytra.

FEMALE.— Length 1.3–1.6 mm, 2.4 times as long as wide; color yellowish brown, often with anterior area of pronotum and lower half of elytral declivity slightly darker.

Frons weakly concave, central third smooth, polished, glabrous, remaining area finely granulate-punctate and bearing a brush of long, yellow hair.

Pronotum 1.1 times as long as wide; widest at base, sides almost straight, very indistinctly converging on basal two-thirds, rather broadly rounded in front; asperities moderately large, close, on more than anterior half; anterior margin armed by a low, irregular, almost continuous row of crenulations; posterior third shining, obscurely reticulate in some specimens, coarsely, deeply, closely punctured, interspaces equal to less than half width of a puncture. Glabrous.

Elytra 1.4 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures rather coarse, deep, close; interstriae almost twice as wide as striae, smooth, shining, punctures coarse, deep, uniseriate, two-thirds as large as those of striae. Declivity convex, rather steep; all punctures smaller than on disc, those of interstriae about equal in size to those of striae. Glabrous.

MALE.— Similar to female except frons convex, reticulate, dull, punctures minute, sparse, tuft of hair absent.

DISTRIBUTION.— S Florida to Veracruz.

USA: **Florida**: Miami, 23-VIII-60, *Ficus carica*, J. R. McFarlin; Perrine, 23-VI-51, *Ficus aurea*, S. L. Wood; Everglades N.P., 6-VII-51, *Ficus auria*, S. L. Wood; Key Largo, 25-VI-51, *Ficus aurea* and *brevifolia*, S. L. Wood; Plantation Key, 3-V-67, D. E. Bright. MEXICO: **Veracruz**: Mandinga, 12-III-80, *Ficus*, T. H. Atkinson.

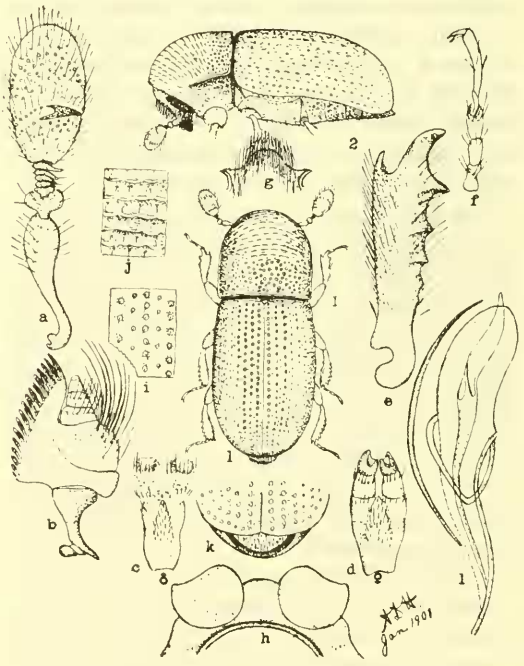



Fig. 142. *Scolytodes schwarzi*: 1, 2, adult female; a, antenna; b, maxilla; c, male labium; d, female labium; e, tibia, anterior aspect; f, tarsus; g, epistoma; h, prosternum; i, section of elytra; j, section of pronotum; k, apices of elytra and abdomen. (After Hopkins 1902:35.)

HOSTS.— *Ficus* spp.

BIOLOGY.— This species infests unthrifty branches in healthy trees and broken or cut branches. The tunnels are typical of the genus.

NOTES.— The above treatment was based on 73 specimens.

### 44. *Scolytodes facetus* Wood

*Scolytodes facetus* Wood, 1967, Great Basin Nat. 27:126 (Holotype, female; Palín, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *ficivorus* Wood by the very fine, somewhat obscure punctures of pronotum and elytra, by the slightly longer and more abundant vestiture on the female frons, and by the more narrowly separated eyes.

FEMALE.— Length 1.6 mm, males 1.4–1.5 mm, 2.3 times as long as wide; color yellowish brown.

This species differs from *ficivorus* in having eyes separated by 1.6 times width of an eye (2.6 times in *ficivorus*); elytra reticulate, with punctures shallow, those of interstriae obscure. Obscure, minute pronotal punctures separated by distances at least twice their own diameters (this distance less than diameter of a puncture in *ficivorus*).

MALE.— Similar to female except frons convex, reticulate, obscurely punctured; eyes separated by 2.1 times width of an eye (3.1 in *ficivorus*).

DISTRIBUTION.— Guatemala.

GUATEMALA: Palín, Esquintla, 19-V-64, 300 m, No. 584, *Ficus*, S. L. Wood.

BIOLOGY.— This species and *ficivorus* infested the same small, broken branch of a mature fig tree. Differences in habits between the two species were not observed.

NOTES.— The above treatment was based on the type series of four specimens.

### 45. *Scolytodes piceus* (Blandford)

*Hexacolus piceus* Blandford, 1897, Biol. Centr. Amer., Coleopt. 4(6):183 (Lectotype, male; Volcán de Chiriquí, Chiriquí, Panama; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— In the above key this species is placed near *facetus* Wood and *schwarzi* Hopkins, but the relationship is remote; the pronotum is much more finely sculptured and the female frons is very different.

FEMALE.— Length 1.9–2.1 mm, 2.5 times as long as wide; color dark reddish brown.

Frons narrow, flattened from epistoma to vertex, central third on lower half smooth, shining, remaining area rather finely, deeply, closely punctured, margins of upper half and on vertex bearing a dense brush of long yellow hair, tips of some setae attaining epistomal margin.

Pronotum 1.1 times as long as wide; sides almost straight, converging very slightly on basal two-thirds, rather narrowly rounded in front; anterior third finely asperate, anterior margin unarmed; surface on posterior two-thirds finely, deeply reticulate, rather dull, punctures fine, shallow, moderately close. Glabrous.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on slightly less than basal two-thirds, rather broadly rounded behind; striae 1 feebly, others not impressed, punctures rather small, deep; interstriae about twice as wide as striae, surface smooth, shining, punctures fine, deep, uniseriate. Declivity convex, rather steep; all punctures slightly smaller than on disc, those of interstriae tending to be confused. Glabrous, except some specimens with very minute, fragile hair on lower area of declivity.

MALE.— Similar to female except frons convex, a broad, transverse impression just above epistoma, surface finely reticulate, a few minute punctures.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Tapantí, Cartago, 1300 m, 17-IX-63, No. 180, tree branch, 26-X-63, No. 265 in *Phoebea mexicana*, No. 266 in *Cecropia mexicana* branch; all by me. PANAMA: Volcán de Chiriquí, G. C. Champion.

HOSTS.— *Cecropia peltata*, *Phoebea mexicana*.

BIOLOGY.— This monogamous species was taken from tree branches about 5 cm in diameter, mostly in the outer bark, although some tunnels reached the cambium region.

NOTES.— The above treatment was based on the male lectotype and on 66 other specimens. The first of Blandford's two syntypes is a male that for many years has borne a label identifying it as the type, although it has never been so designated. I here designate that male, from Volcán de Chiriquí, as the lectotype of *Hexacolus piceus* Blandford.

### 46. *Scolytodes obesus* Wood

*Scolytodes obesus* Wood, 1975, Great Basin Nat. 35:26 (Holotype, female; Barro Colorado Island, Canal Zone, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the remotely related *immanus* Wood by the smaller size, by the stouter body form, by the pair of carinae on the female frons, and by other characters.

FEMALE.— Length 1.8 mm, 2.1 times as long as wide; color yellowish brown, anterior third of pronotum darker.

Frons shallowly, broadly concave from level of antennal insertion to upper level of eyes (upper area concealed by pronotum), surface smooth and shining except subreticulate near margins; epistomal area from margin to level of antennal insertion longitudinally divided into equal thirds by a pair of rather strongly elevated carinae; premandibular epistomal lobe large, conspicuous, pubescent; vestiture mostly confined to margins of upper half of frontal area, consisting of a row of long, subplumose setae, longest setae equal to about one-half to two-thirds distance between eyes.

Pronotum 0.97 times as long as wide; widest near base, sides weakly, arcuately converging on basal two-thirds, rather broadly rounded in front; anterior third moderately declivous, finely asperate; posterior areas reticulate, very finely, rather closely punctured. Glabrous except for an occasional coarse seta on asperate area.

Elytra 1.15 times as long as wide, 1.25 times as long as pronotum; sides almost straight on basal half, slightly wider at base of declivity, rather broadly rounded behind; disc confined to basal half; striae not impressed, punctures small, rather shallowly impressed, spaced by distances equal to diameter of a puncture; interstriae four times as wide as striae, smooth, shining, punctures small to minute, weakly impressed; interstriae 10 weakly carinate to level of sternum 5. Declivity convex, moderately steep; sculpture as on disc. Vestiture of sparse, moderately long bristles on odd-numbered interstriae.

Protibiae slender, lacking minute tooth on posterior face near tarsal insertion.

DISTRIBUTION.— Panama.

PANAMA: Barro Colorado Island, Canal Zone, 7-VIII-67, L. and C. W. O'Brien.

NOTES.— The above treatment was based on the holotype.

### 47. *Scolytodes immanis* Wood

*Scolytodes immanis* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):19 (Holotype, female; Villa Mills near Cerro de la Muerte, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— Most of the known species allied to *immanis* are from South America. In the Central American fauna it is most nearly allied to *alni* Wood, but it may be distinguished by the larger size, by the uniseriate strial punctures, by the smaller pronotal punctures, and by the stouter body form.

FEMALE.— Length 3.5 mm, 2.4 times as long as wide; color very dark brown on head, anterior half of pronotum, elytral suture, and underparts, light yellowish brown on posterior half of pronotum, elytra, and legs.

Frons flattened from well above upper level of eyes to epistoma, with median third of lower half very feebly impressed; impressed area smooth, shining, remaining lateral and dorsal areas rather coarsely, closely, shallowly punctured; vestiture consisting of coarse, long subplumose, yellow hair on punctured area, a majority of setae arising above upper level of eyes, tips of some of those on vertex almost attaining level of antennal insertion.

Pronotum 1.04 times as long as wide; sides almost straight and parallel on basal two-fifths, then arcuately converging to rather narrowly rounded anterior margin; dorsal profile arched from base to anterior margin, indefinite summit on basal half; minutely, closely asperate in front of summit, reticulate and minutely, rather obscurely punctured behind. Glabrous except for a few small setae at anterolateral angles.

Elytra 1.5 times as long as wide, 1.9 times as long as pronotum; sides almost straight, widest near base of declivity, narrowly rounded behind; striae not impressed, punctures fine, shallow, in definite rows; interstriae three times as wide as striae, almost smooth, punctures smaller than those of striae, shallow, rather numerous, confused. Declivity convex, rather steep; striae 1 and perhaps interstriae 2 weakly impressed on middle third. Glabrous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Villa Mills near Cerro de la Muerte, Cartago, 1-VIII-66, 3100 m, No. 44, *Miconia*, S. L. Wood.

BIOLOGY.— Specimens were removed from a pith cavity in a terminal branch of a tree seedling.

NOTES.— The above treatment was based on the type series of two female specimens.

### 48. *Scolytodes alni* Wood

*Scolytodes alni* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):20 (Holotype, female; Volcán Irazu, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— Rather closely related to *piceus* (Blandford), but larger, and striae 3–5 with punctures somewhat confused.

FEMALE.— Length 2.4–2.9 mm, 2.5 times as long as wide; color dark brown.

Frons flattened from vertex to epistoma, surface coarsely, closely punctured; upper half ornamented by a dense brush of very long hair, tips of some attain epistomal margin; epistomal lobe very small.

Pronotum 1.1 times as long as wide; widest near base, sides almost straight, converging very slightly to anterior fourth, then rather narrowly rounded in front; summit near middle; anterior half finely, densely asperate; reticulate and finely, rather sparsely punctured behind. Glabrous.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae feebly impressed at least toward base, punctures fine, distinct; interstriae at least twice as wide as striae, marked by transverse lines, punctures almost equal in size to those of striae, confused, rather close. Declivity steep, convex; strial punctures smaller and deeper than on disc, interstrial punctures distinctly smaller than those of striae. Glabrous.

MALE.— Similar to female except frons convex, weakly impressed just above epistoma, its surface shining, subreticulate, with sparse, fine punctures.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Irazu, Cartago, 28-VI-63, No. 3, and 26-X-63, No. 214, 2300 m, both from *Alnus*, by me.

HOST.— *Alnus acuminata*.

BIOLOGY.— Stumps of recently cut alder trees were selected for attack. The galleries were in green, healthy tissue along the margins of tears or cuts in the bark. The entrance tunnel commenced at or near the cambium where the bark was torn. The galleries were slightly wider than the length of a beetle, somewhat irregular but mostly longitudinal. The upper half of the gallery usually turned transversely and often branched. The wood was engraved very lightly; eggs occurred only on the lower side and were scattered indiscriminately. The larvae fed in congress.

NOTES.— The above treatment was based on the type series of 45 specimens.

### 49. *Scolytodes erineophilus* Wood

*Scolytodes erineophilus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):20 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is allied to *ficivorus* Wood and *marginatus* Wood, but it may be distinguished by characters summarized in the above key.

FEMALE.— Length 1.4–1.6 mm, 2.4 times as long as wide; color medium brown.

Frons feebly convex, almost flat, on a rather narrow area from just below upper level of eyes to epistomal margin; surface etched by minute, transverse lines in central half of flattened area, remainder of flattened area rather coarsely, not closely punctured; convex area above reticulate, with sparse, fine punctures; vestiture consisting of sparse, fine, long hair on punctured part of flattened area, remainder of flattened area rather coarsely, not closely punctured; convex area above reticulate, with sparse, fine punctures; vestiture consisting of sparse, fine, long hair on punctured part of flattened area, not conspicuous.

Pronotum 1.0 times as long as wide; widest at base, sides very feebly arcuate, almost straight, converging anteriorly, then rather strongly, not abruptly rounded to broadly rounded anterior margin; finely, closely asperate on anterior half, asperities decreasing in size and density behind, continued as very fine transverse granules to basal fourth; posterior surface and spaces between asperities strongly reticulate, finely, rather sparsely punctured behind, anterior rims of punctures granulate except on basal fourth. Vestiture sparse, inconspicuous, confined to anterior and lateral areas.

Elytra 1.5 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, narrowly rounded behind; striae not impressed, punctures small, distinct, rather deep; interstriae about one and one-half times as wide as striae, subshining, punctures about two-thirds as large as those of striae, uniseriate. Declivity moderately steep, convex; strial and interstrial punctures greatly reduced in depth and clarity, obscure. Vestiture rather abundant, consisting of short, fine, semirecumbent strial and interstrial hair, interstrial setae on and near declivity longer, erect, stout, somewhat flattened.

MALE.— Similar to female except frons weakly convex, reticulate, finely, sparsely punctured, frontal vestiture shorter, less abundant; a few scattered, erect bristles on interstriae 1, 3, and 5 almost to elytral base.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 17-VIII-63, 1300 m, No. 101, *Ficus*, S. L. Wood.

BIOLOGY.— Galleries were made in phloem tissues of unthrifty twigs less than 1 cm in diameter in a living native fig tree.

NOTES.— The above treatment was based on the type series of 22 specimens.

### 50. *Scolytodes ficivorus* Wood

*Scolytodes ficivorus* Wood, 1967, Great Basin Nat. 27:125 (Holotype, female, Paulín, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is very closely related to *schwarzi* (Hopkins), but it may be distinguished by the more coarsely punctured, less shining pronotum and elytra, by the reticulate pronotal disc, by the more finely asperate anterior area of the pronotum, and by the somewhat more coarsely punctured marginal areas of the female frons. Additional data eventually may prove this to be only a subspecies of *schwarzi*.

FEMALE.— Length 1.5–1.7 mm, 2.3 times as long as wide; color yellowish brown.

Except for the characters noted in the above diagnosis, this species appears to be identical to *schwarzi*.

MALE.— Similar to female except frons convex, reticulate, obscurely punctured, with frontal vestiture greatly reduced.

DISTRIBUTION.— Guatemala.

GUATEMALA: Palín, Esquintla, 19-V-64, 300 m, No. 584, *Ficus*, S. L. Wood.

BIOLOGY.— This species infested phloem tissues in a small broken branch of a native fig tree.

NOTES.— The above treatment was based on the type series of four specimens.

### 51. *Scolytodes reticulatus* (Wood)

*Hexacolus reticulatus* Wood, 1961, Great Basin Nat. 21:98 (Holotype, female; 19 km SE Matamoros, Puebla, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is allied to *ficivorus* Wood, although the relationship is not particularly close. It may be distinguished by the reticulate elytra, by the much finer punctures on elytra and pronotum, and by other characters included in the key.

FEMALE.— Length 1.5–2.0 mm, 2.2 times as long as wide; color reddish brown.

Frons flattened from epistoma to slightly below upper level of eyes, central fourth on lower half smooth, shining, slightly elevated, remaining area rather coarsely, deeply, not closely punctured, punctures separated by distances equal to diameter of a puncture; vestiture of long, yellow hair arising in equal (moderate) density from all margins except epistoma, epistomal brush also present.

Pronotum 1.02 times as long as wide; widest at base, sides weakly arcuate, distinctly converging on basal two-thirds, rather narrowly rounded in front; anterior margin armed by a low, irregular row of contiguous crenulations; anterior third declivous, rather coarsely asperate, a few small asperities to middle; surface strongly reticulate, dull or subshining, punctures rather small, shallow, moderately close. Glabrous.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures rather small, shallow, spaced in a row by width of a puncture; interstriae about twice as wide as striae, entire surface reticulate, subshining, punctures moderately small, uniseriate. Declivity convex, rather steep; all punctures reduced in size, those of interstriae minute. Glabrous.

MALE.— Similar to female except frons moderately convex, entire surface reticulate, sparsely, shallowly punctured; asperities on pronotum usually coarser; interstrial

punctures confused toward declivity on some specimens.

DISTRIBUTION.— Morelos to Puebla and Michoacán.

MEXICO: Michoacán: La Gallina, 1-IX-80, *Ficus*, S-146, T. H. Atkinson. Morelos: Las Piedras, 17-VII-80, *Ficus petiolaris*, T. H. Atkinson. Puebla: 20 km SE Izúcar de Matamoros, 3-VII-63, *Ficus*, S. L. Wood.

BIOLOGY.— Specimens were collected from the bark of branches of strangler fig.

NOTES.— The above treatment was based on the type series of 69 specimens.

### 52. *Scolytodes marginatus* Wood

*Scolytodes marginatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):21 (Holotype, female; Dominical, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is allied to *reticulatus* Wood, but it may be distinguished by the more slender body form, the more deeply impressed striae, the smooth interstriae, and the interstrial setae.

FEMALE.— Length 1.5–1.7 mm, 2.9 times as long as wide; body color rather light brown.

Frons broadly plano-convex from upper level of eyes to epistoma, a shining median carina beginning as a fine line near center, becoming broader and somewhat higher, then ending abruptly just above epistomal margin; surface reticulate, finely, sparsely punctured, punctures larger and deeper near margins of flattened area; vestiture confined to marginal areas, consisting of fine, rather abundant, moderately long hair.

Pronotum 1.2 times as long as wide; sides straight and parallel on basal two-thirds, evenly, rather broadly rounded in front; anterior margin armed by 10 teeth; strongly declivous and asperate on anterior third, asperities rather large and broad, many of them arranged in broken subconcentric rows; posterior area reticulate, rather coarsely, closely punctured. Vestiture confined to asperate and lateral areas, disc glabrous.

Elytra 1.6 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on basal two-thirds, rather narrowly rounded behind; striae narrowly impressed, punctures small, shallow; interstriae about one and one-half times as wide as striae, moderately convex, smooth, punctures small, rather sparse, some minutely subvulcanate, uniseriate. Declivity steep, convex; striae 1 rather strongly impressed, others less strongly impressed than on disc; strial and intrestrial punctures somewhat finer; interstriae 1 slightly elevated. Vestiture consisting of fine, erect, rather long, interstrial hair.

Anterior coxae subcontiguous.

MALE.— Similar to female except frons broadly convex, coarsely, closely, deeply punctured, with a smooth, shining, slightly elevated callus on lateral fourth of epistomal margin; elytral vestiture consisting of apically flattened bristles.

DISTRIBUTION.— Chiapas to Costa Rica.

MEXICO: Chiapas: Palenque Ruins, 9-V-69, D. E. Bright. COSTA RICA: Dominical, Puntarenas, 9-IX-63, 3 m, No. 297, S. L. Wood.

BIOLOGY.— Specimens were removed from phloem tissues of small, unthrifty twigs of a large, unidentified tree. Because of the star-shaped tunnels, this species was thought to be a *Pityophthorus* species, and sufficiently detailed notes were not recorded. Evidently it is polygamous.

NOTES.— The above treatment was based on the type series of 10 specimens.

### 53. *Scolytodes impressus* Wood

*Scolytodes impressus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):22 (Holotype, male; Turrialba, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This unique species has large and very strongly impressed strial punctures for this genus, and it has interstrial rows of spatulate bristles.

MALE.— Length 1.3–1.7 mm, 2.6 times as long as wide; color rather dark, reddish brown.

Frons convex except transversely impressed along epistoma; surface obscurely reticulate, subshining, with rather fine, sparse, sharp punctures, except close and deep along epistoma; vestiture largely confined to epistoma.

Pronotum 1.2 times as long as wide; sides straight and parallel on basal two-thirds, rather broadly rounded in front; anterior third finely, closely asperate; posterior half subshining, obscurely reticulate toward indefinite summit, a few minute points present, punctures coarse, close, deep, separated by less than diameter of a puncture; vestiture obscure, on asperate and lateral areas.

Elytra 1.5 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae 1 moderately, others weakly impressed, punctures coarse, deep; interstriae as wide as striae, shining, punctures fine, some indistinct, uniseriate. Declivity convex, steep; striae, particularly 1, more strongly impressed than on disc; interstriae 1 slightly elevated; punctures not reduced in size; vestiture consisting of apically flattened, interstrial bristles on disc and declivity, distance between rows and between bristles in a row about equal to length of a bristle.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Turrialba, Cartago, 3-III-64, 600 m, No. 459, tree limb, S. L. Wood.

BIOLOGY.— This species was just entering a large broken limb of an unidentified tree; consequently, galleries were not developed. It was associated in the same limb with *Phloeotribus furvus* Wood and *P. demissus* Blandford.

NOTES.— The above treatment was based on the type series of 30 specimens, presumably all males.

### 54. *Scolytodes pelicipennis* (Schedl)

*Hexacolus pelicipennis* Schedl, 1952, Dusenia 3:356 (Holotype, male; Jiménez, Osa Peninsula, Puntarenas, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *impressus* Wood by the stouter body form and by differences in the sculpture of the pronotum and elytra as indicated below.

MALE.— Length 1.2 mm, 2.3 times as long as wide; color light brown.

Frons convex, reticulate, punctures fine, rather close; vestiture inconspicuous.

Pronotum 1.05 times as long as wide; as in *impressus* except asperities much wider, discal punctures much larger, interspaces smooth, averaging less than half as wide as diameter of a puncture. Glabrous.

Elytra 1.3 times as long as wide, 1.3 times as long as pronotum; about as in *impressus* except striae more strongly impressed, punctures slightly larger, interstriae narrower than striae, convex, smooth, punctures fine, uniseriate. Declivity convex, steeper than in *impressus*; sculpture as on disc except striae weakly impressed, punctures more deeply impressed.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Jiménez, Osa Halbinsle, E. Reimoser.

NOTES.— The above treatment was based on the holotype.

### 55. *Scolytodes rugicollis* (Schedl)

*Hexacolus rugicollis* Schedl, 1940, Arb. Morph. Taxon. Ent. Berlin-Dahlem 7:205 (Lectotype, female; Hamburgfarm on Río Reventazón, Limón, Costa Rica, designated by Wood, 1974, Great Basin Nat. 34:287)

*Scolytodes plicatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):21 (Holotype, female; 25 km SE Guápiles, Limón, Costa Rica; Wood Coll.); Wood, 1974, Great Basin Nat. 34:287. *Synonymy*

DIAGNOSIS.— This species and *pannuceus* Wood are unique in having the pronotal asperities exceedingly broad and the anterior margin of the pronotum a continuous, elevated costa. These two species may be distinguished from one another by characters summarized in the above key.

FEMALE.— Length 1.5–1.8 mm, 2.5 times as long as wide; color rather light brown.

Frons mostly convex, subconcavely impressed on central third, a broad, shining callus surrounding lower third of impression; surface rather finely punctured at sides and above to well above upper level of eyes; vestiture fine, hairlike, moderately long and abundant on punctured area.

Pronotum 1.1 times as long as wide; widest at base, sides almost straight on posterior two-thirds, converging slightly anteriorly, broadly rounded in front; anterior third rather strongly declivous, asperities rather low, sharply raised, very broad, some as much as a fourth total width of pronotum; anterior margin armed by a continuous costa; posterior half reticulate, with fine, shallow punctures. Glabrous except for a few bristles on anterior margin.

Elytra 1.5 times as long as wide, 1.4 times as long as pronotum; striae 1 weakly, others not impressed, punctures small, shallow, not sharply defined; interstriae subreticulate, almost twice as wide as striae, punctures fine, shallow. Declivity convex, moderately steep; striae 1 narrowly impressed; all punctures smaller and somewhat deeper than on disc. Vestiture consisting of a few sparse, erect, declivital hairs on odd-numbered interstriae.

MALE.— Similar to female except frons convex, reticulate, with a few obscure punctures, subglabrous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 25 km SE Guápiles, Limón, 22-VIII-66, 100 m, No. 104, *Ficus*, S. L. Wood.

BIOLOGY.— This species was taken from phloem tissues in the limb of a large, recently cut, native fig tree.

NOTES.— The above treatment was based on the lectotype of *rugicollis*, on the holotype of *plicatus*, and on 11 other specimens.

### 56. *Scolytodes pannuceus* Wood

*Scolytodes pannuceus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):16 (Holotype, female; La Ceiba, Atlántida, Honduras; Wood Coll.)

DIAGNOSIS.— This species and *rugicollis* (Schedl) are unique in having unusually broad, costiform, pronotal asperities. This species is distinguished from *plicatus* by the smaller, shallow strial and interstrial punctures, and by the very different sculpture of the female frons.

FEMALE.— Length 1.7 mm (male 1.5 mm), 2.4 times as long as wide; color yellowish brown.

Frons flattened from epistoma to upper level of eyes, surface minutely, densely pilose over almost entire flattened area; epistomal margin very slightly elevated, smooth, shining, a narrow median extension reaching level of antennal insertion; lateral and upper extreme margins bearing a row of long, yellow hair.

Pronotum and elytra as in *plicatus* except pronotal punctures slightly larger, strial and interstrial punctures much larger and deeper.

MALE.— Similar to female except frons convex, reticulate, punctures moderately large, shallow, rather sparse, subglabrous; pronotal asperities slightly larger; pronotal and elytral punctures distinctly finer.

DISTRIBUTION.— Honduras.

HONDURAS: La Ceiba, Atlántida, 7, 17-VI-49, at light, E. C. Becker.

NOTES.— The above treatment was based on the type series of two specimens.

### 57. *Scolytodes multistriatus* (Wood)

*Hexacolus multistriatus* Wood, 1961, Great Basin Nat. 21:97 (Holotype, female; 8 km W Villa Juarez, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This distinctive species is not closely related to any other species known to me. The size, coarse strial and interstrial punctures, and declivital interstrial granules distinguish it from all others.

FEMALE.— Length 1.7–2.2 mm, 2.4 times as long as wide; color very dark brown.

Frons flattened from epistoma to upper level of eyes, surface smooth, closely, rather coarsely, deeply punctured over entire surface; pubescence rather sparse on lower half, becoming dense and much longer on upper third and to vertex, distributed over entire surface.

Pronotum 1.1 times as long as wide; widest at base, sides almost straight, indistinctly converging on basal two-thirds, rather narrowly rounded in front; anterior margin armed by a continuous, undulating, elevated costa; anterior half coarsely asperate; posterior areas weakly reticulate, shining, punctures coarse, deep, moderately close. Glabrous.

Elytra 1.5 times as long as wide; sides almost straight and parallel on more than basal two-thirds, rather broadly, subobtusely rounded behind; striae not impressed, punctures rather coarse, close, deep; interstriae slightly less than twice as wide as striae, smooth, shining, punctures equal (occasionally slightly smaller) in size, depth and spacing to those of striae. Declivity convex, steep; punctures slightly smaller, interstriae armed on upper half by rows of rather widely spaced, rounded granules. Subglabrous, a few interstrial bristles on declivity.

MALE.— Similar to female except frons convex above level of antennal insertion, transversely impressed below, a short, longitudinal, median carina in impressed area, surface reticulate, coarsely, not closely punctured above, finely below.

DISTRIBUTION.— Puebla.

MEXICO: Puebla: 10 km NE Teziutlán, 2-VII-67, No. 134; 8 km W Villa Juárez, 25-VI-53, No. 37; all by me.

BIOLOGY.— One series was removed from a broken limb about 7 cm in diameter, the other from a tree bole 20 cm in diameter. The larvae and adults were xylophagous. The galleries were of the radiate type and contained from one to four females with each male.

NOTES.— The above treatment was based on the type series of 34 specimens and on 48 other specimens.

### 58. *Scolytodes pelicerinus* (Schedl)

*Hexacolus pelicerinus* Schedl, 1952, Dusenia 3:358 (Holotype, male?; Mexico?; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *multistriatus* (Wood) by the much smaller size, by the more slender body form, by the longer pubescence on the female frons, by the more narrowly convex elytral declivity, which entirely lacks granules, and by the sparse elytral setae.

FEMALE.— Length 1.3–1.5 mm, 2.5 times as long as wide; color dark reddish brown.

Basically as in *multistriatus* except as indicated in diagnosis.

DISTRIBUTION.— Puerto Rico.

PUERTO RICO: 19 km E Mayaguez, 8-II-69, C. W. O'Brien.

NOTES.— The above treatment was based on the holotype, which was thought to have been taken in Mexico, and on five specimens from Puerto Rico. There is no evidence that this species belongs either to the Mexican or Central American fauna.

### 59. *Scolytodes pubescens* Wood

*Scolytodes pubescens* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):21 (Holotype, female; San Ignacio de Acosta, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is allied to *ingavorus* Wood, but it may be distinguished by characters summarized in the above key.

FEMALE.— Length 1.5–1.8 mm, 2.4 times as long as wide; color rather dark brown, elytra and basal half of pronotum lighter.

Frons subconcavely impressed on slightly more than median half, with a pair of shining, rather strongly elevated, longitudinal carinae at lateral margins of concavity; surface of frontal area except carinae finely, closely granulate-punctate; vestiture consisting of rather coarse, moderately long setae, rather sparse in concave area, rather dense lateral to carinae and continuing above to a level slightly above upper level of eyes, not longer above.

Pronotum 1.1 times as long as wide; widest at base, sides very weakly arcuate on basal two-thirds, rather narrowly rounded in front; rather coarsely asperate on anterior half, asperities confused; anterior margin armed by about a dozen low teeth; posterior half shining, coarsely, closely, deeply punctured. Vestiture hairlike, moderately abundant except glabrous at center of disc.

Elytra 1.3 times as long as wide, 1.2 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae feebly if at all impressed, punctures close, moderately large, deep; interstriae slightly wider than striae, shining, punctures close, almost as large and as deep as those of striae. Declivity convex, steep; all punctures smaller than on disc, confused lateral to striae 2. Vestiture rather abundant, consisting of erect, short, strial hair and slightly longer interstrial hair; not conspicuously longer on declivity.

MALE.— Similar to female except frons convex, reticulate, obscurely punctured, with sparse, inconspicuous, fine hair; elytral vestiture coarser and evidently more abundant.

DISTRIBUTION.— Costa Rica.

COSTA RICA: San Ignacio de Acosta, San José, 5-VII-63, 1100 m, No. 29, fence post, S. L. Wood.

BIOLOGY.— This species was taken from phloem tissues of a recently cut fence post. From one to three females were associated with each male in star-shaped gallery systems; only the nuptial chamber reached the cambium. Larvae were not present.

NOTES.— The above treatment was based on the type series of 10 specimens.

### 60. *Scolytodes ingavorus* Wood

*Scolytodes ingavorus* Wood, 1967, Great Basin Nat. 27:126 (Holotype, female; Los Corchos, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is rather closely related to *ficivorus* Wood, but it may be distinguished by the pubescent elytra, by the deeper punctures on the pronotal disc and, in the female, by the much more densely pubescens frons that lacks a shining glabrous area at the center.

FEMALE.— Length 1.3–1.7 mm, 2.3 times as long as wide; color yellowish brown, with anterior half of pronotum darker.

Frons flattened from upper level of eyes to somewhat elevated epistoma, with a pair of submarginal, low, longitudinal carinae (or elevations; obscured by vestiture) extending dorsad from epistomal margin, its upper limits obscured by vestiture; surface smooth and shining with fine punctures below, becoming finely granulate and obscurely punctured in

central area above; vestiture consisting of abundant, long, coarse, subplumose setae above upper level of eyes, continuing on lateral areas to epistomal margin as somewhat shorter setae, central area bearing shorter, fine, moderately abundant, hairlike setae.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on slightly less than basal two-thirds, rather broadly rounded in front; summit just in front of middle, anterior area rather coarsely asperate; anterior margin armed by an almost continuous ridge; posterior areas reticulate, punctures coarse, deep, close, separated from one another by less than half diameter of a puncture; scanty hairlike setae confined to sides and asperate area.

Elytra 1.3 times as long as wide, 1.2 times as long as pronotum; sides almost straight (feebly arcuate), and parallel on slightly less than basal two-thirds, broadly rounded behind; striae not impressed, punctures coarse, distinctly but shallowly impressed; interstriae slightly wider than striae, punctures uniseriate, almost identical to those of striae. Declivity steep, convex; all punctures reduced, in rows; surface shining. Vestiture consisting of fine, short, erect, strial and interstrial hair, and longer interstrial hair on declivity.

MALE.— Similar to female except frons broadly convex, transversely impressed just above epistoma; short vestiture on declivity stout, almost scalelike.

DISTRIBUTION.— Nayarit.

MEXICO: Nayarit: Los Corchos, 10-VII-65, 10 m, No. 211, *Inga*, S. L. Wood.

BIOLOGY.— This species infested phloem tissues in small, unthrifty branches of its living host.

NOTES.— The above treatment was based on the type series of 45 specimens.

### 61. *Scolytodes proximus* Wood

*Scolytodes proximus* Wood, 1967, Great Basin Nat. 27:127 (Holotype, female; El Hato del Volcán, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is rather closely related to *tenuis* Wood, but it may be distinguished by the very minute, obscure punctures on the pronotal disc, by the finer, shallower, elytral punctures, by the finer elytral vestiture, and by the less abundant vestiture on the female frons.

FEMALE.— Length 1.7–1.9 mm, 2.8 times as long as wide; color dark brown.

Frons narrowly planoconcave from below upper level of eyes to epistoma; surface reticulate, obscurely punctured; vestiture scanty, consisting of fine, rather sparse, long hair uniformly distributed from upper level of eyes to epistoma.

Pronotum 1.1 times as long as wide; widest slightly in front of middle, sides feebly constricted on posterior half, rather broadly rounded in front; summit indefinite, about one-third length from anterior margin; surface reticulate, minutely, sparsely punctured, anterior third finely asperate; anterior margin armed by a series of low, indefinite teeth. Glabrous except a few setae in asperate area.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on slightly more than basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures rather fine, shallow, obscure; interstriae as wide as striae, somewhat irregular, subshining, punctures fine, uniseriate, obscure. Declivity convex, steep; punctures obscure, about as on disc. Vestiture consisting of minute, recumbent, strial and interstrial hair, and sparse rows of longer, erect interstrial hair, each about as long as distance between rows.

DISTRIBUTION.— Panama.

PANAMA: El Hato del Volcán, Chiriquí, 11-I-64, 500 m, No. 390, *Clusia*, S. L. Wood.

BIOLOGY.— This species infested phloem tissues in unthrifty twigs of the living host tree.

NOTES.— The above treatment was based on the type series of 33 specimens.

### 62. *Scolytodes tenuis* (Wood)

*Hexacolus tenuis* Wood, 1961, Great Basin Nat. 21:99 (Holotype, female; 19 km SE Matamoros, Puebla, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *micidus* Wood by characters included in the above key.

FEMALE.— Length 1.0–1.4 mm, 2.7–3.0 times as long as wide; color very dark brown, almost black.

Frons flattened on a rather narrow area from epistomal margin to a point below upper level of eyes; flattened area finely punctured, pubescent, surface largely obscured by moderately abundant, long, yellow hair, longer and more dense on lateral and upper margins; only a few setae arise above upper level of eyes.

Pronotum 1.2–1.3 times as long as wide; sides straight and almost parallel on basal two-thirds, rather broadly rounded in front; anterior margin serrate, not a continuous costa; anterior third declivous and asperate, asperities decreasing in size posteriorly to well behind middle; surface subreticulate, shining, punctures coarse, deep, rather close. A few setae in anterior area.

Elytra 1.4–1.8 times as long as wide, 1.4–1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, then gently converging, broadly rounded behind; striae not impressed, punctures small, shallow, rather close; interstriae twice as wide as striae, almost smooth, shining, punctures fine, shallow, uniseriate. Declivity convex, rather steep; strial and interstrial punctures fine, subequal in size, in rows, striae 1 feebly impressed. Vestiture of strial and interstrial ground cover of fine, short, suberect hair arising from almost every puncture on disc and declivity; and interstrial, erect bristles on odd-numbered interstriae, spaced between rows and between bristles within a row by about one and one-half times length of a bristle.

MALE.— Similar to female except frons convex, slightly flattened on lower third, reticulate, rather coarsely punctured, pubescence inconspicuous; body stouter, about 2.3 times as long as wide.

DISTRIBUTION.— Jalisco to Honduras.

MEXICO: **Jalisco**: 8 km S La Huerta, 1-VII-65, 500 m, No. 168, *Ficus*. **Morelos**: Cuernavaca, 18-XII-44, *Ficus petiolaris*, N. L. H. Krauss. **Puebla**: 20 km SE Izúcar de Matamoros, 3-VII-53, 1200 m, *Ficus*. GUATEMALA: Palín, Esquintla, 19-V-64, 300 m, No. 683, *Ficus*; Volcán Pacaya, 1-VI-64, 1300 m, No. 692, *Ficus*. HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 558, *Ficus glabrata*. All by me, except as noted.

HOSTS.— *Ficus* spp.

BIOLOGY.— This species breeds in unthrifty twigs of living trees and, less commonly, in cut branches.

NOTES.— The above treatment was based on the type series of 9 specimens and on 92 other specimens.

### 63. *Scolytodes micidus* Wood

*Scolytodes micidus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):17 (Holotype, female; 7 km N Totolapan, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *tenuis* Wood by the closely set bristles on all interstriae, by the finer interstrial punctures, and by the glabrous central area on the female frons.

FEMALE.— Length 1.2–1.4 mm, 2.7–2.9 times as long as wide; color almost black.

Frons flattened from epistoma to upper level of eyes, median third on lower half smooth, shining, slightly elevated, remaining area coarsely, closely, deeply punctured; punctured area bearing a tuft of long, yellow hair.

Pronotum 1.2 times as long as wide; sides rather strongly constricted on basal half, otherwise as in *tenuis* except posterior area smooth, shining (feebly reticulate in a few specimens).

Elytra 1.8 times as long as wide; outline and sculpture as in *tenuis*. Vestiture consisting of fine, short strial hair and long, erect interstrial bristles; each interstrial bristle slightly longer than distance between rows and between bristles within a row.

MALE.— Similar to female except frons convex, deeply, narrowly, transversely impressed, surface coarsely, deeply punctured.

DISTRIBUTION.— Oaxaca to Guatemala.

MEXICO: **Oaxaca**: 7 km N Totolapan, 20-VI-67, 1100 m, No. 68 *Ficus*, S. L. Wood. GUATEMALA: Palín, Esquintla, 19-V-64, 300 m, No. 683, *Ficus*, S. L. Wood.

HOST.— *Ficus* spp.

BIOLOGY.— Specimens were taken from unthrifty twigs of living trees.

NOTES.— The above treatment was based on the type series of 31 specimens.

### 64. *Scolytodes exiguus* Wood

*Scolytodes exiguus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):22 (Holotype, male; San Isidro del General, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— By definition this species should be placed in the subgenus *Hexacolus* due to the pronotal asperities and absence of

punctures toward the anterior margin of the pronotum; however, it almost certainly is more closely related to species here placed in the subgenus *Scolytodes* (s. str.). Its uniformly arched pronotum, pronotal sculpture, elevated declivital interstriae 9, and other characters serve to distinguish it.

MALE.— Length 1.2–1.3 mm, 2.0 times as long as wide; color very dark brown.

Frons convex, becoming somewhat flattened toward epistoma; surface shining, with small, sparse punctures above, more closely punctured below except on shining lateral margins below level of antennal insertion; vestiture very sparse except along epistomal margin.

Pronotum 1.0 times as long as wide; widest at base, sides feebly arcuate, converging anteriorly on basal two-thirds, rather broadly rounded in front; dorsal profile arched from base, but more strongly declivous on anterior third; finely asperate on anterior third, punctures intermixed with asperities to anterior tenth but evidently not attaining anterior margin; posterior area shining, with a very indistinct suggestion of reticulation and a few minute points, punctures rather coarse, close, deep, separated by distances about equal to their diameters; vestiture consisting of a few bristles in asperate area.

Elytra 1.2 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal half, then increasingly arcuate to rather narrowly rounded posterior margin; basal margins marked by a fine raised line; striae not impressed, punctures rather large, moderately deep; interstriae about as wide as striae, shining, almost smooth, punctures fine, shallow, uniseriate. Declivity convex, moderately steep; striae moderately to weakly impressed, punctures somewhat smaller than on disc, deep; interstriae 1 weakly elevated, 2 and 3 weakly convex, punctures about as on disc. Vestiture consisting of erect, apically flattened, interstrial bristles of moderate length, abraded on disc of type, but present on both disc and declivity of paratype.

DISTRIBUTION.— Costa Rica.

COSTA RICA: San Isidro del General, San José, 5-XII-63, 1000 m, No. 278, *Ficus*, S. L. Wood.

BIOLOGY.— Unthrifty, green twigs of a living, native, fig tree were selected for attack.

NOTES.— The above treatment was based on the type series of two male specimens.

### 65. *Scolytodes pumilus* Wood

*Scolytodes pumilus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):23 (Holotype, female; Volcán Poas, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is allied to *obscurus* Wood, but it may be distinguished by the coarser strial and interstrial punctures, and by the sparse vestiture on the female frons.

FEMALE.— Length 1.4–1.6 mm, 2.5 times as long as wide; color rather dark brown.

Frons rather narrowly flattened from just below upper level of eyes to epistoma; surface finely reticulate-granulate, moderately large punctures rather close, only slightly less dense at center; vestiture very fine, moderately dense, rather long.

Pronotum 1.0 times as long as wide; widest at base, converging slightly on basal two-thirds, rather broadly rounded in front; dorsal profile arched from base, more strongly declivous on anterior third; asperities small, confused; posterior area reticulate, with very fine, sparse punctures. Glabrous.

Elytra 1.5 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures rather coarse, deep; interstriae almost smooth, about as wide as striae, punctures indefinite or absent on basal half, small, uniseriate, becoming distinct toward declivity. Declivity rather steep, narrowly convex, striae 1 weakly impressed; strial punctures smaller than on disc, deep; interstriae shining, punctures rather small, deep. Glabrous.

MALE.— Similar to female except frons rather weakly convex, surface almost smooth and shining, reticulation obscurely indicated, punctures minute, obscure; striae somewhat confused on basal fourth, interstrial punctures more evident on 1 and 2.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Poas, Heredia, 19-VIII-66, 2000 m, No. 97; 10 km SE Cartago, Cartago, 3-VII-63, 1800 m, No. 18, *Drimys granadensis*, 14-VII-63, No. 43, *Sapium thelocarpum*, 24-IX-63, No. 204, *Miconia globuliflora*; all by me.

HOSTS.— *Drimys granadensis*, *Miconia globuliflora*, and *Sapium thelocarpum*.

BIOLOGY.— This monogamous species attacked cut or unthrifty small branches of its hosts. The egg chamber was longitudinally elongate. Larval mines were short and irregular.

NOTES.— The above treatment was based on the type series of 50 specimens.

### 66. *Scolytodes obscurus* (Wood)

*Hexacolus obscurus* Wood, 1961, Great Basin Nat. 21:100 (Holotype, female; 5 km SW Martínez de la Torre, Veracruz, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nanellus* Wood by characters summarized in the above key.

FEMALE.— Length 1.0–1.3 mm, 2.4 times as long as wide; color brown.

Frons flattened from epistoma to upper level of eyes, central fourth on lower half smooth, shining, remaining area rather coarsely, closely, shallowly punctured; vestiture of long, rather abundant, yellow hair arising on punctured area, few setae above upper level of eyes.

Pronotum 1.03 times as long as wide; widest at base, sides feebly arcuate, converging slightly on basal two-thirds, rather narrowly rounded in front; finely asperate on anterior half; posterior half deeply reticulate, shining, punctures minute, shallow. Glabrous.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures small, shallow, rather indefinite; interstriae about twice as wide as striae, surface somewhat irregular, shining, punctures fine, shallow. Declivity convex, rather steep; sculpture as on disc. Glabrous.

MALE.— Similar to female except frons evenly convex; surface reticulate, punctures minute, vestiture inconspicuous.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: 5 km SW Martínez de la Torre, 26-VI-53, 300 m, S. L. Wood.

BIOLOGY.— The type series was taken from a large herbaceous shrub in radiate parental galleries in the phloem tissues.

NOTES.— The above treatment was based on the type series of 46 specimens and on 21 other specimens.

### 67. *Scolytodes nanellus* Wood

*Scolytodes nanellus* Wood, 1967, Great Basin Nat. 27:124 (Holotype, female; Barro Colorado Island, Canal Zone, Panama; Wood Coll.)

DIAGNOSIS.— This species is somewhat allied to *pumilus* Wood, but it is much smaller, much less coarsely punctured, and the female frons is armed by a pair of submarginal, longitudinal carinae below and by a brush of long hair above upper level of eyes.

FEMALE.— Length 1.0 mm, male 0.9 mm, 2.4 times as long as wide; color medium brown.

Frons flattened from upper level of eyes to epistoma, with submarginal, low carina extending from epistoma almost to upper level of eyes; surface subshining, very finely and closely punctured; vestiture consisting of rather abundant, coarse, subplumose setae confined to area near or above upper level of eyes, some of setae almost reaching epistomal margin.

Pronotum 1.1 times as long as wide; widest just behind middle, sides feebly arcuate, rather broadly rounded in front; summit distinctly in front of middle, very finely asperate in front, posterior area rather coarsely reticulate, punctures rather fine, not deep. Glabrous.

Elytra 1.4 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on slightly more than basal half, rather narrowly rounded behind; striae 1 weakly, others not impressed, punctures small, not deep; interstriae slightly wider than striae, shining, almost smooth, punctures fine, not always clearly impressed. Declivity convex, rather steep; all punctures somewhat reduced. Vestiture consisting of a few scattered bristles on or near declivity.

MALE.— Similar to female except frons convex, with a slight transverse impression just above epistoma, surface subreticulate, minute punctures obscure, vestiture reduced, confined to epistomal area.

DISTRIBUTION.— Panama.

PANAMA: Barro Colorado Island, Canal Zone, 27-XII-63, 70 m, No. 347, tree branch, S. L. Wood.

BIOLOGY.— This species infested phloem tissues in a small branch.

NOTES.— The above treatment was based on the type series of four specimens.

### *Scolytodes trispinosus* Eggers

*Scolytodes trispinosus* Eggers, 1934, Ent. Blätt. 30:80 (Holotype, female; Amatán; U.S. Nat. Mus.)
*Scolytodes elongatus* Schedl, 1935, Stylops 4:273 (Holotype, female?; Brazil; Schedl Coll.); Wood, 1979, Great Basin Nat. 39:136. *Synonymy*

The female holotype of *Scolytodes trispinosus* Eggers was compared directly to my specimen identified by Schedl as *Scolytodes elongatus* Schedl (from Nova Teutonia, Brazil, 4-V-50, F. Plaumann) and compared by me to the holotype of *elongatus*. Two of the three known specimens of this species are from Brazil. The pin bearing the type of *trispinosus* has the printed label "Amatán" and a handwritten label in ink, "Mexico." Because this species resembles several South American species but none from Central America, because it is not definitely known from any locality outside of South America, and because the label "Mexico" was subsequently added to the pin of the type, I have removed this species from the Mexican fauna and added it to that of South America.

## Tribe MICRACINI

Micracides LeConte, 1876, Trans. Amer. Philos. Soc. 15:346
Hylocuridae Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége, Ser. 2, 8:306 (in part)

Anatomical features.— The Micracini are characterized by the 6-segmented antennal funicle, by the moderately to very strongly procurved sutures of the antennal club, by the moderately separated anterior coxae, by the distinctive protibia, which usually has the margins parallel and all or most of the socketed teeth on the distal margin, by the rounded margins of the pronotum, and by the somewhat distinctive, subplumose vestiture.

Biological features.— With very few exceptions, the members of this tribe breed in small branches and twigs of hardwood trees and shrubs. A majority of them occurs in desert and semidesert areas. The *Pseudothysanoes*, *Stenocleptus*, and *Phloeocleptus* are primarily phloeophagous and monogamous; *Thysanoes*, *Micracis*, and *Hylocurus* are xylophagous and bigamous. The *Micracisella* are pith boring and monogamous. Details of their life cycle are poorly known except that development of most species apparently is very slow.

Taxonomy.— Most of the species in this group breed in small twigs and branches of trees and shrubs having little or no economic importance; consequently, they are generally regarded as scientific curiosities of minor significance. For this reason their biology, distribution, and classification are inadequately known. The tribe occurs in North and South America and in Africa. Almost every American genus has its very similar, but distinct, counterpart in the African fauna.

### Genus *PSEUDOTHYSANOES* Blackman

*Pseudothysanoes* Blackman, 1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:46 (Type-species: *Pseudothysanoes drakei* Blackman =*Cryphalus rigidus* LeConte, original designation)

*Cryptocleptes* Blackman, 1920 (nec Simon, 1884), Mississippi Agric. Expt. Sta. Tech. Bull. 9:51 (Type-species: *Cryptocleptes dislocatus* Blackman, monobasic); Wood, 1971, Great Basin Nat. 31:141. *Synonymy*

*Chalcohyus* Blackman, 1943, Proc. U.S. Nat. Mus. 93(3165);363 (Type-species: *Chalcohyus securigerus* Blackman, monobasic); Wood, 1971, Great Basin Nat. 31:141. *Synonymy*

*Aphanocleptus* Wood, 1960, Great Basin Nat. 20:63 (Type-species: *Aphanocleptus coniferae* Wood, monobasic) (Retained as a subgenus)

*Cryptulocleptus* Wood, 1962, Great Basin Nat. 22:76 (Replacement name for *Cryptocleptes* Blackman); Wood, 1971, Great Basin Nat. 31:141. *Synonymy*

Diagnosis.— This genus is closely related to *Tysanoes* LeConte, but it may be distinguished by the pronotum being as wide or wider than long, by the more prominent pronotal summit, by the more slender protibiae, which are apically tapered or obliquely truncate, with the terminal mucro widened or bifurcate in females of most species, and by the (usually) phloeophagous habit.

Description.— Length 0.7–2.0 mm, 2.0–2.8 times as long as wide, males often shorter and stouter than females; color yellowish brown to black, vestiture usually pale.

Frons usually sexually dimorphic, varying from convex to deeply excavated in either sex, usually more strongly impressed in female. Antennal scape short and broadly expanded (subgenus *Aphanocleptus*) or elongate and slender (subgenus *Pseudothysanoes*); funicle 6-segmented; club small to large, broad to very slender, with or without sutures. Pronotum as wide or wider than long, asperate on anterior half, summit usually well developed, anterior margin usually serrate in male, rarely armed in female. Elytra usually sexually dimorphic, female sculpture simple, conservative, in some groups with little interspecific variability; male elytra extremely variable; elytral apex rounded except moderately mucronate in one species.

DISTRIBUTION.— Southeastern Canada to Brazil; 61 species occur north of Panama, and 8 from the Caribbean area and South America.

BIOLOGY.— All observed species were either monogamous or bigamous and constructed biramous parental galleries in the phloem or cambium tissues, except for the xylophagous *heliura* group and *mucronatus* Wood, and those species which bore in dying *Yucca* leaves. Larval mines usually wander indiscriminately and are moderately long. A majority of the known species inhabit arid or semiarid country, where they infest desert shrubs. A few species also occur in very wet, tropical forests.

NOTES.— The diversity of species in this group is great. Several species groups were previously named or treated as distinct genera, but the recently named species clearly demonstrate that sutures of the antennal club and characters of the funicle are not reliable characters for separating species groups within the genus. These species groups are being modified in parallel fashion simultaneously along several different lines of evolutionary development not sufficiently distinct to constitute genera. The bifurcate terminal mucro of the female protibia also is being developed or suppressed along several different evolutionary lines and should be used in the classification of species with great caution.

Key to the Species of *Pseudothysanoes*

1. Antennal scape short, strongly flattened, commonly as wide or wider than long in both sexes, little if any longer than pedicel; antennal club rather small, widest through basal half, sutures, when present, straight or moderately procurved; subgenus *Aphanocleptus* ..... 2
— Antennal scape elongate, slender, club-shaped, at least twice as long as pedicel, club variable, with or without sutures; subgenus *Pseudothysanoes* ..... 13

2(1). Interstriae 3 on declivity not at all elevated, declivity more narrowly convex ..... 3
— Interstriae 3 on declivity distinctly (weakly in female of *sedulus* and *quercicolens*) elevated and finely serrate ..... 8

3(2). Frons in both sexes (or in female only) deeply, broadly, concavely excavated from eye to eye, from epistoma to well above upper level of eyes; mandibles either normal or modified ..... 4a
— Frons feebly if at all impressed in either sex; mandibles normal ..... 5

4a(3). Frons very extensively impressed, upper margin of concavity slightly projecting orad on median fourth, glabrous; mandibles near middle armed by a strongly developed, transverse ridge; Oaxaca; 1.4–1.6 mm ..... 3. ***excavatus*** **(Wood)**
— Female frons less extensively impressed, upper margin of concavity abrupt, not projecting, bearing a row of scales; male frons flat to moderately convex, mandibles normal ..... 4b

4b(4a). Excavated area on female frons glabrous, impunctate, rugose-reticulate; pronotal disc rugose-reticulate; Chiapas; 1.2–1.4 mm ..... 1. ***recavus*** **Wood**
— Excavated area on female frons with short, stout setae uniformly distributed, surface smooth, shining, sparsely punctured; pronotal disc smooth, shining; Texas; *Prosopis*; 1.2–1.4 mm ..... 2. ***turnbowi*** **Wood**

5(3). Posterior area of pronotal disc reticulate to rugulose, punctures granulate; discal interstriae usually with uniseriate rows of granules; Nuevo León to Veracruz; *Quercus*; 1.2–1.5 mm ..... 4. ***querneus*** **Wood**
— Posterior area of pronotal disc smooth, shining, punctured; discal interstriae devoid of granules ..... 6

6(5). Larger; pronotal punctures on disc coarse, deep, close; strial punctures coarse, as wide as interstriae; Chihuahua to Nuevo León; *Picea*, *Pseudotsuga*; 1.3–1.7 mm ..... 5. ***coniferae*** **(Wood)**

— Smaller; pronotal punctures minute, widely spaced; strial punctures fine, less than half as wide as interstriae; 0.8–1.4 mm ..... 7

7(6). Male body stout, 2.0 (female 2.3) times as long as wide; interstrial scales of male almost as long as distance between scales within a row, about three-fourths as long as distance between rows; male declivity broadly convex, surface with abundant, minute, points; female frons broadly subconcave; Oaxaca; *Gossypium*; 1.0–1.4 mm ..... 6. ***obesus*** **(Wood)**

— Male body slender, 2.4 (female 2.8) times as long as wide; interstrial scales of male spaced within a row and between rows by two or more times length of a scale; male declivity narrowly convex, almost smooth; female frons flattened on lower half; Durango to Oaxaca; *Quercus*; 0.8–1.5 mm (see also 8. ***concentralis*** **Wood**) ..... 7. ***quercinus*** **(Wood)**

8(2). Smaller; strial punctures minute, discal interstriae three times as wide as striae; interstriae 3 in male strongly elevated on upper two-thirds of declivity, ending abruptly below, its summit not serrate; Sinaloa; 1.0–1.2 mm ..... 9. ***thomasi*** **Wood**

— Larger; interstriae and striae about equal in width; elevation on interstriae 3 extending to junction with 9 ..... 9

9(8). Interstriae 3 weakly elevated, 9 feebly, if at all, convex ..... 10

— Interstriae 3 and 9 moderately to rather strongly elevated ..... 11

10(9). Strial punctures comparatively small, spaced within a row by distances greater than diameter of a puncture; interstrial scales slender, about three to five times as long as wide; body color brown; Arizona to Chihuahua; *Quercus*; 0.9–1.3 mm ..... 10. ***brunneus*** **Wood**

— Strial punctures rather coarse, spaced within a row by distances equal to half diameter of a puncture; interstrial scales broad, less than three times as long as wide; body color black; Arizona to New Mexico; *Quercus*; 1.4–1.7 mm ..... 11. ***sedulus*** **Blackman**

11(9). Small, slender, 2.7 times as long as wide; male declivital interstriae 3 exceedingly strongly, narrowly elevated and continued to apex, elevation more than twice as high as wide, height almost equal to width of interstriae 1 and 2 combined, its summit coarsely serrate; interstriae 4–9 on declivity each with two to six rather coarse tubercles; female declivital interstriae 1 and 9 moderately elevated, elevation not as high as wide; female frons narrowly, shallowly concave near center; Jalisco; *Struthanthus*; 1.0–1.3 mm ..... 12. ***vallatus*** **Wood**

— Larger, stouter species with declivital interstriae only moderately elevated; usually in *Quercus* ..... 12

12(11). Strial punctures coarse, interstriae narrower than striae; vestiture behind pronotal summit uniformly slender; Sinaloa and Durango to Michoacán; *Quercus*; 1.3–1.6 mm (see also 13. ***securus*** **Wood**) ..... 14. ***quercicolens*** **Wood**

— Strial punctures smaller, interstriae as wide as striae; vestiture behind pronotal summit largely scalelike, intermixed with slender setae; New York to North Carolina; *Quercus*, etc.; 1.1–1.4 mm ..... 15. ***lecontei*** **Blackman**

13(1). Antennal club moderately large, with straight sutures clearly indicated; terminal mucro on anterior tibia unmodified, slender in both sexes; male elytral declivity convex, unarmed by spines or marginal or other elevated ridges, ornamented by rows of interstrial scales; hosts *Phoradendron* ..... 14

— Antennal club often small, slender, sutures moderately to strongly procurved if visible, obsolete in many species; terminal mucro on anterior tibia normal in male, in female usually conspicuously widened or bifurcate; male elytral declivity commonly armed by spines or elevated ridges ..... 27

14(13). Female frons rather strongly convex above level of antennal insertion, not ornamented by long hair at vertex; male variable, but frons usually more strongly convex ..... 15

— Female frons rather deeply, broadly concave (shallowly concave in *graniticus*) from epistoma to vertex, upper margins on or near vertex ornamented by a tuft of long hair; male frons shallowly concave almost to upper level of eyes ..... 23

15(14). Male declivity strongly convex, commencing well behind middle, declivital striae not impressed, punctures moderately small to very fine, interstrial bristles less radically modified ..... 16

— Male declivity broadly convex, commencing in front of middle, striae impressed, punctures coarse, deep, interstrial bristles very long ..... 22

16(15). Strial punctures on male declivity little if any smaller than on disc; male discal interstrial granules usually continued to elytral base, interstrial scales usually shorter ..... 17

— Strial punctures on male declivity minute or entirely obsolete; interstrial granules on disc absent; interstrial scales longer ..... 20

17(16). Interstrial scales on male declivity two to three times as long as wide, each scale distinctly shorter than distance between scales within a row or between rows ..... 18

— Interstrial scales on male declivity at least five times as long as wide, each at least one and one-third times as long as distance between scales within a row or between rows ..... 19

18(17). Interstriae on male disc finely, uniseriately punctured; *Phoradendron*; Oaxaca; 1.1–1.4 mm ..... 16. **furvescens Wood**

— Interstriae on male disc uniseriately granulate to base; Honduras to Costa Rica; *Phoradendron*; 1.1–1.4 mm ..... 17. **furvus Wood**

19(17). Male elytral declivity shorter, steeper, more strongly convex, confined to posterior third, interstrial scales each about five times as long as wide, each scale about one and one-third times as long as distance between scales in a row or between rows; Jalisco; *Phoradendron*; 1.0–1.4 mm ..... 18. ***furvatus* Wood**

— Male elytral declivity more gradual, almost reaching middle of elytra, more broadly convex, interstrial scales each about six to eight times as long as wide, at least twice as long as distance between scales in a row or between rows; California and Arizona to Chihuahua and Texas; *Phoradendron*; 1.0–1.5 mm (see also 19a. ***leechi* Wood**) ..... 19b. ***phoradendri* Blackman**

20(16). Male declivity with fine, uniseriate granules on all interstriae, strial punctures fine, distinct, interstrial scales more closely, regularly spaced on lower half of declivity; Jalisco; *Phoradendron*; 1.3–1.5 mm ..... 20. ***funereus* Wood**

— Male declivity devoid of strial and interstrial punctures and granules on central area of lower half, interstrial scales usually absent from this area ..... 21

21(20). Strial punctures on disc rather coarse, about as wide as interstriae; interstriae 3 on male declivity bearing three or four moderately coarse granules; Durango to Coahuila; *Phoradendron*; 1.4–1.8 mm ..... 21. ***funebris* Wood**

— Strial punctures on disc very small, scarcely half as wide as an interstriae; male declivity devoid of granules, bearing a large, conspicuous, shining bulla on lower half covering interstriae 2 and 3; Oaxaca; *Phoradendron*; 1.5–2.0 mm ..... 22. ***bullatus*** **Wood**

22(15). Male elytral declivity occupying slightly more than posterior half of elytra, interstriae 8 at base of declivity bearing a double row of scales; scales on male elytral declivity about twice as long as distance between rows, each scale with its sides parallel almost to its apex; Nayarit; *Phoradendron*; 1.4–1.7 mm ..... 23. ***viscivorus*** **Wood**

— Male declivity occupying posterior two-thirds of elytra, scales at base of declivity on interstriae 8 uniseriate; declivital scales of male three or more times as long as distance between rows, each widest at base, tapering very gradually to blunt apex; Oaxaca; *Phoradendron*; 1.3–1.6 mm ..... 24. ***amassius*** **Wood**

23(14). Interstrial scales on disc longer, slender, each more than four times as long as wide; female frons with a dense tuft of very long hair on vertex, tips of some hairs reaching epistomal margin; scales on male declivity more widely spaced within a row than between rows, each scale about eight times as long as wide; Puebla; *Phoradendron*; 1.4–1.7 mm ..... 25. ***peniculus*** **Wood**

— Interstrial scales on disc broad, less than three times as long as wide; hair in tuft on female vertex not more than half long enough to reach epistomal margin, less abundant; scales on male declivity much more closely spaced within a row than between rows ..... 24

24(23). Female frons shallowly impressed from epistoma to vertex, tuft of hair at upper limits of impression very short, moderately abundant; (poorly developed in *tumidulus*); declivital interstriae in male uniseriately, rather coarsely granulate (except *tumidulus*), scales on lower half of interstriae 1 slightly smaller ..... 25

— Female frons rather deeply concave, tuft of hair on vertex much longer, reaching almost half distance to epistomal margin; declivital interstriae in male feebly if at all granulate ..... 26

25(24). Female frontal vestiture only slightly longer on vertex; female elytral scales small; male declivity obtusely subangulate at base, basal half impressed, an obscure bulla at middle, declivital face glabrous, interstriae with fine rounded granules; Queretaro; *Phoradendron*; 1.5–2.0 mm ..... 26. ***tumidulus*** **Wood**

— Female vestiture on vertex distinctly longer and more abundant; male declivity convex, with rows of scales ..... 26

25b(15a). Female frontal impression ending at upper level of eyes, hair on vertex less abundant, yellowish, lower half of frons brightly shining, glabrous except for well-developed epistomal brush; female elytral scales four times as long as wide; Oaxaca; *Phoradendron*; 1.9–2.0 mm ..... 27. ***graniticus*** **Wood**

— Female frontal impression deeper, extending above eyes, hair on vertex dense, white, lower half of frons sparsely pubescent, devoid of epistomal brush; female elytral scales short, about one to one and one-half times as long as wide; Hidalgo; *Phoradendron*; 1.6 mm ..... 28. ***verticillus*** **Wood**

26(24). Male declivity confined to slightly more than posterior third of elytra; strial punctures fine, shallow; scales on male declivital interstriae similar throughout, each about three to four times as long as wide; tuft of hair on female vertex slightly longer; Tlaxcala to Oaxaca; *Phoradendron*; 1.3–1.8 mm ..... 29. ***verdicus*** **Wood**

— Male declivity occupying more than posterior half of elytra; strial punctures rather coarse, rather shallow; scales on interstriae 1–3 on lower half of male declivity about half as long as those on remaining area; tuft of hair on female vertex slightly less dense, shorter; Honduras; *Phoradendron*; 1.3–1.7 mm ..... 30. ***viscicolens*** **Wood**

27(13). Elytral apices clearly mucronate; general habitus much like *Micracis*, but tibiae and antennae clearly of *Pseudothysanoes*; color reddish brown; discal strial punctures small, shallow; declivital interstriae all uniseriately, coarsely granulate; xylophagous; Honduras; 1.2–1.4 mm ..... 31. ***mucronatus*** **(Wood)**

— Elytral apices not at all mucronate ..... 28

28(27). Male abdominal tergum 8 narrowly mucronate and projecting beyond elytral apices falsely resembling an elytral mucro; last visible female sternum narrowly projecting to form a mucro resembling that of male; female frons concave or flat ..... 29

— Male tergum 8 and female sternum 5 normal, not mucronate ..... 31

29(28). Female frons flattened, slender median groove on upper half; strial and interstrial punctures on declivity rather coarse, apparently confused; elytral vestiture of fine hair and slender bristles; Puebla; 1.2–1.4 mm ..... 32. ***cuspidis*** **Wood**

— Female frons concave; strial and interstrial punctures on declivity in rows; vestiture usually coarser ..... 30

30(28). Strial punctures moderately large, rather deep, sharply impressed; male strial and interstrial declivital setae scalelike, those on interstriae twice as large, each about twice as long as wide, in female strial setae hairlike, interstrial scales each three to four times as long as wide; female frons deeply concave; Guatemala; 1.3–1.7 mm ..... 33. ***subulatus*** **(Wood)**

— Strial punctures obscurely shallowly impressed, not clearly defined, evidently very small; male interstrial declivital scales small, three to four times as long as wide, strial setae hairlike, in female both strial and interstrial setae slender, almost hairlike; female frons less deeply concave; Panama; 1.5–1.8 mm ..... 34. ***spicatus*** **(Wood)**

31(28). Sutures of antennal club commonly but not always clearly marked; pronotum commonly with a distinct constriction on anterior half and narrowly rounded in front; pronotal summit usually behind middle, usually narrow, often impressed on either side, posterior area tending to be more coarsely sculptured (pronotal characters do not fit *heliura* group); if antennal and pronotal characters doubtful, then male elytral declivity either armed on interstriae 2 and 4 by coarse spines or else a conspicuous partial or complete circumdeclivital ridge present ..... 32

— Sutures of antennal club obscure or entirely absent; pronotum broadly rounded in front, without a lateral constriction, summit at or anterior to middle, usually broad; male elytral declivity never armed by spines or ridges ..... 51

32(31). Male elytral declivity convex, never armed by an elevated ridge or costa; pronotum constricted on anterior half, summit narrow, behind middle; if placement doubtful, then elytral scales very slender ..... 33

— Male elytral declivity with a sharply elevated lateral ridge that may continue from apex to suture at base of declivity, forming a complete circumdeclivital ridge; female slender, declivital ridge entirely absent, declivital scales short, broad, each about two to three times as long as wide; pronotal summit broad, in front of middle, posterior area smooth or very finely sculptured ..... 47

33(32). Male elytral declivity unarmed by spines on any interstriae ..... 34

— Male elytral declivity armed by four or more long, slender, pointed spines ..... 43

34(33). Antennal club large (except *hopkinsi*), much longer and usually also wider than length of scape, two procurved sutures well developed ..... 35

— Antennal club small, slender, its length less than length of scape, entirely devoid of sutures ..... 40

35(34). Interstrial scales on declivity short, rather broad, separated within a row by more than twice length of a scale ..... 36

— Interstrial scales on declivity separated by distances equal to length of a scale (some male *hopkinsi* with a few scales more widely spaced) ..... 37

36(35). Elytral scales very small, spaced within a row by distances equal to three times length of scale, between rows by more than twice length of a scale, each scale two to three times as long as wide; frons shallowly concave on lower two-thirds in both sexes; female scape with a conspicuous tuft of hair; Oaxaca; *Psittacanthus*; 1.4–1.7 mm ..... 35. ***plumalis*** **Wood**

— Male frons with a narrow, weak impression near center; male declivital scales separated within a row by distances equal to twice length of a scale, between rows by slightly less than twice length of a scale, each scale broad, less than twice as long as wide; Jalisco; 1.2–1.3 mm ..... 36. ***coracinus*** **Wood**

37(35). Interstrial scales on male declivity elongate, some three or more times as long as distance between rows, normal in female, each scale about three times as long as wide; frons almost flat in both sexes, a very feeble, small impression near center; Michoacán; *Phoradendron*; 1.3–1.6 mm ..... 37. ***tenellus*** **Wood**

— Male interstrial declivital scales not longer than distance between rows, female scales three or more times as long as wide ..... 38

38(37). Frons flattened to weakly convex, devoid of any impression; interstrial scales on declivity 3 to 6 times as long as wide in male, 6 to 10 or more times in female; antennal club small, 1.6 (male) to 1.8 (female) times as long as wide; Durango; *Yucca* leaves; 1.1–1.3 mm ..... 38. ***yuccavorus*** **Wood**

— Frons flattened to shallowly concave, with a large, strongly impressed, shining fovea within concave area; interstrial scales on declivity about three to four times as long as wide in male, four to five times as long as wide in female; antennal club 1.4 times as long as wide or less ..... 39

39(38). Discal interstriae uniseriately granulate, rather coarse in female; male interstrial scales about six times as long as wide; S California; *Fremontia*; 1.3–1.5 mm ..... 39. ***hopkinsi*** **Blackman**

— Discal interstrial punctures not at all granulate in male, feebly granulate in female; male interstrial scales each about four times as long as wide; Michigan and Ontario to Kansas and Pennsylvania; *Tilia*; 1.3–1.6 mm ..... 40. ***rigidus*** **(LeConte)**

40(34). Antennal club not more than 1.5 times as long as wide, three times as wide as width of pedicel; male and female body form similar, slender ..... 41

— Antennal club small, slender, 2.0 times as long as wide, about twice as wide as width of pedicel; body form sexually dimorphic, male very stout ..... 42

41(40). Discal interstrial vestiture of blunt, slender scales; declivital interstrial scales slightly shorter than distance between rows; frons transversely impressed at level of antennal insertion, with a distinctly impressed median fovea; Puebla; *Arbutus*; 1.0–1.3 mm ..... 41. ***arbuti*** **(Wood)**

— Discal interstrial vestiture of pointed, stout hair; declivital interstrial bristles distinctly longer than distance between rows; frons weakly convex; Panama; 1.2–1.3 mm ..... 42. ***caritus*** **(Wood)**

42(40). Male discal interstriae devoid of granules; pronotal summit very narrow; Oaxaca; leguminous shrub; 0.8–1.2 mm ..... 43. ***crassinus*** **Wood**

— Male discal interstriae uniseriately coarsely granulate; pronotal summit rather broad; Arizona; *Yucca* leaves; 0.8–1.2 mm ..... 44. ***frondicolens*** **Wood**

43(33). Male elytra with recurved spines on declivital interstriae 2, 3, 5, and 7 of about equal size, slightly longer than very broad scales; Chiapas; *Acacia*; 1.0–1.2 mm ..... 45. ***contrarius*** **Wood**

— Male declivity with spines on either interstriae 2 or 3, spines directed caudad ..... 44

44(43). Male declivity with major spines on interstriae 3; female frons at least partly concave; larger, darker, more coarsely sculptured species ..... 45

— Male declivity with major spines on interstriae 2; female frons convex; smaller, lighter in color, more finely sculptured ..... 46

45(44). Male declivital interstriae 3 armed by two coarse spines, 5 and 7 each with one smaller spine, 1 unarmed; female frons abruptly, rather deeply concave on median third; discal interstriae feebly if at all granulate; California; *Sphaeralcea*; 1.2–1.4 mm ..... 46. ***bartoni*** **Bruck**

— Male interstriae 1, 3, and 5 each bearing one or more spines, those on 3 largest; female frons concave from eye to eye from epistoma to vertex; discal interstriae uniseriately, finely granulate; Florida; *Tilia*; 1.2–1.4 mm ..... 47. ***multispinatus*** **Wood**

46(44). Male elytral declivity normally convex, commencing well behind middle of elytra; spines on male interstriae 2 equal in length to little more than half width of interstriae 2; interstrial granules finer and scales slightly narrower in both sexes; Costa Rica; *Acacia*; 1.0–1.3 mm ..... 48. ***acacicolens*** **Wood**

— Male elytral declivity rather strongly impressed on upper half, commencing in front of middle; spines on male interstriae 2 as long or longer than width of interstriae 2; interstrial granules slightly larger and scales broader in both sexes; Oaxaca; 0.9–1.3 mm ..... 49. ***spinatus*** **Wood**

47(32). Male elytral declivity with elevated lateral ridge extending from apex to interstriae 9, ending near declivital base; strial punctures coarse, deep, interstriae about half as wide as striae in male; female frons shallowly impressed on lower half; Arizona; *Quercus*; 1.0–1.2 mm ..... 50. ***costatus*** **Wood**

— Male elytral declivity completely encompassed by circular, elevated ridge extending from sutural apex along ventrolateral margin of declivity to suture at base of declivity; female frons more strongly impressed over greater area ..... 48

48(47). Face of male declivity broadly, evenly convex, punctures coarse, confused; female frons shallowly concave, median fovea obscure if present ..... 49

— Face of male declivity more strongly impressed near ridge, more irregularly protruding toward interstriae 2, interstriae 2 bearing a series of four or more coarse bristles, strial punctures small, more or less in rows; female frons with median fovea very deeply impressed, strong concavity includes part or all of frons ..... 50

49(48). Smaller, more slender; male circumdeclivital ridge feebly or not at all elevated near apex; female frons broadly concave from epistoma to vertex, a patch of fine, short pubescence on upper third; Colima; 0.9–1.1 mm ..... 51. ***vesculus*** **Wood**

— Larger, stouter; male circumdeclivital ridge strongly elevated near apex, about twice as high as thick; female frons shallowly concave on lower half, devoid of pubescence; Texas; *Condalia*; 1.3–1.5 mm ..... 52. ***heliura*** **Wood**

50(48). Impressed area immediately inside circumdeclivital ridge on male declivity poorly developed, central convex area occupying three-fourths of declivity, interstriae 2 usually not at all granulate at bases of bristles; female frons with strong, narrow, transverse impression at level of antennal insertion connected to deep, narrow, median impression; Arizona to Chihuahua; *Ceanothus*; 1.1–1.3 mm ..... 53. ***spinura*** **Wood**

— Impressed area near inner margins of male declivity broad, strongly developed, central, strongly convex area occupying half of declivity, interstriae 2 granulate at base of bristles; female frons deeply concave from epistoma to vertex; Colima; 1.0–1.2 mm ..... 54. ***mancus*** **Wood**

51(31). Interstrial setae on female declivity very slender, bristlelike, those on male declivity four or more times as long as wide; female frons largely convex ..... 52

— Interstrial setae on both male and female declivity about two to six times as long as wide; female frons broadly, shallowly impressed ..... 53

52(51). Female frons convex above, somewhat flattened on lower third; elytral punctures minute, very obscure; male declivital scales about six times as long as wide; Puebla; *Yucca* leaves; 0.8–1.2 mm ..... 55. ***yuccae*** **(Wood)**

— Female frons convex, with a small, narrow, shallow, median impression on lower half; elytral punctures minute, distinct; male declivital scales about four times as long as wide; Oaxaca; 0.7–1.0 mm ..... 56. ***minulus*** **(Wood)**

53(51). Male strial punctures on disc coarse, deeply impressed, striae much wider than interstriae; female frons broadly, shallowly, evenly concave ..... 54

— Male strial punctures smaller, not as deep, interstriae distinctly wider than striae; female frons usually less extensively, more abruptly impressed at least on upper half of impressed area ..... 55

54(53). Male discal interstriae smooth, with minute, uniseriate punctures; male elytra more slender, 1.7 times as long as wide; female frons shining, glabrous; S Texas to Tamaulipas; *Mimosa*, *Acacia*; 0.9–1.1 mm ..... 57. ***acaciae*** **(Blackman)**

— Male interstrial punctures on posterior half of disc rather coarsely, uniseriately granulate; male elytra stouter, 1.4 times as long as wide; female frons with rather dense, subpilose hair on upper half of concavity; Oaxaca; 0.8–1.0 mm .... ..... 58. ***subpilosus*** **(Wood)**

55(53). Male declivity with strial punctures moderately coarse on upper half, smaller but distinct below, similar differences in females but much more difficult to detect ..... 56

— Male declivity with striae obsolete or nearly so, punctures confused if distinct ..... 59

56(55). Male declivity with strial punctures very close, separated by much less than diameter of a puncture, deeply impressed, interstrial punctures very close, moderately coarse; female frons rather deeply concave ..... 57

— Male declivital striae not impressed, strial and interstrial punctures rather widely spaced, interstrial punctures much smaller than those of striae ..... 58

57(56). Male declivital striae apparently impressed, interstriae weakly elevated, very indistinctly granulate; female frons more extensively excavated to well above upper level of eyes; Oaxaca; leguminous tree; 1.1–1.4 mm ..... 59. ***acares*** **(Wood)**

— Male declivity with striae not impressed, interstriae not elevated, smooth; female frontal excavation ending at upper level of eyes; Oaxaca; leguminous shrub; 1.0–1.4 mm ..... 60. ***mirus*** **(Wood)**

58(56). Male strial punctures on disc rather deep, interstriae on disc not all granulate; male anterior margin of pronotum armed by eight teeth; pronotal disc more reticulate-granulate; female frons shallowly, broadly concave almost from eye to eye, lateral margins obtusely angled; Michoacán; *Acacia*; 1.0–1.4 mm ..... 61. ***aquilus*** **(Wood)**

— Male strial punctures on disc of equal size but shallow, interstrial punctures on declivity distinctly, feebly granulate; male anterior margin of pronotum armed by four teeth; pronotal disc more shining; female frons concavely impressed on less than median half, lateral margins indefinite, rounded; West Virginia to Florida and Louisiana; *Carya*; 1.0–1.3 mm (see also 63. ***perseae*** **Wood**) ..... 62. ***dislocatus*** **(Blackman)**

59(55). Sutures of antennal club clearly developed and marked by setae; male strial punctures on disc larger, interstrial scales on declivity about four times as long as wide; larger; Arizona; 1.0–1.4 mm ..... 64. ***huachucae*** **Blackman**

— Sutures on antennal club obsolete; male strial punctures on disc smaller, interstrial scales on declivity wider, about twice as long as wide; smaller species ... 60

60(59). Strial punctures on male disc fine, shallow, almost obsolete on declivity; female concavity ending below upper level of eyes; Colima; 0.9–1.3 mm ..... 65. ***mendicus*** **(Wood)**

— Strial punctures on male disc larger, on declivity fine, distinct, confused; female frontal concavity extending above upper level of eyes; Colima; 0.8–1.1 mm ..... 66. ***pumilus*** **(Wood)**

### 1. *Pseudothysanoes recavus* Wood

*Pseudothysanoes recavus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):14 (Holotype, female; 8 km or 5 miles S Simojovel, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *dimorphus* (Schedl), from Brazil, by the larger, deeper strial punctures, by the more deeply excavated female frons, with the impression extending only slightly above the eyes, by the presence of a dense fringe of short setae on the upper margin of the female frontal concavity, and by the stouter elytral scales.

FEMALE.— Length 1.2–1.4 mm (males 1.2 mm), 2.2 times as long as wide; color very dark brown, almost black.

Frons deeply, rather broadly concave from epistoma to slightly above eyes; premandibular epistomal lobe rather well developed; surface of concavity reticulate on upper two-thirds, smooth below; upper margin of concavity bearing a dense fringe of scale-like setae on median two-thirds; epistoma with a few long, subplumose setae in lateral areas. Antennal scape strongly triangular, two and one-half times as wide as long, bearing a dense brush of long hair somewhat more elaborate than in *dimorphus*; club moderately large, elongate-oval, minutely pubescent, entirely devoid of sutures.

Pronotum 0.91 times as long as wide; as in *dimorphus* except posterior areas more finely reticulate, and granules between summit and basal margin slightly larger.

Elytra 1.4 times as long as wide; outline as in *dimorphus*; striae not impressed; punctures rather fine, distinctly impressed, interstriae rather smooth, shining, almost twice as wide as striae, punctures very fine, uniseriate. Declivity steep, convex; interstrial punctures replaced by rounded granules of similar size and appearance to those of *dimorphus*, but more widely spaced. Vestiture of rows of minute, fine, recumbent, strial hair, and rows of erect, interstrial scales; each white scale about five times as long as wide, almost as long as distance between rows, slightly longer than distance between scales within a row.

MALE.— Similar to female except body 1.9 times as long as wide; frons rather weakly convex, rugose-reticulate, vestiture sparse, less conspicuous; anterior margin of pronotum armed by eight small teeth; interstrial

punctures on disc finely granulate; interstrial scales less than one and one-half times as long as wide.

DISTRIBUTION.— Chiapas.

MEXICO: Chiapas: 8 km S Simojovel, 4-VII-69, D. E. Bright.

NOTES.— The above treatment was based on the type series of 64 specimens.

### 2. *Pseudothysanoes turnbowi* Wood

*Pseudothysanoes turnbowi* Wood, 1977, Great Basin Nat. 37:217 (Holotype, female; Bentsen-Rio Grande State Park, Hidalgo Co., Texas; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *recavus* Wood by the smoother, more brightly shining pronotum and elytra, by the less deeply, more extensively excavated female frons, which has punctures and small, stout setae in the excavated area, and by the more slender scales on the male declivity.

FEMALE.— Length 1.2–1.4 mm, 2.3 times as long as wide; color very dark brown, vestiture pale.

Frons similar to *recavus* except less strongly, more extensively impressed, surface of impressed area smooth, shining, with sparse punctures and stout setae.

Pronotum as in *recavus* except smoother, interstrial setae slightly longer, more slender.

Elytra as in *recavus* except smoother, interstrial setae slightly longer, more slender.

MALE.— Similar to male *recavus* except differing by smoother frons, pronotum, and elytra and by the much more slender declivital setae, each seta about three times as long as wide.

DISTRIBUTION.— Texas.

USA: Texas: Bentsen-Rio Grande State Park, Hidalgo Co., emerged 29-XII-75 to 8-VIII-76, *Prosopis glandulosa*, R. H. Turnbow.

NOTES.— The above treatment was based on the type series of 66 specimens.

### 3. *Pseudothysanoes excavatus* (Wood)

*Cryptulocleptus excavatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):33 (Holotype, male; 30 km SE El Cameron, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This remarkable species is unique in the genus. It is distinguished by the remarkably extensive frontal excavation of both sexes; its larger size and the short, tufted scape also aid in distinguishing it.

MALE.— Length 1.4–1.6 mm, 2.1 times as long as wide; color dark brown to black.

Frons very broadly, deeply, concavely excavated from eye to eye, from epistoma to vertex, upper margin acute, with its median fourth projecting cephalad slightly; surface reticulate, glabrous. Mandibles near middle armed by a transverse, strongly developed ridge. Antennal scape slightly longer and twice as wide as pedicel; club twice as long as wide, devoid of sutures.

Pronotum 0.89 times as long as wide; widest two-fifths pronotum length from base, sides and anterior margin equally rounded on an almost circular arc; anterior margin armed by two small teeth; summit at middle, broad; anterior slope very coarsely asperate; posterior areas almost smooth, obscurely reticulate, shining; small scales almost obsolete except at margins.

Elytra 1.2 times as long as wide, 1.4 times as long as pronotum; widest at base, sides straight on basal two-thirds, very feebly converging posteriorly, broadly rounded behind; striae not impressed, punctures small, shallow, somewhat obscure; interstriae wider than striae, minutely subrugulose, shining, punctures fine, obscure. Declivity steep, convex; strial punctures greatly reduced, becoming obsolete; interstrial punctures finely granulate. Vestiture consisting of minute, fine, strial hair and rows of erect interstrial scales; each scale on disc slender, elongate, slightly longer than distance between rows, becoming shorter but not narrower toward declivity, on declivity each scale equal in length to little more than half distance between rows, about twice as long as wide. Posterior margin of sternum 5 narrowly rounded, projecting slightly.

FEMALE.— Similar to male except 2.3 times as long as wide; frontal excavation slightly deeper, with median area near epistoma slightly elevated; mandibular ridge absent; scape wider, bearing a small tuft of hair; margin of pronotum unarmed; discal scales on elytra slightly shorter; sternum 5 less strongly produced.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 30 km SE El Cameron, 21-VI-67, 1000 m, No. 78, S. L. Wood.

HOST.— *Gossypium* sp.

BIOLOGY.— This species was taken from twigs of a small tree with *obesus*.

NOTES.— The above treatment was based on the type series of five specimens.

### 4. *Pseudothysanoes querneus* Wood

*Pseudothysanoes querneus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):20 (Holotype, male; 17 km E Pachuca, Hidalgo, Mexico; Wood Coll.)

DIAGNOSIS.— This species is rather closely related to *quercinus* Wood, but it may be distinguished by the more coarsely punctured, rugulose pronotal disc, by the coarser strial punctures, and by the much wider elytral scales.

MALE.— Length 1.2–1.5 mm, 2.5 times as long as wide; color black.

Frons convex, a slight transverse impression just above epistoma; surface obscurely, rather coarsely punctured, rugulose; vestiture of moderately abundant, rather short, coarse setae. Antennal scape short, broad, slightly longer than pedicel; club rather small, widest through segment 2, sutures 1 and 2 slightly procurved, 1 marked by setae only at sides.

Pronotum 0.87 times as long as wide; widest on basal third, sides arcuately converging toward broadly rounded anterior margin; anterior margin armed by six low teeth; summit at middle, moderately high; anterior slope asperate; posterior area coarsely, indistinctly punctured, rugulose. Vestiture moderately abundant, stout.

Elytra 1.6 times as long as wide; sides straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures moderately coarse, rather deep; interstriae as wide as striae, somewhat irregular, punctures rather fine, uniseriate. Declivity steep, convex; striae irregularly, weakly impressed, interstrial punctures with coarse, low granules; most of surface obscurely subgranulose. Vestiture of semirecumbent strial hair, and rows of equally long, erect interstrial scales; each scale about twice as long as wide.

FEMALE.— Similar to male except antennal scape as wide as long, bearing a tuft of very long white hair; teeth on anterior margin of pronotum smaller, some obsolete; interstrial scales slightly longer and more slender, each about three to four times as long as wide.

DISTRIBUTION.— Nuevo León to Veracruz.

MEXICO: **Nuevo León**: Chipinque Mesa, Monterrey, 26-IV-69, D. E. Bright. **Hidalgo**: 17 km E Pachuca, 10-VI-67, 2500 m, No. 5; 8 km W Tulacingo, 11-VI-67, 2400 m, No. 10, both from *Quercus* by me. **Querétaro**: 129 km NE San Juan del Río on Highway 120, 9-VI-71, 2700 m, *Quercus*, D. E. Bright. **Veracruz**: Huatusco, 7-VII-67, 300 m, No. 173, *Quercus*, S. L. Wood.

HOST.— *Quercus* spp.

BIOLOGY.— Specimens were taken from phloem tissues of twigs of three different species of oak.

NOTES.— The above treatment was based on the type series of 44 specimens and on several other specimens.

### 5. *Pseudothysanoes coniferae* Wood

*Aphanocleptus coniferae* Wood, 1960, Great Basin Nat. 20:64 (Holotype, female; 30 km W La Laja, Chihuahua, Mexico; Wood Coll.)

DIAGNOSIS.— This is the most distinctive species of those here placed in the subgenus *Aphanocleptus*. It is somewhat allied to *querneus* Wood and *quercinus* Wood, but it may be distinguished by the shining, coarsely punctured pronotal disc, by the coarse strial punctures, by the more abundant vestiture, by the host, and by other characters.

MALE.— Length 1.3–1.7 mm, 2.5 (female 2.7) times as long as wide; color dark brown to almost black.

Frons convex, transversely impressed just above epistoma, a very weak impression in central area; surface obscurely reticulate, finely, rather closely punctured; vestiture of moderately abundant, coarse, moderately long setae. Antennal scape short, as wide as long, not longer than pedicel; club small, 1.7 times as long as wide, widest through segment 2, with two straight sutures.

Pronotum 0.97 times as long as wide; subcircular, widest just behind middle; anterior margin armed by four teeth; summit at middle, anterior area asperate; posterior area smooth, shining, coarsely, very closely, rather deeply punctured. Vestiture of rather abundant, coarse, long setae.

Elytra 1.7 times as long as wide, 2.0 times as long as pronotum; sides straight and parallel on more than basal two-thirds, rather broadly rounded behind; striae not impressed, punctures coarse, deep; interstriae narrower than striae, smooth, punctures fine, uniseriate. Declivity steep, convex; striae

weakly impressed; interstrial punctures very feebly granulate. Vestiture of stout strial hair, and rows of slightly longer, abundant interstrial scales; each scale from one to three times as long as wide, each shorter than distance between rows but longer than distance between scales within a row.

FEMALE.— Similar to male except usually slightly larger and more slender; frons more distinctly impressed; scape more broadly expanded and ornamented by long hair.

DISTRIBUTION.— Chihuahua and Nuevo León.

MEXICO: Chihuahua: 30 km W La Laja, 16-VII-60, about 2500 m, *Picea*, S. L. Wood; 26 km NE San Juanito, 19-VII-60, Douglas fir, S. L. Wood. Nuevo León: Cerro Potosí.

HOSTS.— *Picea chihuahuensis, Pseudotsuga menzeisii.*

BIOLOGY.— Shaded out branches about 2–6 cm in diameter in living trees were selected for attack. Parental galleries consisted of an irregular nuptial chamber, from which two transverse egg tunnels extended in opposite directions, each about 1 cm in length. Both nuptial chamber and egg galleries engraved both wood and phloem. Larval mines engraved the wood very lightly, parallel to its grain, and extended up to 4 cm from the egg tunnel.

NOTES.— The above treatment was based on the type series of 40 specimens and on 3 other specimens.

### 6. *Pseudothysanoes obesus* (Wood)

*Cryptulocleptus obesus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):33 (Holotype, male; 30 km SE El Cameron, Oaxaca; Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *quercinus* Wood by characters summarized in the above key.

MALE.— Length 1.0–1.2 mm (females 1.2–1.4 mm), 2.0 (female 2.3) times as long as wide; color reddish brown, elytra black (lighter in less mature specimens).

Frons planoconvex almost to upper level of eyes; minutely punctate above, becoming smoother below; vestiture consisting of a few short subplumose setae over flattened area. Scape short, little longer than pedicel, bearing a small tuft of hair; club moderately large, oval.

Pronotum 0.86 times as long as wide; widest one-third pronotum length from base, sides rather strongly arcuate, converging toward narrowly rounded anterior margin; anterior margin armed by four teeth, median pair larger; summit behind middle, well developed; anterior area coarsely asperate; posterior area very minutely rugose, punctures obscure. Vestiture largely scalelike.

Elytra 1.15 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on slightly more than basal half, rather broadly rounded behind; striae not impressed, punctures small, obscure; interstriae wider than striae, punctures fine, uniseriate. Declivity steep, broadly convex; surface minutely rugose, as on disc, except interstrial punctures closer. Vestiture consisting of interstrial rows of erect scales, each scale less than twice as long as wide.

FEMALE.— Similar to male except 2.3 times as long as wide, frons shallowly concave to upper level of eyes; scape larger, broadly triangular, bearing a large tuft of long hair; anterior margin of pronotum unarmed; elytra minutely rugose, all punctures obscure.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 30 km SE El Cameron, 21-VI-67, 1000 m, No. 79, *Gossypium*, S. L. Wood.

BIOLOGY.— Specimens were removed from dying twigs of a small shrubby tree identified as *Gossypium* sp. The beetles were removed from the cambium region.

NOTES.— The above treatment was based on the type series of 28 specimens.

### 7. *Pseudothysanoes quercinus* (Wood)

*Cryptulocleptus quercinus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):30 (Holotype, male; 37 km W Durango, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This species may be distinguished by characters summarized in the above key, although it is not closely related to any known species.

MALE.— Length 0.8–1.1 mm (females 1.2–1.5), 2.4 (female 2.8) times as long as wide; color very dark brown.

Frons convex, narrowly, transversely impressed just above epistoma; surface rugose-reticulate, punctures fine; vestiture moderately abundant, conspicuous, subplumose,

moderately short. Scape only slightly longer than pedicle, bearing several long setae.

Pronotum 0.81 times as long as wide; widest near middle, subcircular in outline; anterior margin armed by four small teeth; summit at middle, rather high, anterior slope rather coarsely asperate; posterior area smooth, shining, punctures sparse, very minute; vestiture consisting of stout, erect hair posteriorly, of bifid scales in asperate area.

Elytra 1.6 times as long as wide, 1.9 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures of moderate size and depth; interstriae almost smooth, as wide as striae, punctures fine, uniseriate. Declivity rather steep, convex; essentially as on disc but surface more irregular. Vestiture consisting of fine, short, strial hair and rows of erect, interstrial scales; each scale one and one-half times as long as strial hair, about two-thirds as long as distance between rows, similarly spaced within each row, each scale about twice as long as wide.

FEMALE.— Similar to male except 2.8 times as long as wide; frons as in male; scape very slightly larger, bearing a large, long tuft of hair; anterior margin of pronotum unarmed; strial punctures not as deep, more widely spaced; declivity less clearly punctured; elytral scales more closely spaced within rows, very slightly longer, each scale about four times as long as wide.

DISTRIBUTION.— Durango to Oaxaca.

MEXICO: **Durango**: 37 km W Durango, 4-VI-65, 2000 m, No. 10, *Quercus*, S. L. Wood. **Oaxaca**: Putla, 14-V-71, *Quercus*, D. E. Bright.

HOST.— *Quercus* sp.

BIOLOGY.— The Durango series was taken from tunnels in the phloem of an unthrifty branch 2 cm in diameter.

NOTES.— The above treatment was based on the type series of 34 specimens and on several other specimens.

### 8. *Pseudothysanoes concentralis* Wood

*Pseudothysanoes concentralis* Wood, 1975, Great Basin Nat. 35:27 (Holotype, female; 10 km or 6 miles SE Totolapan, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *quercinus* Wood by the concentric, carinate pronotal asperities, by the more strongly impressed frons, by the greatly reduced elytral punctures, and by the wider elytral scales.

FEMALE.— Length 1.0–1.2 mm, 2.6 times as long as wide; color dark brown.

Frons rather strongly concave on median two-thirds of area below upper level of eyes, surface subrugose, with sparse granules except almost smooth on lower half of concavity; vestiture short, sparse. Antennal scape as wide as long, as long as pedicel, bearing a small tuft of long hair; club about as in *quercinus*.

Pronotum 0.73 times as long as wide; outline as in *quercinus*; summit at middle; anterior slope on median third armed by six concentric, uniform, transverse carinae, other asperities absent, carina 1 submarginal, sixth at summit; posterior areas shining, almost smooth, punctures almost obsolete. Vestiture consisting of a row of scales posterior to each of first five carinae, and rather sparse, coarse hair in remaining areas.

Elytra 1.8 times as long as wide, 1.4 times as long as pronotum; outline as in *quercinus*; striae not impressed, punctures small, shallow; interstriae almost smooth, about twice as wide as striae, punctures almost obsolete; surface usually covered by a thin incrustation. Declivity convex, steep, sculpture as on disc but punctures even more obscure. Vestiture mostly abraded, consisting of widely spaced, short, interstrial scales, each scale one and one-half to two times as long as wide.

MALE.— Length 0.8 mm; similar to female except smaller, slightly stouter; frontal concavity not as deep; pronotal asperities not fused or clearly concentric.

DISTRIBUTION.— Oaxaca.

MEXICO: **Oaxaca**: 10 km SE Totolapan, 21-VI-67, 1000 m, No. 73, leguminous roadside shrub with a yellow flower, possibly *Cassia*, S. L. Wood.

NOTES.— The above treatment was based on the type series of 26 specimens.

### 9. *Pseudothysanoes thomasi* Wood

*Pseudothysanoes thomasi* Wood, 1967, Great Basin Nat. 27:38 (Holotype, male; Mazatlán, Sinaloa, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This unique species is placed near *brunneus* Wood and *sedulis* Blackman, although it is not closely related. The small

size and the unusual elevation on the male declivital interstriae 3 serve to distinguish it.

MALE.— Length 1.0–1.2 mm, 2.5 times as long as wide; color light brown.

Frons broad, weakly convex below upper level of eyes, with epistomal area distinctly elevated, more strongly convex above eyes; surface finely rugose and with a small, rounded granule at base of each seta; vestiture consisting of moderately long, abundant, fimbriate setae, those above directed dorsad, those on epistoma directed orad. Antennal scape short, subcircular, scarcely longer than pedicle; club 1.4 times as long as wide; pubescent, sutures indistinctly indicated.

Pronotum 0.94 times as long as wide; sides strongly arcuate, widest just behind middle; summit distinct, asperities moderately large; anterior margin armed by eight coarse, basally separate teeth; surface behind summit minutely reticulate, with a few small, rounded, squamiferous granules; vestiture consisting of semierect scales and a few inconspicuous bristles.

Elytra about 1.5 times as long as wide; sides straight and subparallel on basal two-thirds, rather broadly rounded behind; striae feebly impressed, punctures minute, distinguished with difficulty from those of interstriae; interstriae subrugose, punctures indistinct. Declivity convex, moderately steep; interstriae 2 strongly narrowed below, 3 with large unarmed elevation extending about two-thirds length of declivity from base, ending abruptly below, its base as wide as 1 and 2 combined, its height slightly less than its basal width. Vestiture consisting of rows of short, recumbent, hairlike, strial setae, and slightly longer scalelike setae; each scale on posterior half at least as wide as long.

FEMALE.— Similar to male except frons more strongly impressed; strial punctures more strongly impressed; elytral declivity devoid of elevation; interstriae 2 almost normal; elytral scales slightly more slender.

DISTRIBUTION.— Sinaloa.

MEXICO: Sinaloa: Mazatlán, VIII-64, J. B. Thomas.

BIOLOGY.— Except that it was taken from the bark of a tree, nothing is known of the habits of this species.

NOTES.— The above treatment was based on two male and two female paratypes in my collection.

### 10. *Pseudothysanoes brunneus* Wood

*Pseudothysanoes brunneus* Wood, 1971, Great Basin Nat. 31:72 (Holotype, male; Miller Canyon, Huachuca Mts., Arizona; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *sedulus* Blackman by the smaller size, by the more widely spaced strial punctures, by the more slender elytral scales, and by the lighter body color.

MALE.— Length 0.9–1.3 mm, 2.4 (female 2.7) times as long as wide; color brown.

Frons convex, a transverse impression just above epistoma; surface rather coarsely, closely, subrugulosely punctured; vestiture of moderately abundant, coarse, short setae. Scape very slightly longer than wide, as long as pedicel; club small oval, suture 1 indicated by setae only at sides, 2 weakly procurved.

Pronotum 0.86 times as long as wide; subcircular, anterior margin armed by about four to six small teeth; summit high, anterior slope asperate; posterior area shining, with fine, close punctures and granules. Vestiture of stout, rather short, moderately abundant setae.

Elytra 1.6 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures rather coarse, deep; interstriae narrower than striae, almost smooth, fine, uniseriate punctures on anterior half of disc replaced by fine granules on posterior half. Declivity convex, steep; interstriae 1 slightly, 3 and 9 distinctly elevated, all interstriae with a row of fine granules. Vestiture of rows of fine, short, strial hair, and rows of erect interstrial scales; each scale two to three times as long as wide, shorter than distance between rows of scales or between scales within a row.

FEMALE.— Similar to male except body more slender, 2.7 times as long as wide, scape slightly wider and ornamented by a small tuft of hair; strial punctures much smaller, interstriae wider than striae and devoid of granules on disc; elytral scales about four to five times as long as wide.

DISTRIBUTION.— Arizona to Chihuahua.

USA: Arizona: Madera Canyon, Santa Rita Mts., 10-VII-52, *Quercus*; Miller Canyon, Huachuca Mts., 10-VII-52, *Quercus*. MEXICO: Chihuahua: 40 km S Creel, 18-VII-60, *Quercus*, S. L. Wood.

HOSTS.— *Quercus* spp.

BIOLOGY.— Small, broken oak twigs were selected for attack. Specimens were removed from phloem tissues.

NOTES.— The above treatment was based on the type series of 19 specimens and on 13 other specimens.

### 11. *Pseudothysanoes sedulus* Blackman

*Pseudothysanoes sedulus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Bull. 25:204 (Holotype, male; Bear Canyon, Catalina Mts., Arizona; U.S. Nat. Mus., 27138)

*Pseudothysanoes gambetti* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Bull. 25:205 (Holotype, male; Pelonillo Reserve, New Mexico; U.S. Nat. Mus.); Wood, 1971, Great Basin Nat. 31:151. *Synonymy*

*Pseudothysanoes barberi* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Bull. 25:206 (Holotype, male; Williams, Arizona; U.S. Nat. Mus., 27137); Wood, 1971, Great Basin Nat. 31:151. *Synonymy*

DIAGNOSIS.— This species is allied to *brunneus* Wood, but it may be distinguished as noted in the diagnosis of *brunneus* and in the key.

MALE.— Length 1.4–1.7 mm, 2.3–2.4 (female 2.5) times as long as wide; color black.

Frons and pronotum as in *brunneus* except anterior margin of pronotum armed by six to eight teeth, disc closely, rather coarsely, subrugosely punctured.

Elytra 1.4–1.5 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures moderately coarse, deep; interstriae as wide as striae, almost smooth, punctures uniseriate, finely granulate. Declivity convex, steep; striae with punctures smaller, rather obscure; interstriae 3 weakly to moderately elevated, all interstriae uniseriately, rather coarsely granulate, 3 often with a partial double row; declivital surface obscurely rugose. Vestiture consisting of fine, short, strial hair, and interstrial rows of erect scales, each scale one to two times as long as wide, two-thirds as long as distance between rows, slightly longer than distance between scales within a row.

FEMALE.— Similar to male except body more slender, 2.5 times as long as wide, scape much wider; bearing a tuft of long hair; strial punctures slightly smaller, interstrial punctures finer, not at all granulate on disc or declivity; elytral scales about two to almost three times as long as wide.

DISTRIBUTION.— Arizona to New Mexico.

USA: Arizona: Bear Canyon, Santa Catalina Mts., 4-II-08, Hopk. US 7175-2, *Quercus*, 30-III-08, Hopk. US 7189, *Q. emoryi*, *Q. gambelii*, 20-VIII-14, Hopk. US 12687, Oak, M. Chrisman; Prescott N.F., 17-V-30, Hopk. US 20403-k, *Quercus*, M. W. Blackman; Tucson, 9-I-08, *Q. emoryi*, M. Chrisman; 6 km S Prescott, 5-VI-69, 1700 m, No. 29, *Quercus*, W. G. Harwood; Williams, 26-IX-01, *Quercus*, II-02, 9426-29, Oak, Schwarz and Barber. New Mexico: Mayhill, 4-VI-69, No. 47, *Quercus*, S. L. Wood; Peloncillo Reserve, bred 12-XI-07, 6-I-08, Hopk. US 5589, *Quercus*, J. L. Webb.

HOSTS.— *Quercus emoryi*, *Q. gambelii*, and *Q.* spp.

BIOLOGY.— Dying or unthrifty, standing host material about 2–6 cm in diameter was selected for attack. Specimens were removed from phloem tissues.

NOTES.— The above treatment was based on the holotypes of *sedulus*, *gambetti*, and *barberi*, and on 167 other specimens.

### 12. *Pseudothysanoes vallatus* Wood

*Pseudothysanoes vallatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):24 (Holotype, male; Volcán Colima, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This remarkable species is entirely unique in the genus. Presumably it is allied to *lecontei* Blackman, but the male declivital interstriae 3 are exceedingly strongly elevated and very coarsely serrate, the height of the elevation exceeds the combined widths of interstriae 1 and 2, 1 is neither elevated nor serrate, and in the female the elevation on 3 is only moderately developed.

MALE.— Length 1.0–1.3 mm, 2.7 times as long as wide; color very dark brown.

Frons convex, a slight transverse impression just above epistoma; surface rather coarsely reticulate except almost smooth on epistomal area; vestiture rather sparse, moderately long, consisting of subplumose setae. Scape short, only slightly longer but distinctly wider than pedicel, club small, oval, two weakly arcuate sutures indicated by setae.

Pronotum subcircular in outline, anterior margin armed by two subcontiguous teeth; anterior slope asperate, summit at middle; posterior area transversely substrigose-reticulate with a few very small granules, more regularly reticulate laterally; vestiture

consisting of rather sparse, slender scales and hair of equal length intermixed.

Elytra 1.7 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on basal two-thirds, then rounded to meet broadly truncate apex; striae not impressed, punctures small, distinct; interstriae slightly narrower than striae, each bearing a uniseriate row of small, rounded, squamiferous granules. Declivity rather steep; flattened to weakly excavated between very strongly, very narrowly elevated interstriae 3, 1 feebly elevated toward apex, punctures of striae 1 and 2 more strongly impressed than on disc; interstriae 3 elevated to sutural apex, armed by 10 very coarse, contiguous, blunt teeth that increase in size to just below middle of declivity; interstriae 1–9 each bearing one to three rounded nodules at base of declivity, those on 7 largest. Vestiture consisting of rows of interstrial scales and smaller strial hair; scales longer on declivity, particularly those on summit of elevated crest of interstriae 3.

FEMALE.— Similar to male except frons weakly impressed to upper level of eyes and more finely sculptured; scape slightly larger and bearing a small tuft of hair; anterior margin of pronotum unarmed; declivital interstriae 3 only moderately elevated and unarmed, nodules at base of declivity also absent.

DISTRIBUTION.— Jalisco.

MEXICO: Jalisco: Volcán Colima, 23-VI-65, 2500 m, No. 105, S. L. Wood.

HOST.— *Struthanthus venetus.*

BIOLOGY.— This species was taken from dying branches of mistletoe in series with large numbers of *Micracisella monadis* Wood and of another *Pseudothysanoes*; consequently, it was overlooked at the time of collection and nothing was recorded of its habits.

NOTES.— The above treatment was based on the type series of 14 specimens.

### 13. *Pseudothysanoes securus* Wood

*Pseudothysanoes securus* Wood, 1977, Great Basin Nat. 37:216 (Holotype, female; 8 km or 5 miles W Tulacingo, Hidalgo, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *quercicolens* Wood by the much longer, more slender, flattened process on the female scape, by the more slender, more acutely pointed antennal club, by the more slender, more isolated pronotal asperities, and by many other characters.

FEMALE.— Length 1.5 mm, 2.9 times as long as wide, color black, vestiture white.

Frons about as in *quercicolens* except surface rugose-reticulate. Scape acutely triangular, twice as wide as long, ornamented by a conspicuous tuft of rather long hair; club small, twice as long as wide, acutely pointed at apex, sutures obscure.

Pronotum about as in *quercicolens* except anterior margin unarmed, asperate area smaller, asperities smaller, more slender.

Elytra about as in *quercicolens* except strial punctures not as deep, interstriae more irregular, punctate granules larger, closer; declivital striae 1 and 2 with punctures reduced, interstriae 2 narrower, flat, 3 with weak elevation not reaching junction with 9. Vestiture white, closer, interstrial scales on disc one and one-half to two times as long as wide, on declivity about as long as wide.

DISTRIBUTION.— Hidalgo.

MEXICO: Hidalgo: 8 km W Tulancingo, 11-VI-67, 2400 m, No. 12, *Quercus*, S. L. Wood.

NOTES.— The above treatment was based on the type series of two specimens.

### 14. *Pseudothysanoes quercicolens* Wood

*Pseudothysanoes quercicolens* Wood, 1956, Canadian Ent. 88:235 (Holotype, male; 50 km SW El Salto, Durango, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *lecontei* Blackman and *sedulus* Blackman by characters summarized in the above key.

MALE.— Length 1.3–1.6 mm, 2.5 times as long as wide; color darker brown to almost black.

Frons as in *brunneus* Wood. Scape short, longer than wide, as long as pedicel; club moderately large with two weakly procurved sutures. Pronotum as in *sedulus*.

Elytra 1.5 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures rather coarse, deep; interstriae slightly narrower than striae, subrugose, punctures very fine, uniseriate, becoming granulate toward declivity. Declivity convex, steep; strial

punctures smaller, less distinctly impressed; interstriae 3 and 9 elevated, almost as high as wide; all interstriae uniseriately granulate. Vestiture consisting of fine, semirecumbent, strial hair and rows of slightly longer, erect interstrial scales; each scale as long as distance between rows, separated within a row by a slightly shorter distance, each about four to six times as long as wide.

FEMALE.— Similar to male except frons more finely punctured; scape as wide as long, bearing a tuft of long hair; declivital interstriae 3 and 9 less strongly elevated, all interstrial granules finer.

DISTRIBUTION.— Sinaloa and Durango to Michoacán.

MEXICO: Durango: 50 km SW El Salto, 23-VII-53, 2700 m, *Quercus*, S. L. Wood. Michoacán: 10 km E Volcán Parícutin, 19-VI-65, 2500 m, No. 86, *Quercus*, S. L. Wood. Sinaloa: 30 km NE Copala, 27-VII-53, 1000 m, *Quercus*, S. L. Wood.

HOSTS.— *Quercus* spp.

BIOLOGY.— Specimens were taken from phloem tissues of recently cut or broken oak branches about 2–6 cm in diameter.

NOTES.— The above treatment was based on 24 paratypes and on 31 other specimens.

### 15. *Pseudothysanoes lecontei* Blackman

*Pseudothysanoes lecontei* Blackman, 1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:4 (Holotype, male; Washington, D.C.; Mus. Comp. Zool., 14357)

DIAGNOSIS.— This species is distinguished from *sedulus* Blackman by characters summarized in the above key.

MALE.— Length 1.1–1.4 mm, 2.5 (female 2.7) times as long as wide; color dark brown.

As in *sedulus* except punctures on pronotal disc very slightly larger; declivital interstriae 2 more narrowly elevated, 2 and 4–8 each with a row of granules, 2 also bearing a row of scales; elytral scales each three to almost four times as long as wide.

FEMALE.— Similar to male except differing in same way female of *sedulus* differs from male.

DISTRIBUTION.— New York to North Carolina.

USA: District of Columbia, Maryland, New Jersey, New York, North Carolina, Pennsylvania, Virginia, West Virginia.

HOSTS.— *Castenea dentata*, *Celtis* sp., and *Quercus* spp.

BIOLOGY.— Reared from the bark of twigs and branches of the host trees.

NOTES.— The above treatment was based on the holotype and on 133 other specimens.

### 16. *Pseudothysanoes furvescens* Wood

*Pseudothysanoes furvescens* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):21 (Holotype, male; 18 km N Huajuapan, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is in the *phoradendri* group and is very closely related to *furvus* Wood. From *furvus* it is distinguished by the absence of granules on the male discal interstriae, and by the shorter elytral scales.

MALE.— Length 1.1–1.4 mm, 2.3 (female 2.8) times as long as wide; color black.

Frons convex, transversely impressed above epistoma; surface finely rugose, punctures not evident; vestiture of sparse, coarse, short setae. Antennal scape elongate; club moderately large, oval, widest at middle, suture 1 straight, 2 obscure.

Pronotum as in *furvus*.

Elytral proportions and outline as in *furvus*; striae not impressed, punctures small, shallow; interstriae slightly wider than striae, smooth, punctures very fine, not at all granulate or elevated. Declivity convex, steep; striae as on disc; interstriae each with a row of fine granules. Vestiture consisting only of rows of interstrial scales, each scale about three times as long as wide, slightly shorter than distance between rows, spaced within a row by about one and one-half times length of a scale.

FEMALE.— Similar to male except more slender, 2.8 times as long as wide, frons less strongly convex; anterior margin of pronotum unarmed; strial punctures much smaller, obscure; occasional strial hair present.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 18 km N Huajuapan, 15-VI-67, No. 42, *Phoradendron*, S. L. Wood.

BIOLOGY.— Unthrifty or injured mistletoe was selected for attack by this species. The gallery systems were in the phloem tissues.

NOTES.— The above treatment was based on the type series of 16 specimens.

### 17. *Pseudothysanoes furvus* Wood

*Pseudothysanoes furvus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):26 (Holotype, male; Cañas, Guanacaste, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *furvatus* Wood by the presence of granules on the discal interstriae of the male. These two species may be recognized from other species in the *phoradendri* group by the short scales on the male elytral declivity.

MALE.— Length 1.1–1.4 mm, 2.2 (female 2.8) times as long as wide; color black with white scales.

Frons convex above, transversely impressed from just above level of antennal insertion to epistomal margin; surface finely granulate; vestiture consisting of moderately abundant, coarse, short, subplumose hair.

Pronotum 0.93 times as long as wide; widest about one-third pronotum length from base, sides rather strongly arcuate on basal half, laterally constricted on anterior half, narrowly rounded in front; anterior margin armed by eight serrations that decrease in size laterally; summit just behind middle, rather high; coarsely asperate from summit forward; posterior area minutely punctuate-subgranulate and with obscure, fine punctures, more nearly reticulate laterally; vestiture of minute hair and longer, broad scales, those on asperate area longer.

Elytra 1.3 times as long as wide; 1.5 times as long as pronotum; sides straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures small, deep; interstriae almost twice as wide as striae, minutely irregular, subvulcanate squamiferous punctures weakly elevated, almost as large as those of striae. Declivity convex, steep; sculpture about as on disc, but punctures and granules somewhat smaller. Vestiture consisting of interstrial rows of erect scales; each scale as long as distance between rows and between adjacent scales in a row, about three times as long as wide.

FEMALE.— Similar to male except slightly larger, more slender, 2.8 times as long as wide; frons less coarsely sculptured, vestiture more abundant, finer; antennal scape bearing a small tuft of subplumose hair; sculpture of pronotum finer, anterior margin unarmed; elytral punctures and granules greatly reduced except only slightly smaller on declivity; elytral scales smaller.

DISTRIBUTION.— Honduras to Costa Rica.

HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 569, *Phoradendron robustissimum*. COSTA RICA: Finca La Pacifica, Cañas, Guanacaste, 13-IV-66, 50 m, No. 1, *Phoradendron*; 20 km SE Liberia, Guanacaste, 10-VII-66, 50 m, No. 16, *Phoradendron*; all by me.

HOSTS.— *Phoradendron* spp.

BIOLOGY.— This species breeds in the phloem tissues of dead and dying twigs of mistletoe.

NOTES.— The above treatment was based on the type series of 72 specimens and on 30 other specimens.

### 18. *Pseudothysanoes furvatus* Wood

*Pseudothysanoes furvatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):26 (Holotype, male; 35 km N Juchitlán, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *furvus* Wood by the much coarser and deeper male strial punctures, this difference only slight in the female; by the larger, closer, interstrial granules on the male disc; and by the slightly longer, more slender male declivital scales, the female declivital scales being more slender but slightly shorter.

MALE.— Length 1.0–1.4 mm, 2.3 (female 2.8) times as long as wide; color dark brown to black, with summit of pronotum reddish.

Frons and pronotum as in *furvus*.

Elytra 1.3 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures moderately large, deep; interstriae slightly narrower than striae, smooth, each with a uniseriate row of rather small, rounded, squamiferous granules, each granule as wide as its interstriae. Declivity beginning at or just behind middle, rather steep, convex; sculpture as on disc except granules smaller, many obscure. Vestiture consisting of rows of erect interstrial scales, each scale on disc two to three times as long as wide, each equal in length at base to two-thirds distance between rows at base of declivity; each scale on declivity about four to six times as long as wide and slightly longer than distance between rows.

FEMALE.— As in female of *furvus* except as noted in the diagnosis above.

DISTRIBUTION.— Jalisco.

MEXICO: **Jalisco**: 35 km N Juchitlán, 3-VII-65, 1300 m, No. 183, *Phoradendron*, S. L. Wood.

BIOLOGY.— As in *furvus*, except the host tree of the mistletoe was not identified.

NOTES.— The above treatment was based on the type series of 33 specimens.

### 19a. *Pseudothysanoes leechi* Wood

*Pseudothysanoes leechi* Wood, 1980, Great Basin Nat. 40:356 (Holotype, male; 3 km NNE Angwin, Napa Co., California; Calif. Acad. Sci.)

DIAGNOSIS.— This species is distinguished from *phoradendri* Blackman by the larger size, by the much shorter, stouter male declivital scales, and by the much longer setae on the female vertex. From the more closely related *verdicus* Wood it is distinguished by the stouter scales on the male declivity, by the much less strongly impressed female frons, with the setae on the vertex distinctly shorter and less abundant, and by other characters cited below.

MALE.— Length 1.4–1.7 mm, females 1.6–1.8 mm, 2.4 (females 2.5) times as long as wide; color very dark brown, vestiture pale.

Frons as in *verdicus* except median third on lower half of frons more distinctly, concavely impressed.

Elytra 1.45 times as long as wide, 1.7 times as long as pronotum; as in *verdicus* except strial punctures on disc slightly larger, interstrial granules distinctly larger, extending to base, interstrial scales closer, shorter, those on declivity about twice as long as wide, each half to two-thirds as long as distance between rows.

FEMALE.— Similar to female *verdicus* except frons shallowly concave on median two-thirds of lower two-thirds, setae on vertex shorter, less abundant, tips of longest attaining middle of frons; posterior areas of pronotum without reticulation; strial punctures slightly deeper, interstrial punctures and scales closer, scales distinctly shorter. A very small tuft of hair on scape.

DISTRIBUTION.— California.

USA: **California**: North side Howell Mt., 3 km NNE Angwin, Napa Co., 18-VI to 27-VIII-80, *Phoradendron flavescens* var. *villosum* (on *Quercus kelloggii*), H. B. Leech.

NOTES.— The above treatment was based on the type series of 33 specimens.

### 19b. *Pseudothysanoes phoradendri* Blackman

*Pseudothysanoes phoradendri* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Bull. 25:202 (Holotype, male; Victoria, Texas; U.S. Nat. Mus., 27139)

DIAGNOSIS.— This is one of about a dozen species in this genus entirely restricted to mistletoes of the genus *Phoradendron*, nine of which form a rather compact group. This species is most closely allied to *furvatus* Wood, from which it may be distinguished by characters summarized in the above key.

MALE.— Length 1.0–1.5 mm, 2.2 (female 2.7) times as long as wide; color black, summit of pronotum usually reddish brown.

Frons convex above, transversely impressed just above epistoma and with a small concavity on median third of lower half; granulate-punctate above, becoming smooth and shining in concave area; vestiture sparse, consisting of coarse, erect, moderately long setae. Antennal scape long, slender; club moderately large, oval, two weakly procurved sutures.

Pronotum 0.90 times as long as wide; subtriangular, widest at base, slightly arcuate, converging toward narrowly rounded anterior margin; anterior margin armed by six teeth; summit high, behind middle; anterior slope asperate, posterior area reticulate, subrugulose, punctures fine, obscure, a few fine granules directly behind summit. Vestiture sparse, of a few scales and stout bristles.

Elytra 1.4 times as long as wide, 1.6 times as long as pronotum; sides almost straight on basal two-thirds, slightly wider at declivital base, obtusely angulate behind; striae not impressed, punctures rather coarse, deep, close; interstriae slightly narrower than striae, almost smooth, uniseriately, finely granulate. Declivity broadly convex, beginning at middle of elytra; strial punctures slightly smaller than on disc. Vestiture consisting of rows of interstrial scales; each scale at base about three times as long as wide, increasing in length toward declivity, on declivity each scale about six to eight times as long as wide, at least twice as long as distance between scales within a row or between rows.

FEMALE.— Similar to male except more slender, 2.7 times as long as wide; frontal impression a bit more extensive; antennal scape bearing a small tuft of hair; anterior margin of pronotum unarmed; strial punctures smaller, not as deep; declivity confined to posterior third of elytra; strial hair present on declivity, interstrial scales about four times as long as wide.

DISTRIBUTION.— S California and Arizona to Chihuahua and W Texas.

USA: **Arizona**: Catalina Springs, Hubbard and Schwarz; Santa Catalina Mts., Hopk. US 7554, mistletoe. **California**: Mt. Laguna, San Diego Co., 7-XII-40, Hopk. US 32545, *Phoradendron* on *Quercus kelloggii*, D. DeLeon; Ventura Co., 9-IV-06, Hopk. US 2762. **Texas**: Menard, 13-V-46, mistletoe, L. S. Bottomer; Victoria, 6-III-09, corn stalk (?), and 16-III-11, *Phoradendron flavescens*, J. D. Mitchell. MEXICO: **Chihuahua**: 39 km S Creel, 13-VII-60, *Phoradendron*, S. L. Wood.

HOST.— *Phoradendron flavescens*.

BIOLOGY.— This species breeds in the phloem tissues of dying branches of mistletoe.

NOTES.— The above treatment was based on the holotype and on 28 other specimens.

## 20. *Pseudothysanoes funereus* Wood

*Pseudothysanoes funereus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):21 (Holotype, male; Volcán Colima, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is very closely related to *phoradendri* Blackman, but it may be distinguished by the more slender body form, by the more rugose pronotal disc, by the much smaller strial punctures on both disc and declivity, and by the near absence of interstrial granules.

MALE.— Length 1.3–1.5 mm, 2.4 times as long as wide; body color black.

Head and prothorax as in *phoradendri* except pronotal disc slightly more rugose.

Elytra 1.5 times as long as wide; sides straight and parallel on basal two-thirds, narrowly rounded behind; striae not impressed, punctures small, shallow, separated by two or more diameters of a puncture; interstriae smooth, at least twice as wide as striae, punctures uniseriate, very small, feebly if at all granulate. Declivity beginning well behind middle, convex; interstrial granules small, regular. Vestiture as in *phoradendri*.

DISTRIBUTION.— Jalisco.

MEXICO: **Jalisco**: Volcán Colima, 23-VI-65, 2500 m, No. 108, *Phoradendron longifolium*, S. L. Wood.

BIOLOGY.— Specimens were just entering the bark of a dying mistletoe that grew in an oak tree.

NOTES.— The above treatment was based on the type series of seven specimens.

## 21. *Pseudothysanoes funebris* Wood

*Pseudothysanoes funebris* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):27 (Holotype, male; 27 km W Durango, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *bullatus* Wood by characters of the male elytral declivity as indicated in the above key.

MALE.— Length 1.4–1.8 mm, 2.4 times as long as wide; color black, summit of pronotum reddish.

Frons transversely impressed below upper level of eyes, central area shallowly concave; finely granulate-punctate above eyes, finely punctured below; vestiture consisting of moderately abundant, subplumose setae of moderate length.

Pronotum 0.95 times as long as wide; outline and sculpture as in *verdicus* except granules in posterior area reduced and setae finer.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; outline as in *verdicus*; striae not impressed, punctures moderately large, shallow, distinct; interstriae wider than striae, surface somewhat irregularly marked by lines, punctures fine, uniseriate, becoming granulate near declivity. Declivity confined to posterior third, rather steep, convex; strial punctures greatly reduced above, obsolete below; interstriae 1 devoid of granules on lower three-fourths and 2 on lower half, upper half of 2, all of 3 and 4 and lateral areas armed by moderately large, somewhat pointed, isolated, squamiferous granules. Vestiture consisting of erect scales; each scale on disc about four times as long as wide, almost equal in length to distance between rows, more slender, one and one-half times as long and more widely spaced than on disc; spacing of scales within row on declivity slightly greater than spacing between rows.

FEMALE.— Similar to male except frontal concavity slightly deeper and wider; anterior margin of pronotum unarmed; elytra 1.7

times as long as wide, surface of disc somewhat more irregular; elytral declivity sculptured to apex as on disc; interstrial scales about six times as long as wide, not longer or more widely spaced on declivity.

DISTRIBUTION.— Durango to Coahuila.

MEXICO: Coahuila: 28 km SE Saltillo, 21-VI-71, 2000 m, mistletoe on juniper, D. E. Bright. Durango: 27 km W Durango, 4-VI-65, 2000 m, No. 9, *Phoradendron boleanum*, S. L. Wood; 70 km W Durango, 18-VI-71, 2600 m, mistletoe on oak, D. E. Bright.

HOST.— *Phoradendron boleanum*.

BIOLOGY.— This species was taken from phloem tissues in the dying twigs of the above mistletoe that grew in *Arbutus* trees. An error occurred in the original description in host designation.

NOTES.— The above treatment was based on the type series of 130 specimens. A series from 5 km N Suchixtepec, Oaxaca, on Highway 175, 4-VI-71, 3100 m, in mistletoe on alder, by D. E. Bright in the Canadian National Collection is assigned to this species, although it represents a slight deviation.

### 22. *Pseudothysanoes bullatus* Wood

*Pseudothysanoes bullatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):28 (Holotype, male; 42 km SE Nichixtlan, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *funebris* Wood by the large, shining bulla on the male elytral declivity and by other characters mentioned in the above key.

MALE.— Length 1.5–2.0 mm, 2.3 times as long as wide; color very dark brown, posterior half of elytra usually lighter.

Frons moderately, transversely impressed on lower half, convex above; surface rather coarsely granulate-punctate above, finely rugose on lower third; vestiture consisting of stout, rather sparse, short, subplumose setae. Scape with about a dozen long setae.

Pronotum 0.94 times as long as wide; widest at base, sides arcuately converging from base to narrowly rounded anterior margin, with a slight constriction one-third pronotum length from anterior margin; anterior margin armed by six small teeth; summit behind middle, well developed, broad; posterior area very finely rugose-reticulate, minute punctures obscure; vestiture of scales and hair intermixed.

Elytra 1.4 times as long as wide, 1.6 times as long as pronotum; outline as in *verdicus* Wood; striae not impressed, punctures rather small, distinctly impressed; interstriae wider than striae, minutely, irregularly marked by obscure lines and points, squamiferous punctures rather fine, usually distinct, not granulate. Declivity occupying slightly more than posterior third, convex, rather steep; strial and interstrial punctures reduced, becoming obsolete by middle of declivity; points largely replace obscure lines on interstriae, surface shining; interstriae 3 with a large, low bulla on upper part of lower half of declivity, extending slightly to interstriae 2 and 4. Vestiture consisting of erect, interstrial scales, each about two to three times as long as wide, slightly longer toward declivity, those on upper declivity spaced within and between rows by a distance equal to length of a scale; lower two-thirds of declivity glabrous.

FEMALE.— Similar to male except frons shallowly concave on median three-fourths from epistoma to above upper level of eyes, upper area bearing rather numerous, moderately short, yellow setae; anterior margin of pronotum unarmed and more broadly rounded; declivital interstriae each bearing a uniseriate row of fine granules to apex, bulla obscure; declivity shorter, steeper; vestiture more abundant, extending to apex, each scale more slender, above five times as long as wide.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 42 km SE Nochixtlán, 17-VI-67, 2300 m, No. 55, *Phoradendron*, S. L. Wood.

BIOLOGY.— This species was taken from phloem tissues of a dying mistletoe.

NOTES.— The above treatment was based on the type series of 11 specimens.

### 23. *Pseudothysanoes viscivorus* Wood

*Pseudothysanoes viscivorus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):25 (Holotype, male; Volcán Ceboruco, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is in the *phoradendri* group; it is distinguished from *amassius* Wood by characters summarized in the above key.

MALE.— Length 1.4–1.7 mm, 2.3 times as long as wide; color dark brown to black, summit of pronotum reddish.

Frons convex, transversely impressed on lower half, subconcave toward center; surface finely reticulate-granulate, with small, obscure punctures; vestiture of sparse, subplumose setae of moderate length.

Pronotum 0.91 times as long as wide; widest on basal third, sides strongly arcuate on basal half, strongly constricted one-third length from narrowly rounded anterior margin; anterior margin armed by six small teeth; summit behind middle, well developed; anterior slope coarsely asperate to summit; posterior area coarsely reticulate, fine punctures obscure; vestiture of intermixed fine hair and slightly longer, erect scales, each scale about four to six times as long as wide.

Elytra 1.3 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae very weakly impressed toward declivity, punctures rather coarse, deep; interstriae almost as wide as striae, punctures uniseriate, rather coarse, subgranulate on anterior margins especially toward declivity. Declivity beginning slightly in front of middle, moderately steep, broadly convex; striae weakly impressed, punctures slightly larger than on disc; interstrial punctures usually not at all granulate. Vestiture consisting of minute strial hair and rows of interstrial scales; each scale on disc slightly shorter than distance between rows, each about three to four times as long as wide; scales on declivity equal in width to those on disc, but three times as long; scales on declivital interstriae 8 and 9 in partial double rows and equal in length to one another.

FEMALE.— Similar to male except anterior margin of pronotum unarmed; elytra 1.5 times as long as wide, declivity restricted to posterior third, more narrowly rounded, steeper; strial punctures smaller, similar on disc and declivity; interstrial granules larger and more regular; declivital vestiture only slightly longer than on disc, each declivital scale about four to six times as long as wide.

DISTRIBUTION.— Nayarit.

MEXICO: Nayarit: Volcán Ceboruco, 5-VII-65, 1100 m, No. 191, *Phoradendron* probably *robinsonii*, S. L. Wood.

BIOLOGY.— Specimens were taken from phloem tissues of the above mistletoe.

NOTES.— The above treatment was based on the type series of 19 specimens.

### 24. *Pseudothysanoes amassius* Wood

*Pseudothysanoes amassius* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):25 (Holotype, male; 20 km S Matías Romero, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished, with some difficulty, from *viscivorus* Wood, and it eventually may become a subspecies. It is distinguished by a slightly more strongly impressed frons, by the shorter, uniseriate scales on the male declivital interstriae 9 and a reduced number of scales on 8, and by the much broader interstrial scales of the female.

MALE.— Length 1.3–1.6 mm, 2.1 times as long as wide; color dark brown to black, summit of pronotum reddish.

As in *viscivorus* except frons more broadly, more deeply impressed; strial punctures near declivity somewhat finer, interstrial granules finer; scale son declivital interstriae 9 uniseriate and distinctly shorter than those on 8.

FEMALE.— As in the female of *viscivorus* except frons broadly, more strongly impressed; interstrial granules much smaller; interstrial scales much broader, each about two to two and one-half times as long as wide.

DISTRIBUTION.— Oaxaca.

MEXICO: **Oaxaca**: 20 km S Matías Romero, 24-VI-67, 700 m, No. 93, *Phoradendron*, S. L. Wood.

BIOLOGY.— As in *viscivorus*.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 25. *Pseudothysanoes peniculus* Wood

*Pseudothysanoes peniculus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):28 (Holotype, male; 13 km W Texmelucan, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— The male of this species resembles *funebris* Wood, but the female has the frons excavated and elaborately decorated by setae.

MALE.— Length 1.4–1.7 mm, 2.3 times as long as wide; color dark brown, part of elytra and summit of pronotum lighter in some specimens.

Frons rather strongly, broadly, transversely impressed on lower half, convex above, epistoma gradually raised to margin; surface finely granulate-punctate, finer in impression; vestiture consisting of moderately abundant, short, subplumose setae.

Pronotum 0.96 times as long as wide; outline as in *verdicus* Wood; surface behind summit rather coarsely reticulate, minute, sparse punctures obscure; vestiture of scales and stout hair intermixed.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; outline as in *verdicus*; striae not impressed, punctures small, shallow, obscure; interstriae about as wide as striae, irregularly marked, punctures fine, obscure, very feebly granulate, squamiferous. Declivity on slightly more than posterior third, convex, moderately steep; sculpture essentially as on disc. Vestiture of rows of erect scales; each scale at base about four times as long as wide, at least eight times as long as wide on declivity, each slightly longer than distance between rows at base, increasing in length toward declivity until about twice as long as distance between rows on declivity, spacing within each row equal to or slightly less than length of scale.

FEMALE.— Similar to male except frons concave from eye to eye, from epistoma to vertex, area above eyes ornamented by a dense brush of long, yellow hair, tips of some setae extending to epistomal margin; scape with a rather large fringe of long hair; anterior margin of pronotum unarmed; elytra 1.6 times as long as wide, declivity confined to posterior third; elytral surface, particularly on declivity, more nearly minutely rugose; elytral scales shorter (about two-thirds as large) and closer.

DISTRIBUTION.— Puebla.

MEXICO: **Puebla**: 13 km W Texmelucan, 13-VI-67, 2600 m, No. 26, *Phoradendron*, S. L. Wood.

BIOLOGY.— Specimens were taken from phloem tissues of dying mistletoe.

NOTES.— The above treatment was based on the type series of 11 specimens.

### 26. *Pseudothysanoes tumidulus* Wood

*Pseudothysanoes tumidulus* Wood, 1975, Great Basin Nat. 35:28 (Holotype, male; 129 km NE San Juan del Río on Highway 120, Queretaro, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from the distantly allied *graniticus* Wood by the different female frons, by the smaller elytral scales, and by the very different male declivity as described below.

MALE.— Length 1.5–2.0 mm, 2.2 times as long as wide; color very dark brown.

Frons flattened on lower two-thirds, with small concavity on median fifth ascending slightly to epistomal margin, convex above; subshining and almost smooth on flattened area, more coarsely punctate-granulate above; vestiture confined to epistomal area and to convex area.

Pronotum similar to *graniticus* except anterior margin narrowly rounded and armed by six teeth and posterior areas rather strongly reticulate.

Elytra 1.3 times as long as wide; sides straight and parallel on basal three-fourths, rather abruptly rounded, then broadly rounded behind; striae not impressed, punctures small, moderately deep, spaced by distances equal to diameter of a puncture; interstriae three times as wide as striae, almost smooth, punctures minute, granulate, uniseriate except confused near declivity. Declivity with basal margin abrupt, basically convex except upper half flattened to striae 4, a moderate bulla just below middle from interstriae 2–4; strial punctures smaller and not as deep as on disc, closer, in indistinct rows, of same size and shape as confused interstrial granules, interstrial punctures obsolete; bulla covered by same surface sculpture as elsewhere. Vestiture of interstrial rows of scales, each slightly longer than wide on disc except scales confused, more abundant, much longer, and more slender at base of declivity; declivity glabrous; rows of fine, recumbent strial hair on disc.

FEMALE.— Similar to male except frons broadly, shallowly concave from epistoma to well above eyes, vestiture on upper area slightly more abundant (less abundant and shorter than in *graniticus*); anterior margin of pronotum more broadly rounded, unarmed; declivity convex, sculpture as on disc except strial punctures obsolete; rows of interstrial scales continued to apex, each scale equal in length to three-fourths distance between rows, more closely spaced within a row, each about three to four times as long as wide.

DISTRIBUTION.— Queretaro.

MEXICO: **Queretaro**: 129 km SE San Juan del Río on Highway 120, 9-VI-71, 2500 m, mistletoe on oak, D. E. Bright.

NOTES.— The above treatment was based on the type series of 29 specimens.

### 27. *Pseudothysanoes graniticus* Wood

*Pseudothysanoes graniticus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):21 (Holotype, female; 43 km SE Nochixtlán, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *verdicus* Wood and *viscicolens* Wood by the shallowly impressed female frons, with setae on the vertex short, and by the more coarsely granulate male declivital interstriae, with scales on lower half of interstriae 1 smaller.

FEMALE.— Length 1.9 mm (male 1.8 mm), about 2.7 times as long as wide, color very dark brown.

Frons shallowly concave from epistoma to upper level of eyes, flattened to vertex, surface of concave area smooth, shining, impunctate, finely punctured above, somewhat strigose at sides; epistomal brush conspicuous at sides; flattened area above eyes bearing rather abundant, moderately short, coarse hair. Antennal scape elongate, ornamented by abundant, long hair; club about 2.5 times as long as wide; antenna as long as pronotum.

Pronotum 0.96 times as long as wide; widest at base, sides almost straight, feebly converging on basal half, broadly rounded in front; anterior margin unarmed; summit rather high, at middle; anterior area asperate; posterior area rugose-reticulate, with fine, obscure punctures, fine granules behind summit. Vestiture sparse, of fine and coarse short hair.

Elytra about 1.6 (slightly spread) times as long as wide, 1.8 times as long as pronotum; striae not impressed except 1 weakly, punctures rather small, deep; interstriae slightly less than twice as wide as striae, almost smooth, uniseriately, finely granulate. Declivity convex, steep; interstrial granules slightly larger, confused on 2 and 3. Vestiture of very fine strial hair and rows of erect interstrial scales; each scale on disc three to four times as long as wide on disc, four to five times as long as wide on declivity, each scale slightly longer than distance between scales within a row or between rows.

MALE.— Similar to female except stouter, about 2.5 times as long as wide (estimated); frons not visible; pronotum distinctly constricted on anterior half, anterior margin armed by 10 teeth; strial punctures coarser, interstriae one and one-half times as wide as striae, much more coarsely granulate; elytral scales slightly longer, proportions as on female; scales on lower half of interstriae 1 conspicuously smaller; granules on declivital interstriae 2 and 3 uniseriate.

DISTRIBUTION.— Oaxaca.

MEXICO: **Oaxaca**: 43 km SE Nochixtlán, 17-VI-67, No. 55, *Phoradendron*, S. L. Wood.

BIOLOGY.— Specimens were taken from bark of a dying branch of mistletoe.

NOTES.— The above treatment was prepared from the holotype and allotype; no other specimens are known.

### 28. *Pseudothysanoes verticillus* Wood

*Pseudothysanoes verticillus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):22 (Holotype, female; 27 km N Ixmiquilpan, Hidalgo, Mexico; Wood Coll.)

DIAGNOSIS.— This species is very closely allied to *viscicolens* Wood, but it may be distinguished by the more shallowly concave female frons, with a more dense tuft of hair on the vertex, and by the much shorter elytral scales.

FEMALE.— Length 1.6 mm, 2.8 times as long as wide; color almost black, pronotal summit reddish brown.

Frons as in *viscicolens* except less deeply concave, tuft of hair on vertex slightly shorter, more dense. Antenna and pronotum as in *viscicolens*.

Elytra 1.7 times as long as wide, 1.8 times as long as pronotum; striae not impressed, punctures rather small, moderately deep; interstriae about twice as wide as striae, punctures uniseriate, finely granulate. Declivity as in *graniticus* Wood, with indistinct granules and punctures on interstriae 2 and 3 confused. Vestiture of fine, short strial hair, and rows of erect, short, interstrial scales; each scale one to one and one-half times as long as wide, half as long as distance between rows, equal in length to distance betwen scales in a row.

DISTRIBUTION.— Hidalgo.

MEXICO: **Hidalgo**: 27 km N Ixmiquilpan, 10-VII-67, 1900 m, probably *Phoradendron*, S. L. Wood.

BIOLOGY.— Presumably due to an error, this specimen was associated with the same field collection number (No. 188) as another series from *Acacia*. It evidently was taken in

flight and dropped in the vial with the series from *Acacia* without noting that it represented a different species. *Phoradendron* was in the area.

NOTES.— The above treatment was based on the unique holotype.

### 29. *Pseudothysanoes verdicus* Wood

*Pseudothysanoes verdicus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):27 (Holotype, male; 7 km N Tlaxco, Tlaxcala, Mexico; Wood Coll.)

DIAGNOSIS.— This species is allied to *viscicolens*, but it is distinguished by the more slender body form, and by other characters included in the above key.

MALE.— Length 1.3–1.8 mm, 2.3 times as long as wide; color dark brown, pronotal summit reddish.

Frons convex above, moderately, transversely impressed just above epistoma, with a slight dorsal extension of impression toward center; surface finely rugose; vestiture sparse, rather short, widely distributed.

Pronotum 0.92 times as long as wide; widest at base, sides weakly arcuate and converging on basal three-fifths to a conspicuous constriction, rather narrowly rounded in front; anterior margin armed by four small teeth; summit rather high, behind middle; posterior area coarsely reticulate, with small, sparse, rounded, squamiferous granules; vestiture of intermixed fine, short hair and longer, slender scales.

Elytra 1.4 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures minute, distinct; interstriae about twice as wide as striae, irregularly marked by lines and obscure points, punctures finely granulate, squamiferous. Declivity confined to posterior third, convex, rather steep; sculpture as on disc except granules smaller, obscure. Vestiture consisting of minute strial hair and rows of erect interstrial scales; each scale on declivity four to five times as long as wide, about equal in length to distance between rows, very slightly shorter on disc.

FEMALE.— Similar to male except frons shallowly concave almost from eye to eye from epistoma to vertex, upper margin ornamented by a dense tuft of long yellow hair, tips of setae reaching slightly beyond middle of concavity; scape with a small tuft of hair; anterior margin of pronotum unarmed; elytral scales slightly smaller.

DISTRIBUTION.— Tlaxcala to Oaxaca.

MEXICO: **Oaxaca**: 42 km SE Nochixtlán, 17-VI-67, No. 65, *Phoradendron*, S. L. Wood. **Tlaxcala**: 7 km N Tlaxco, 6-VI-67, 2700 m, No. 24, mistletoe, S. L. Wood.

HOST.— *Phoradendron* spp.

BIOLOGY.— Specimens were taken from phloem tissues of dying mistletoe that was growing in *Juniperus deppeana* at Tlaxco.

NOTES.— The above treatment was based on the type series of 65 specimens.

### 30. *Pseudothysanoes viscicolens* Wood

*Pseudothysanoes viscicolens* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):25 (Holotype, male; Zamorano, Morazán, Honduras; Wood Coll.)

DIAGNOSIS.— This species is allied to *verdicus* Wood, but it may be distinguished by characters summarized in the above key.

MALE.— Length 1.3–1.7 mm, 2.2 times as long as wide; color dark brown to black, pronotal summit reddish.

Frons convex, with a feeble impression above epistoma; an obscure subfoveate impression indicated near center; reticulate below, becoming minutely subgranulate above; vestiture sparse, inconspicuous.

Pronotum 0.92 times as long as wide; sides weakly arcuate, converging very slightly on basal two-thirds then broadly rounded in front; anterior margin armed by six small teeth; summit well developed; posterior area minutely rugulose, with sparse, small, subgranulate punctures; vestiture consisting of rather sparse, small, scale- and hairlike setae.

Elytra 1.3 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures rather small, deep; interstriae wider than striae, punctures small, uniseriate. Declivity beginning well before middle of elytra, moderately steep, broadly convex; sutural striae only feebly impressed, punctures distinctly larger and deeper than on disc; interstriae narrower, otherwise as on disc. Vestiture consisting of minute strial hair and rows of erect interstrial scales; each scale on disc about twice as long as wide, about two-thirds as long as distance between rows; each scale on declivity as wide or slightly wider

than those on disc, and on upper half at least three times longer than those on disc, decreasing in length on interstriae 1 and 2 on lower half to size of scales on disc.

FEMALE.— Similar to male except frons rather deeply concave from epistoma to vertex, concavity clothed with moderately abundant, short, stout setae, upper margin bearing a tuft of long, yellow hair equal in length to half diameter of concavity; anterior margin of pronotum unarmed; declivity confined to posterior third of elytra; strial punctures somewhat reduced; interstrial granules small, regularly placed on disc and declivity; declivity more narrowly convex, sculpture and vestiture as on disc, each scale three to four times as long as wide.

DISTRIBUTION.— Honduras.

HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 569, *Phoradendron robustissimum*, S. L. Wood.

BIOLOGY.— Specimens were taken in phloem tissues of dying mistletoe.

NOTES.— The above treatment was based on the type series of 16 specimens.

### 31. *Pseudothysanoes mucronatus* (Wood)

*Cryptulocleptus mucronatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):34 (Holotype, male; La Lima, Cortez, Honduras; Wood Coll.)

DIAGNOSIS.— Although most of the generic characters of *Pseudothysanoes* clearly fit this species, it is unique in having the elytral apices acuminately extended to form a short mucro, as seen in *Micracis* or possibly *Micracisella*. The mucro appears to be a secondary acquisition that should not have a bearing on the generic placement of this species.

MALE.— Length 1.2–1.4 mm, 2.5 times as long as wide; color dark reddish brown.

Frons convex, with a feeble impression just above epistoma; surface rather coarsely rugose above, more finely below, with a small, median, smooth area on lower third; vestiture short, sparse. Scape elongate, with fewer than a dozen setae; club broadly oval, unmarked by any indication of sutures.

Pronotum 1.0 times as long as wide; widest two-fifths pronotum length from base, sides weakly arcuate, moderately constricted a fourth of pronotum length behind broadly rounded anterior margin; anterior margin armed by four minute teeth; summit at middle, moderately high; anterior slope armed by many small asperities; posterior areas rather coarsely reticulate, with moderately abundant, fine, isolated granules behind summit; vestiture of stout, hairlike setae.

Elytra 1.5 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind except for very short, sutural mucro; striae not impressed, punctures fine, distinct; interstriae minutely subrugose, wider than striae, punctures small, obscure, becoming granulate toward declivity. Declivity convex, very steep; strial punctures larger than on disc but very obscure; interstrial punctures replaced by rather large rounded granules. Vestiture consisting of very fine, moderately long strial hair and rows of erect interstrial scales; scales slightly shorter and more slender on disc; each scale on declivity spaced within and between rows by distances equal to length of scale, each scale about four times as long as wide. Apex with a very short mucro.

FEMALE.— Similar to male except 2.6 times as long as wide; frons less strongly convex, less coarsely rugose, with median fovea near center; anterior margin of pronotum unarmed; elytral scales more slender, at least six times as long as wide on declivity.

DISTRIBUTION.— Honduras.

HONDURAS: La Lima, Cortez, 5-V-64, 70 m, No. 572, S. L. Wood.

BIOLOGY.— Specimens were taken from tunnels in the xylem of stems 1 cm in diameter from a shrubby, woody vine.

NOTES.— The above treatment was based on the type series of 46 specimens.

### 32. *Pseudothysanoes cuspidis* Wood

*Pseudothysanoes cuspidis* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):22 (Holotype, female; 10 km NE Teziutlán, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is allied to *subulatus* Wood and *spicatus* Wood, but it may be distinguished by the smaller size, by the flattened and grooved female frons, by the coarser punctures on the elytral declivity, and by the slender, rather long elytral setae.

FEMALE.— Length 1.2–1.4 mm, 2.7 times as long as wide; color very dark brown.

Frons transversely flattened, longitudinally concave from epistoma to upper level of eyes, median line narrowly sulcate from level of antennal insertion to upper level of eyes; surface smooth and shining on epistomal area, then finely substrigose, becoming more coarsely reticulate-granulate above eyes; vestiture sparse, fine, inconspicuous. Antennal scape elongate; club moderately large, sutures very obscure.

Pronotum 1.0 times as long as wide; sides feebly arcute, subparallel on basal half, distinctly constricted on anterior half, broadly rounded in front; summit at middle, moderately high; sparsely asperate on anterior slope; finely rugose-reticulate behind, a few minute granules. Vestiture of sparse hair.

Elytra 1.8 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on more than basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures small, shallow; interstriae not smooth, less than twice as wide as striae, punctures fine, obscured by surface sculpture. Declivity convex, steep; interstriae uniseriately, finely granulate. Vestiture of rows of very fine strial hair and rows of slightly longer, coarser, interstrial setae, not at all scalelike; interstrial setae about as long as distance between rows. Last visible sternum narrowly produced to form a mucronate process.

DISTRIBUTION.— Puebla.

MEXICO: Puebla: 10 km NE Tezintlán, 2-VII-67, 1600 m, No. 144, S. L. Wood.

BIOLOGY.— Specimens were taken from the cambium region of a tree branch 3 cm in diameter. The biramous parental tunnels paralleled the grain of the wood. The species is bigamous. Females pack the egg tunnels with frass as they progress; males evidently leave the nuptial chamber soon after the females begin the egg galleries. A sample of the host tree has not yet been identified.

NOTES.— The above treatment was based on the type series of 14 female specimens.

### 33. *Pseudothysanoes subulatus* (Wood)

*Cryptulocleptus subulatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):34 (Holotype, male; Volcán Pacaya, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species, *cuspidis* Wood, and *spicatus* Wood form a unique group in the genus in which the last visible tergum of the male and the last visible sternum of the female form a mucro that projects beyond the elytral apex. This species is distinguished from the closely related *spicatus* as indicated in the above key.

MALE.— Length 1.3–1.7 mm, 2.3 times as long as wide; color very dark brown to black, pronotal summit reddish brown.

Frons and pronotum as in *spicatus* except part of pronotal vestiture stout.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; outline as in *spicatus*; striae not impressed, punctures rather large, deep, sharply impressed; interstriae almost smooth, shining, one and one-half times as wide as striae, uniseriate punctures finely granulate. Declivity steep, convex; striae very feebly impressed, punctures more obscure. Vestiture consisting of short, fine strial hair (some flattened on declivity), and rows of longer, interstrial scales; each scale slightly more than half as long as distance between rows, separated within rows by distances equal to length of scale, each about twice as long as wide. Tergal mucro about as in *spicatus*.

FEMALE.— Similar to male except 2.6 times as long as wide; frons rather deeply concave on median three-fourths from epistoma to vertex, a small, smooth, median area on lower half, most females ornamented by a small, sparse tuft of hair at upper margin of concavity; anterior margin of pronotum unarmed; strial punctures not as deep, perhaps smaller, interstrial scales very slightly longer and more slender, each scale about four times as long as wide; tergal mucro replaced by sternal mucro as in *spicatus*.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán Pacaya, 1-VI-64, 1300 m, No. 700, Caldo de Frijol, S. L. Wood.

HOST.— Possibly *Eschweilera* sp.

BIOLOGY.— Specimens were taken from the phloem of branches less than 8 cm in diameter of a recently cut tree known locally as Caldo de Frijol.

NOTES.— The above treatment was based on the type series of 59 specimens.

### 34. *Pseudothysanoes spicatus* (Wood)

*Cryptulocleptus spicatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):33 (Holotype, male; Cerro Punta, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *subulatus* by characters summarized in the above key.

MALE.— Length 1.5–1.8 mm, 2.4 times as long as wide; color dark brown, summit of pronotum reddish brown.

Frons convex above, becoming more nearly flattened on lower third; surface rugose-reticulate and obscurely punctured; an indefinite, median, subfoveate impression just below upper level of eyes; vestiture fine, short, inconspicuous, except long and conspicuous along epistomal margin. Scape elongate.

Pronotum 0.90 times as long as wide; widest a third of pronotum length from base, sides arcuate, a weak constriction on anterior third, rather broadly rounded in front; anterior margin armed by about eight small teeth; summit just behind middle, moderately high; asperities on anterior slope rather large; posterior area rugose-reticulate, a few fine granules behind summit. Vestiture hairlike.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures very small, obscure; interstriae almost twice as wide as striae, very finely rugose, punctures very fine, their anterior margins very finely granulate. Declivity convex, steep; sculpture essentially as on disc. Vestiture consisting of fine, moderately long strial hair and rows of slightly longer interstrial bristles; each bristle about two-thirds as long as distance separating rows, separated within rows by distances equal to length of bristle, bristles becoming scalelike on declivity, each scale there at least three times as long as wide. Last visible tergum narrowly produced into a mucrolike process that projects beyond elytral apex.

FEMALE.— Similar to male except 2.6 times as long as wide; frons shallowly concave to vertex, lower, median half smooth, shining, and ascending toward epistomal margin; anterior margin of pronotum unarmed; interstrial setae on disc fine, hairlike, bristlelike on declivity; mucro formed by last visible sternum; last tergum rounded on posterior margin.

DISTRIBUTION.— Panama.

PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, No. 382, S. L. Wood.

BIOLOGY.— Specimens were taken from tunnels in the cambium region of a log 1 m in diameter. The galleries tended to be longitudinal.

NOTES.— The above treatment was based on the type series of 50 specimens.

### 35. *Pseudothysanoes plumalis* Wood

*Pseudothysanoes plumalis* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):29 (Holotype, male; 18 km N Huajuapan, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *coracinus* Wood by characters summarized in the above key.

MALE.— Length 1.4–1.7 mm, 2.4 times as long as wide; color dark brown.

Frons shallowly concave almost to upper level of eyes, convex above; surface rugose-reticulate, with a few fine granules in convex area; vestiture sparse, inconspicuous. Scape with fewer than a dozen setae.

Pronotum 0.91 times as long as wide; outline as in *verdicus*; posterior area reticulate, very fine punctures obscure; vestiture of fine and stout hairlike setae.

Elytra 1.4 times as long as wide, 1.65 times as long as pronotum; sides straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures rather coarse, deep; interstriae narrower than striae, almost smooth, punctures very fine, uniseriate. Declivity largely confined to posterior third, convex, steep; strial punctures greatly reduced, interstrial punctures very finely granulate. Vestiture consisting of rows of small, erect, interstrial scales of about equal size on disc and declivity; each scale about three times as long as wide, about one-half as long as distance between rows of scales, spaced within rows by distances equal to about three times length of a scale.

FEMALE.— Similar to male except frons more broadly, somewhat more deeply concave; scape bearing a large, dense tuft of long, yellow hair; pronotum armed by two teeth on anterior margin; declivity slightly

shorter and steeper; declivital interstrial granules obsolete.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 18 km N Huajuapan, 15-VI-67, 2000 m, No. 43, *Psittacanthus*, S. L. Wood.

BIOLOGY.— Specimens of this species were taken from phloem tissues of the above-named mistletoe.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 36. *Pseudothysanoes coracinus* Wood

*Pseudothysanoes coracinus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):29 (Holotype, male; 34 km N Juchitlán, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— The male of this species is distinguished from *hopkinsi* Blackman by the more nearly flattened frons, by the more weakly impressed strial punctures, and by the much broader interstrial scales.

MALE.— Length 1.2–1.3 mm, 2.2 times as long as wide; color almost black, pronotal summit reddish.

Frons convex above, weakly, transversely impressed just above epistoma, with a narrow impression extending dorsad to center of frons; surface rugose-reticulate; vestiture sparse, consisting of coarse, subplumose setae of moderate length.

Pronotum 0.84 times as long as wide; widest a third of pronotum length from base, sides rather strongly arcuate on basal two-thirds, then weakly constricted before rather broadly rounded anterior margin; anterior margin armed by four broad, low teeth; summit high, behind middle; posterior area reticulate, punctures sparse, minute, obscure; vestiture of stout and slender, short, hairlike setae.

Elytra 1.3 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on slightly more than basal half, rather narrowly rounded behind; striae not impressed, punctures rather small, distinct but not deep; interstriae about as wide as striae, punctures uniseriate, finely granulate. Declivity on slightly less than posterior half, convex, rather steep; as on disc except strial punctures slightly smaller, interstrial granules very slightly higher. Vestiture consisting of minute, fine, strial hair and rows of erect interstrial scales; each scale about twice as long as wide; not longer on declivity.

DISTRIBUTION.— Jalisco.

MEXICO: Jalisco: 34 km N Juchitlán, 3-VII-65, 1300 m, No. 182a, S. L. Wood.

BIOLOGY.— Specimens were taken from the cambium region in twigs of an unidentified tree.

NOTES.— The above treatment was based on the type series of four male specimens.

### 37. *Pseudothysanoes tenellus* Wood

*Pseudothysanoes tenellus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):23 (Holotype, male; 33 km W Morelia, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *hopkinsi* Blackman by the very elongate interstrial scales on the male declivity and by the flattened frons with a feeble central impression in both sexes.

MALE.— Length 1.3–1.6 mm, 2.4 times as long as wide; color almost black.

Frons almost flat from transverse impression just above epistoma to upper level of eyes, convex above, a small median impression at upper level of eyes; smooth and shining near median line, becoming rugose-reticulate in lateral areas, rugose-punctate above eyes; vestiture of sparse, coarse setae. Scape elongate, slender; club longer than scape, broadly oval, two sutures clearly marked, rather strongly procurved.

Pronotum 1.0 times as long as wide; widest at base, sides strongly arcuate, very strongly constricted on anterior half, rather narrowly rounded in front; anterior margin armed by six coarse teeth; summit behind middle, asperate on anterior slope; reticulate-granulate in posterior area, with sparse, fine, obscure punctures, a few granules behind summit. Vestiture of sparse, short, stout setae.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, obtusely angulate behind; striae not impressed, punctures moderately large, deep; interstriae slightly wider than striae, almost smooth, uniseriately, coarsely granulate on posterior third, punctures feebly to not at all granulate to base. Declivity broadly convex, rather steep; striae weakly impressed on upper two-

thirds, punctures smaller; uniseriate interstrial granules rather coarse at base, decreasing in size posteriorly on upper two-thirds, almost obsolete below. Vestiture consisting of rows of interstrial scales, short on disc, each about three times as long as wide, increasing in length toward declivity, very long and delicate on declivity, some about four times as long as distance between rows.

FEMALE.— Similar to male except frons more extensively flattened, more finely sculptured; pronotum similarly, almost equally armed; interstrial granules slightly smaller; declivital scales little longer than those on disc, each about three times as long as wide, those on interstriae 1 and 2 smaller.

DISTRIBUTION.— Michoacán.

MEXICO: **Michoacán**: 33 km W Morelia, 16-VI-65, 2300 m, No. 64, *Phoradendron*, S. L. Wood; Patzcuaro km 32, 31-X-80, S-130, *Psittacanthus*, T. H. Atkinson.

BIOLOGY.— Specimens were taken from phloem tissues in dying branches of mistletoe.

NOTES.— The above treatment was based on the type series of 19 specimens and on 5 other specimens.

### 38. *Pseudothysanoes yuccavorus* Wood

*Pseudothysanoes yuccavorus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):23 (Holotype, male; 15 km W Durango, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *hopkinsi* Blackman by the flattened frons with the absence of a central fovea, by the smaller, more slender antennal club, and by the shorter, stouter interstrial scales.

MALE.— Length 1.1–1.3 mm, 2.2 (female 2.5) times as long as wide; color black.

Frons weakly convex, almost flat to upper level of eyes, a weak transverse impression just above epistoma; epistoma shining, remaining area rather coarsely reticulate-granulate, punctures fine, obscure; vestiture of sparse, short, coarse setae. Antennal scape elongate, slender; club small, 1.6 (female 1.8) times as long as wide, sutures very obscure, weakly procurved.

Pronotum 0.92 times as long as wide; subtriangular, widest at base, sides weakly arcuate, converging toward narrowly rounded anterior margin; anterior margin armed by four coarse teeth; summit high, narrow; anterior area coarsely asperate; posterior area rugulose, a few fine granules behind summit; vestiture of sparse, coarse setae of moderate length.

Elytra 1.3 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on slightly more than basal two-thirds, rather broadly rounded behind; striae not impressed, punctures small, moderately deep; interstriae twice as wide as striae, almost smooth, uniseriately, rather coarsely granulate. Declivity rather steep, convex; as on disc. Vestiture consisting of minute, fine strial hair, and erect, interstrial scales; each scale three times as long as wide, separated between rows and within a row by distances slightly greater than length of a scale.

FEMALE.— Similar to male except body form more slender; antennal club longer; anterior margin of pronotum more broadly rounded, unarmed; interstrial granules almost obsolete on disc; interstrial scales slightly longer, very slender, each eight or more times as long as wide.

DISTRIBUTION.— Durango.

MEXICO: **Durango**: 15 km W Durango, 4-VI-65, 1300 m, No. 1, *Yucca* leaves, S. L. Wood.

BIOLOGY.— Specimens were taken from dying leaves of a large, healthy, branching *Yucca*. The parental galleries apparently were biramous and transverse.

NOTES.— The above treatment was based on the type series of 47 specimens.

### 39. *Pseudothysanoes hopkinsi* Blackman

*Psudothysanoes hopkinsi* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Bull. 25:200 (Holotype, male; Piru Ck., Ventura Co., California; U.S. Nat. Mus., 27140)

DIAGNOSIS.— This species is distinguished from *yuccavorus* Wood and *rigidus* (LeConte) by characters summarized in the above key.

MALE.— Length 1.3–1.5 mm, 2.3 (female 2.5) times as long as wide; color black.

Frons flattened to very shallowly concave, with a very large, deep, central fovea; otherwise as in *yuccavorus*. Antennal club 1.3 times as long as wide. Pronotum essentially as in *yuccavorus* except posterior area more brightly shining, less coarsely rugulose, with punctures clearly evident.

Elytra as in *yuccavorus* except strial punctures larger, interstriae as wide as striae;

interstrial scales each about four to six times as long as wide, spaced between rows and within rows by distances slightly less than length of a scale.

FEMALE.— Similar to male except body more slender; frons narrowly, deeply concave on lower half; teeth on anterior margin of pronotum reduced in size and number.

DISTRIBUTION.— S California.

USA: **California**: Big Pines Pk., Los Angeles Co., 18-IV-40, *Fremontia californica*; 3 km (2 miles) E California Hot Springs, XII-68, 18-IV-40, *F. californica*, H. B. Leech; Piru Ck., Ventura Co., 4-VI-04, Hopk. US 2782, *Salix*; San Bernardino Co.; Sequoia N.P., 19-IV-34, Hopk. US 21069, *Fremontia*; Tejon Pass near Lebec, Ventura Co., 4000 ft, *Fremontia*.

HOST.— *Fremontia californica*.

BIOLOGY.— Except for host preference nothing on the habits of this species has been reported.

NOTES.— The above treatment was based on the holotype and on 125 other specimens.

### 40. *Pseudothysanoes rigidus* (LeConte)

Fig. 143

*Cryphalus rigidus* LeConte, 1876, Proc. Amer. Philos. Soc. 15:362 (Lectotype, male; Canada; Mus. Comp. Zool., 1031 present designation)

*Pseudothysanoes drakei* Blackman, 1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:48 (Lectotype, male; Syracuse, New York; U.S. Nat. Mus., 24746, present designation); Wood, 1957, Canadian Ent. 89:402. *Synonymy*

DIAGNOSIS.— This species is distinguished from *hopkinsi* Blackman by characters summarized in the above key.

MALE.— Length 1.3–1.6 mm, 2.2 (female 2.4) times as long as wide; color very dark brown, almost black, pronotal summit reddish brown.

Frons as in *hopkinsi*. Pronotum about as in *hopkinsi* except anterior area broader, posterior area more finely sculptured, subreticulate, punctures very fine.

Elytra 1.4 times as long as wide, 1.6 times as long as pronotum; striae not impressed, punctures small, distinct; interstriae wider than striae, smooth, punctures fine, uniseriate, not at all granulate. Declivity convex, moderately steep; striae very feebly impressed; interstriae weakly convex, punctures not granulate. Vestiture of fine, short, strial hair, and interstrial rows of erect scales; each scale on declivity about four times as long as wide, slightly longer than distance between scales between rows or within a row.

FEMALE.— Similar to male except more slender; frons shallowly, broadly concave from epistoma to upper level of eyes, deeply, narrowly impressed at center of lower half; anterior margin of pronotum unarmed; elytral scales very slightly shorter; interstrial punctures on disc and declivity feebly granulate.

DISTRIBUTION.— Ontario to Kansas and Pennsylvania.

CANADA: "Canada" (presumably southern Ontario), G. H. Horn. USA: **Kansas**: Lawrence, 5, 7-IX-50, *Tilia americana*, S. L. Wood. **Michigan**: Detroit, VI, Hopk. W.Va. 7599c, Hubbard and Schwarz. **New York**: Syracuse, 6-X-20, basswood, C. J. Drake. **Ohio**: Deshler, Hopk. US 2301, *Tilia*, A. D. Hopkins. **Pennsylvania**: Clark's Valley, 20-III, *Tilia americana*, J. N. Knull; Dauphin, 10-I, J. N. Knull.

HOST.— *Tilia americana*.

BIOLOGY.— Hundreds of specimens were reared from recently cut branches about 3–8 cm in diameter at Lawrence, Kansas. Parental galleries were biramous and transverse. Larval mines tended to follow the grain of the wood, but were entirely within the bark.

NOTES.— The above treatment was based on the three syntypes of *rigidus*, on 15 paratypes of *drakei*, and on 263 other specimens.

Because a lectotype has not formally been designated, I here designate the first specimen in the LeConte series, a male, previously regarded as the type and bearing the label Type 1031, as the lectotype of *Cryphalus rigidus* LeConte. Although Blackman's description of *drakei* was based almost exclusively on a particular male, he indicates his species was based on a (syntypic) series of 59 specimens. Because of the ambiguity and to avoid future problems, I here designate the male in the U.S. National Museum from Blackman's series that has been labeled as the holotype, and recognized as such by all who have dealt with this species, as the lectotype of *Pseudothysanoes drakei* Blackman.

### 41. *Pseudothysanoes arbuti* (Wood)

*Cryptulocleptus arbuti* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):30 (Holotype, male; 13 km W Texmelucan, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *caritus* Wood by characters summarized in the above key.

MALE.— Length 1.0–1.3 mm, 2.7 times as long as wide; color very dark brown.

Frons convex above, narrowly, rather strongly, transversely impressed just above epistoma, impression extending slightly dorsad at center; vestiture confined to epistomal margin. Scape twice as long as pedicel, bearing about six setae; club oval, very slightly longer than wide.

Pronotum 0.94 times as long as wide; essentially as in *quercinus* except posterior area minutely rugose-reticulate, most of punctures minutely granulate.

Elytra 1.7 times as long as wide, 1.8 times as long as pronotum; outline about as in *quercinus*; striae not impressed, punctures rather coarse, close, not sharply impressed; interstriae as wide as striae, minutely irregular, punctures very fine, uniseriate. Declivity steep, convex; strial punctures slightly reduced in size, interstrial punctures minutely granulate. Vestiture consisting of very fine, moderately long strial hair and slightly longer, erect interstrial scales; each scale slender, equal in length to distance between rows, slightly closer within each row, each at least eight times as long as wide.

FEMALE.— Similar to male except 3.0 times as long as wide; upper frons bearing rather abundant short, stout setae; scape bearing about a dozen setae; anterior margin of pronotum unarmed; elytral scales a little more slender.

DISTRIBUTION.— Puebla.

MEXICO: Puebla: 13 km W Texmelucan, 13-VI-67, 2600 m, No. 27, *Arbutus*, S. L. Wood.

BIOLOGY.— Specimens were taken from small twigs.

NOTES.— The above treatment was based on the type series of 36 specimens.

### 42. *Pseudothysanoes caritus* (Wood)

*Cryptulocleptus caritus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):30 (Holotype, male; Cerro Punta, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *arbuti* Wood by the less strongly convex frons that lacks a transverse impression, by the smaller, less abundant, pronotal asperities, and by the very different pronotal and elytral vestiture.

MALE.— Length 1.2–1.3 mm, 2.7 times as long as wide; color dark brown.

Frons convex to epistomal margin, a moderately large fovea just below center; surface reticulate in marginal areas, smooth and shining on middle half, with a few scattered, small, punctures; vestiture inconspicuous. Scape elongate; club small, oval.

Pronotum 1.0 times as long as wide; widest near base, sides very weakly arcuate, converging slightly to shallow constriction one-third pronotum length from rather narrowly rounded anterior margin; anterior margin armed by four moderately large teeth; summit at middle, moderately high; anterior slope with fine asperities; posterior area minutely rugose, minute punctures obscure; vestiture slender, hairlike in both asperate and posterior areas.

Elytra 1.7 times as long as wide, 1.8 times as long as pronotum; outline as in *quercinus*; striae not impressed, punctures fine; interstriae as wide as striae, with abundant, very minute points, punctures very fine, obscure. Declivity steep, convex, as on disc except interstrial punctures finely granulate. Vestiture consisting of very fine long, strial hair and erect interstrial setae; each interstrial seta on disc stout, hairlike, one and one-half times as long as strial hair, slightly longer than distance between rows, more closely spaced within each row; interstrial setae becoming scalelike on declivity and very slightly longer, each scale at least six times as long as wide.

FEMALE.— Similar to male except 2.9 times as long as wide; frons very weakly, transversely impressed just above epistomal margin; anterior margin of pronotum unarmed; interstrial granules on declivity very minute; interstrial setae on declivity stout but essentially hairlike.

DISTRIBUTION.— Panama.

PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, No. 411, S. L. Wood.

BIOLOGY.— This species was taken from phloem tissues in broken branches of an unidentified tree.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 43. *Pseudothysanoes crassinus* Wood

*Pseudothysanoes crassinus* Wood, 1969, Brigham Young Sci. Bull., Biol. Ser. 10(2):29 (Holotype, male; 24 km W Tehuantepec, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is allied to *frondicolens* Wood, but it may be distinguished by characters mentioned in the above key.

MALE.— Length 0.8–1.0 mm (female 1.0–1.2 mm), 2.0 (female 2.4) times as long as wide; color black.

Frons and pronotum as in *coracinus* Wood except teeth on anterior margin of pronotum more slender, summit higher and wider, and posterior areas obscurely reticulate.

Elytra 1.1 times as long as wide, 1.25 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; striae not impressed, punctures obsolete; interstriae each with a uniseriate row of large tubercles, increasing in size toward declivity. Declivity beginning at middle, rather steep, convex; a few minute strial punctures obscurely indicated; interstrial granules greatly reduced on upper half, obsolete on lower half and replaced by very minute, obscure punctures. Vestiture consisting of fine, moderately long, suberect, strial hair and interstrial rows of longer, erect scales; each scale about four times as long as wide on disc, six times as long as wide on declivity; each scale as long as distance between rows on disc, slightly longer on declivity, spaced within rows by a slightly greater distance.

FEMALE.— Similar to male except larger; 2.4 times as long as wide; frontal impression very slightly larger; anterior margin of pronotum unarmed; strial punctures obscurely visible; interstrial granules obsolete; declivity confined to posterior third of elytra, more narrowly convex; interstrial scales slender, at least eight times as long as wide.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 24 km W Tehuantepec, 22-VI-67, 70 m, No. 35, S. L. Wood.

BIOLOGY.— Specimens were taken from the cambium region of the bole of a small, dying, thornless leguminous tree having bipinnately compound leaves.

NOTES.— The above treatment was based on the type series of 65 specimens.

### 44. *Pseudothysanoes frondicolens* Wood

*Pseudothysanoes frondicolens* Wood, 1971, Great Basin Nat. 31:73 (Holotype, male; Herb Martyr Campground, Chiricahua Mts., Arizona; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *crassinus* Wood by the absence of interstrial granules in the male, by the impressed female frons, by the finer pronotal sculpture, and by the less abundant elytral vestiture.

MALE.— Length 0.8–1.0 mm (female 1.0–1.2 mm), 2.1 (female 2.3) times as long as wide; color rather dark brown.

Frons flattened on lower third, convex above, with a conspicuously impressed median fovea; surface rather obscurely reticulate-granulate below, coarser above; vestiture of sparse, coarse hair. Antennal scape long, slender; club small, oval, sutures not indicated.

Pronotum 0.90 times as long as wide; subtriangular, widest near base, sides arcuately converging to narrowly rounded anterior margin, armed by two coarse, median teeth (four teeth present in some specimens); summit slightly behind middle, rather high and narrow; anterior slope rather coarsely asperate; posterior area very finely sculptured, almost smooth, sparse minute punctures. Vestiture sparse, short, rather fine.

Elytra 1.3 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; surface usually covered by an incrustation; striae not impressed, punctures moderately coarse, rather shallow, not close; interstriae as wide as striae, evidently smooth, punctures fine, not at all granulate. Declivity occupying slightly more than posterior third, very broadly convex, rather steep; strial punctures larger than on disc; interstriae not at all granulate; somewhat flattened between interstriae 3, with suture feebly elevated on upper half. Vestiture of rows of fine, short strial hair, and rows of longer, erect interstrial scales; scales sparse, widely, irregularly spaced, each about four times as long as wide, curved toward elytral apex on apical part; declivital interstriae 3 usually devoid of scales, 1 often with only one, 3 and 4 each with about three to five scales.

FEMALE.— Similar to male except body form more slender; frons irregularly concave on rather narrow triangular area from epistoma to vertex; anterior margin of pronotum armed as in male; strial punctures finer; elytral scales more slender, each about six

times as long as wide, sparse but more regularly placed.

DISTRIBUTION.— S Arizona.

USA: Arizona: Herb Martyr Campground, Chiricahua Mts., 7-VII-69, 1900 m, No. 75, *Yucca*, S. L. Wood.

BIOLOGY.— This species breeds in the dying lower leaves of living plants about 2–3 m in height. The parental galleries were in the form of a transverse "H," apparently with two short egg tunnels formed by each of two females. The straight larval mines were constructed longitudinally between the fibers.

NOTES.— The above treatment was based on the type series of 156 specimens.

### 45. *Pseudothysanoes contrarius* Wood

*Pseudothysanoes contrarius* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):14 (Holotype, male; Lagos de Colores, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *bartoni* Bruck by the more slender, recurved spines on the male declivital interstriae 2, 3, 5, and 7, by the coarser strial punctures, by the broader interstrial scales, and by the more broadly rounded anterior margin of the pronotum.

MALE.— Length 1.0–1.2 mm, 2.1 times as long as wide; color black.

Frons convex, a weak transverse impression on lower half, subfoveate at center; surface rugose-reticulate, punctures not evident; vestiture confined to epistomal brush.

Pronotum 0.89 times as long as wide; widest near base, sides moderately arcuate, converging toward rather broadly rounded anterior margin; anterior margin armed by 10 small denticles. Vestiture of sparse, short, stout bristles, a few small scales in lateral area.

Elytra 1.3 times as long as wide; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures coarse, deep; interstriae as wide as striae, smooth, shining, with uniseriate rows of small granules. Declivity convex, gradual, beginning at middle of elytra; strial punctures gradually reduced in size until minute near apex; granules on interstriae 1 smaller than on disc, obsolete on 2 except one or two near base enlarged into slender, sharply pointed, recurved spines, 3 with seven to nine similar spines, 5 with three, and 7 with about five spines; spines on 3 slightly recurved, longest spines equal in length to width of an interstriae, slightly shorter than interstrial scales. Vestiture of rows of minute, fine, interstrial hair, and rows of erect, interstrial scales; each scale about two-thirds as long as distance between rows, about three to four times as long as wide, those arising from posterior surface of spines often slightly larger.

DISTRIBUTION.— Chiapas.

MEXICO: Chiapas: Lagos de Colores, 14-VI-69, *Acacia*, D. E. Bright.

NOTES.— The above treatment was based on the type series of four specimens.

### 46. *Pseudothysanoes bartoni* Bruck

*Pseudothysanoes bartoni* Bruck, 1936, Bull. S. California Acad. Sci. 35:32 (Holotype, male; Saddle Peak, Santa Monica Mts., California; Ohio State Univ. Coll.)

DIAGNOSIS.— This species, *contrarius* Wood, and *multispinatus* Wood are the only species in the genus in which male declivital interstriae 3 and 5 are armed by long, slender, sharply pointed spines. This species is distinguished from *contrarius* and *multispinatus* by characters summarized in the above key.

MALE.— Length 1.2–1.4 mm, 2.3 times as long as wide; color black.

Frons convex, rather weakly, transversely impressed above epistoma; surface almost smooth below impression, rather coarsely granulate-punctate above; vestiture of moderately abundant, coarse setae of moderate length. Antennal scape slender, elongate; club moderately large, oval, sutures obscurely indicated.

Pronotum 0.95 times as long as wide; subtriangular, widest at base, sides arcuately converging toward very narrowly rounded anterior margin; anterior margin armed by four teeth, median pair longer; summit at middle; anterior slope asperate; posterior area shining, finely punctured, surface irregular but not rugulose. Vestiture rather sparse, short, stout.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures rather small, deep; interstriae as wide as

striae, almost smooth, punctures fine, becoming granulate near declivity. Declivity confined to posterior third, convex, rather steep; about as on disc except interstrial granules very fine, interstriae 3 armed by two moderately large, slender, pointed spines, one at declivital base, othre spine two-fifths declivital length from base; interstriae 5 and 7 each with one similar spine just below declivital base. Vestiture of rows of short, fine, strial hair, and rows of interstrial scales; each scale rather slender, six or more times as long as wide at base of declivity, slightly shorter on disc and declivity.

FEMALE.— Similar to male except more slender; frons more broadly flattened, with a deep, shining, oval concavity on median third at and just above level of antennal insertion; pronotum more broadly rounded in front, anterior margin usually unarmed; elytral declivity devoid of spines.

DISTRIBUTION.— S California.

USA: **California**: Saddle Peak, Santa Monica Mts., 16-XII-33, *Malvastrum thurberi*, C. R. Bruck; Westwood Hills, Los Angeles Co., 26-II-35, 25-VI-39, 1,6-IX-40, *Malvastrum*, A. T. McClay.

HOST.— *Sphaeralcea fasciculata.*

BIOLOGY.— Unknown except for the host association.

NOTES.— The above treatment was based on the holotype, allotype, 22 paratypes, and 37 other specimens.

### 47. *Pseudothysanoes multispinatus* Wood

Fig. 154

*Pseudothysanoes multispinatus* Wood, 1957, Great Basin Nat. 17:109 (Holotype, male; Gainseville, Florida; U.S. Nat. Mus., 71622)

DIAGNOSIS.— This species is distinguished from *bartoni* Bruck by the discal interstriae being narrower than the striae, with punctures finely granulate, by the spines on the male declivital interstriae 1, 3, and 5, and by the more extensively impressed female frons.

MALE.— Length 1.2–1.4 mm, 2.2 times as long as wide; color dark brown.

Frons somewhat flattened below, with median third on lower half abruptly, deeply concave, epistomal area elevated; surface granulate-punctate above, almost smooth and shining on epistoma and in concavity; vestiture of rather sparse, coarse setae. Antennal scape long, slender; club rather large, oval, sutures obscure.

Pronotum 0.91 times as long as wide; basically as *bartoni* except more broadly rounded in front.

Elytra 1.3 times as long as wide, 1.5 times as long as pronotum; outline as in *bartoni*; striae feebly impressed, punctures coarse, rather deep; interstriae narrower than striae, uniseriately, subcrenulately granulate. Declivity occupying slightly more than posterior third, convex, moderately steep; about as on disc except interstriae 1, 3, and 5 each armed by one to three long slender spines on upper half, those on 3 usually longer. Vestiture consisting of rows of fine, short, strial hair, and rows of erect, interstrial scales; each scale about three times as long as wide at base of declivity, shorter on disc and lower half of declivity, much longer on upper half of declivity.

FEMALE.— Similar to male except frons more broadly impressed exclusive of median excavation on lower half; anterior margin of pronotum usually unarmed; elytral spines absent; interstrial scales of uniform length, each about four times as long as wide.

DISTRIBUTION.— Florida.

USA: **Florida**: Gainesville, 17-I-39, No. 8870, *Tilia cienserrata*, A. N. Tissot; Alahua Co., 21-IV-76, *Tilia*, T. H. Atkinson.

HOST.— *Tilia cienserrata.*

BIOLOGY.— Unknown except for the host association.

NOTES.— The above treatment was based on the type series of 43 specimens.

### 48. *Pseudothysanoes acacicolens* Wood

*Pseudothysanoes acacicolens* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):23 (Holotype, male; Playa del Coco, Guanacaste, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *spinatus* Wood in the male by the much smaller declivital spines and by the unaltered sculpture and vestiture of the elytral declivity, both being essentially continuous with that of the disc. In the female the pronotum is more coarsely reticulate and the elytral declivity more coarsely punctured than in *spinatus*, evidently with very fine granules on interstriae 3.

MALE.— Length 1.0–1.2 mm (female 1.1–1.3 mm), 2.4 times as long as wide; color light brown.

Frons convex above, transversely impressed above epistoma; surface coarsely reticulate; vestiture consisting of scattered, rather short, subplumose hair.

Pronotum 1.0 times as long as wide; subcircular, with a slight constriction on anterior half; anterior margin armed by six irregular teeth; summit at middle, high; coarsely asperate in front; posterior area rather coarsely reticulate, punctures fine, inconspicuous; vestiture rather abundant, consisting of suberect slender scales and shorter hair intermixed.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly, evenly rounded behind; striae not impressed, punctures moderately large, rather deep; interstriae as wide as striae, 1 and to a lesser extent 5 bearing a uniseriate row of moderately large, low tubercles, punctures on other interstriae weakly if at all granulate. Declivity convex, very slightly flattened on upper half; striae as on disc but evidently somewhat narrower; interstriae 2 bearing a slender spine at upper margin of declivity, and a similar spine one-fourth of declivital length from upper margin; spines similar in position and shape to those of *spinatus* but only half as long; interstriae 5 bearing two similar but smaller spines, one just above and one just below level of lower spine on interstriae 2; granules on 2 and 5 not continued below lower spine on each interstriae. Vestiture consisting of fine strial hair and interstrial scales; each scale about four times as long as wide on disc and sides, somewhat shorter on striae 1–3 on lower two-thirds of declivity.

FEMALE.— Similar to male except larger, more slender; frons a little less strongly convex; anterior margin of pronotum unarmed; declivity more strongly convex, unarmed; elytral scales more slender, somewhat shorter and narrower on declivity.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Playa del Coco, Guanacaste, 21-III-63, 10 m, No. 236, *Acacia*, S. L. Wood.

BIOLOGY.— Specimens were taken from the cambium region in the bole and larger limbs of a dying *Acacia* tree (a species having slender thorns).

NOTES.— The above treatment was based on the type series of 68 specimens.

### 49. *Pseudothysanoes spinatus* Wood

Fig. 145

*Pseudothysanoes spinatus* Wood, 1956, Canadian Ent. 88:154 (Holotype, male; 27 km W Tehuantepec, Oaxaca, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This distinctive species is distinguished from *acacicolens* Wood by characters summarized in the above key.

MALE.— Length 0.9–1.1 mm (female 1.1–1.3 mm), 2.4 (female 2.5) times as long as wide; color yellowish brown.

Frons convex, transversely impressed just above epistoma; surface finely granulate, finer toward epistoma; vestiture of sparse, coarse, short setae. Antennal scape long, slender; club moderately small, oval, devoid of sutures.

Pronotum 0.90 times as long as wide; widest near base, sides arcuate, converging very slightly on basal half, rather narrowly rounded in front; anterior margin armed by four teeth; summit at middle, rather high; anterior slope asperate; posterior area shining, obscurely reticulate, finely, sparsely punctured. Vestiture of short, sparse, broad scales on disc, a few short bristles at sides and on asperate area.

Elytra 1.4 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures rather small, deep; interstriae as wide as striae, smooth, punctures minute, granulate near declivity. Declivity occupying posterior half of elytra, gradual, broadly convex; striae about as on disc, interstriae narrower; interstriae 2–6 each with a granule at base of declivity, 2 with one large, slender spine at base of declivity, another just above middle of declivity, length of each spine equal to combined width of interstriae 1 and 2; interstriae 5 and 6 each with one slightly smaller spine at margin of declivity. Vestiture on disc of rows of fine, short strial hair, and rows of erect, interstrial scales; each scale about two to four times as long as wide; scales on declivity very small, if present.

FEMALE.— Similar to male except body more slender; anterior margin of pronotum unarmed; declivity confined to posterior third, more strongly convex, steep, devoid of spines and large granules; elytral scales more uniformly distributed.

DISTRIBUTION.— Oaxaca.

USA: **Oaxaca**: 27 km W Tehuantepec, 8-VII-53, 200 m, and 25 km W Tehuantepec, 22-VI-67, 200 m, No. 85, S. L. Wood.

BIOLOGY.— Specimens were taken from the cambium region in a dying limb 8 cm in diameter of a small, spineless, leguminous tree having bipinnately compound leaves.

NOTES.— The above treatment was based on the male and female paratypes in my collection and on 33 other specimens.

### 50. *Pseudothysanoes costatus* Wood

*Pseudothysanoes costatus* Wood, 1956, Canadian Ent. 88:236 (Holotype, male; Madera Canyon, Santa Rita Mts., Arizona; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species belongs to the *heliura* group of species, but it differs from all other species in the group in having the lateral declivital costa in the male extend only from the elytral apex to interstriae 9. Additional distinguishing characters appear in the above key.

MALE.— Length 1.0–1.2 mm, 2.7 (female 3.0) times as long as wide; color dark brown.

Frons flattened and minutely punctured on lower half, convex and granulate-reticulate above; vestiture of coarse, short setae of moderate abundance on upper area. Antennal scape elongate, slender; club small, oval, sutures obscurely indicated.

Pronotum 0.93 times as long as wide; widest on basal half, sides on basal half arcuate, not converging, distinctly constricted on anterior half, rather broadly rounded in front; anterior margin armed by four subcontiguous teeth, lateral pair submarginal; summit at middle; anterior slope asperate; posterior area almost smooth, punctures minute, sparse. Vestiture on disc consisting of a few erect scales; a few subplumose bristles on anterior area.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures coarse, deep; interstriae less than half as wide as striae, punctures fine. Declivity convex, rather steep; strial punctures greatly reduced in size; interstriae wider, with fine granules; an acutely elevated subcostal margin extends from elytral apex to interstriae 9. Vestiture consisting of rows of fine, short, strial hair, and rows of interstrial bristles; each bristle short, about twice as long as wide, usually entirely abraded on declivity.

FEMALE.— Similar to male except more slender; frons shallowly concave to upper level of eyes, impressed area smooth, shining; anterior margin of pronotum unarmed; strial punctures small, interstriae wider than striae; elytral declivity shorter, steeper, more narrowly convex; declivital interstriae devoid of granules; interstrial scales more generally distributed on declivity.

DISTRIBUTION.— Arizona.

USA: **Arizona**: Madera Canyon, Santa Rita Mts., 16-VII-52, *Quercus*, W. E. La Berge.

BIOLOGY.— Specimens were taken from the bark of oak twigs.

NOTES.— The above treatment was based on the three male and one female paratypes in my collection.

### 51. *Pseudothysanoes vesculus* Wood

*Pseudothysanoes vesculus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):24 (Holotype, male; 3 km W Armeria, Colima, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *heliura* Wood by the smaller size, by the more slender form, by the nonelevated apical margin of the male declivity, and by the excavated female frons that bears a tuft of minute setae toward the vertex.

MALE.— Length 0.9–1.1 mm, 2.4 times as long as wide, color brown.

Frons not visible on only male studied. Antennal scape long; sutures on club largely obsolete.

Pronotum 0.97 times as long as wide; widest near base, sides weakly arcuate, converging slightly before broadly rounded, unarmed anterior margin; summit distinct, asperate on anterior slope, subshining, minutely, obscurely punctured and with obscure lines in posterior area; vestiture with scales and short stout hair intermixed.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides straight, increasing very slightly posteriorly to obliquely truncate declivity; striae not impressed, punctures distinctly impressed; interstriae wider than striae, punctures uniseriate, fine, obscure. Declivity obliquely truncate, face evenly,

weakly convex, an acutely elevated ridge extending from suture at base around margin of declivity about three-fourths distance to sutural apex, obsolete on this final fourth; strial and interstrial punctures equal in size, very close, moderately deep over entire face. Vestiture consisting of rows of interstrial scales and short strial hair; scales on disc about three times as long as wide, increasing slightly in length toward declivity; declivital margin bearing a ring of closely set, much larger, stout scales; scales on declivital face uniform in size, much smaller and more slender than on disc.

FEMALE.— Similar to male except frons shallowly, broadly concave from epistoma to vertex, median third of upper half densely pilose; strial punctures finer; declivity convex, without elevated margin, sculpture essentially as on disc but slightly deeper; vestiture as on disc and somewhat finer.

DISTRIBUTION.— Colima.

MEXICO: Colima: 3 km W Armeria, 28-VI-65, 70 m, No. 136 (not 131), S. L. Wood.

BIOLOGY.— Specimens were taken from a small, cut, thornless tree 8 cm in diameter.

NOTES.— The above treatment was based on the type series of the male holotype and five females.

### 52. *Pseudothysanoes heliura* Wood

*Pseudothysanoes heliura* Wood, 1956, Canadian Ent. 88:237 (Holotype, male; Luling, Texas; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This is the largest known species in the *heliura* species group. It is distinguished from *vesculus* Wood by characters summarized in the above key.

MALE.— Length 1.3–1.5 mm, 2.4 (female 2.6) times as long as wide; color dark brown.

Frons transversely impressed at level of antennal insertion, convex above; surface smooth, shining in central area of lower third, rather coarsely reticulate-granulate in convex area; vestiture sparse, rather short, moderately coarse. Antennal scape slender, elongate; club widest on distal half, sutures obscure.

Pronotum 0.93 times as long as wide; widest on basal third, sides arcuately converging to moderate constriction on anterior half, rather broadly rounded in front; anterior margin armed by about six small teeth; summit at middle, rather high; anterior slope asperate; posterior area coarsely reticulate, with fine, sparse, obscure punctures. Vestiture a mixture of short, fine hair and slender scales in posterior area, a few stout bristles in asperate area.

Elytra 1.5 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal three-fourths, obtusely angulate behind; striae not impressed, punctures small, deep; interstriae about twice as wide as striae, minutely irregular, punctures fine, uniseriate. Declivity margined from elytral apex to declivital base by an elevated circumdeclivital ridge; declivital face rather steep, convex; declivital punctures moderately large, close, deep, confused; declivital face completely unarmed by tubercles or granules; circumdeclivital ridge a costa of almost uniform height except slightly higher toward apex. Vestiture of rows of minute strial hair on disc and rows of erect interstrial scales; scales on declivital margin longer, wider, closely set.

FEMALE.— Similar to male except body more slender; frons more extensively, more deeply impressed almost to upper level of eyes; anterior margin of pronotum unarmed; interstrial punctures on disc finely granulate; circumdeclivital ridge entirely absent; declivital striae as on disc, declivital interstriae with fine punctures; declivital vestiture as on disc but slightly longer, scales each about four times as long as wide, equal in length to distance between rows.

DISTRIBUTION.— Texas.

USA: Texas: Luling, 30-III-51, *Condalia obtusifolia*, S. L. Wood; Brownsville, VI.

HOST.— *Condalia obtusifolia*.

BIOLOGY.— This xylophagous, bigamous species constructed parental and larval gallery systems very similar to *Micracis* in stems about 3 cm in diameter.

NOTES.— The above treatment was based on 18 paratypes and on one other specimen.

### 53. *Pseudothysanoes spinura* Wood

*Pseudothysanoes spinura* Wood, 1959, Great Basin Nat. 19:58 (Holotype, male; Oak Creek Canyon, Arizona; Wood Coll.)

DIAGNOSIS.— This species belongs to the *heliura* group; it is distinguished from

*mancus* Wood by characters summarized in the above key.

MALE.— Length 1.1–1.3 mm, 2.4 (female 3.0) times as long as wide; color dark brown.

Frons and pronotum as in *heliura* except anterior margin of pronotum slightly produced medially and armed by only four teeth; pronotal disc almost smooth, obscurely reticulate, punctures minute.

Elytral disc as in *heliura*, declivity more narrowly convex in central area, more broadly impressed laterally; strial punctures in rows, obscure on 1; declivital interstriae 1 with four to six coarse, very long, pointed bristles, a fine granule at base of each bristle; circumdeclivital ridge not as high on upper third.

FEMALE.— As in female *heliura* except frons more abruptly impressed above epistoma, impression extending as a narrow, median groove to a very deep, foveate impression at upper level of eyes; interstrial punctures fine, not granulate; elytral scales shorter, more widely spaced.

DISTRIBUTION.— Arizona and Chihuahua.

USA: Arizona: Oak Creek Canyon, 20-VIII-58, 30-IX-60, *Ceanothus integerrimus*; Cave Creek, Chiricahua Mts., 7-VI-69, 2300 m, *Ceanothus integerrimus*. MEXICO: Chihuahua: 10 km N Chihuahua, 21-VII-60, (?) *Rhus*; all taken by me.

HOST.— *Ceanothus integerrimus*.

BIOLOGY.— This species was taken from phloem tissues of branches about 2–4 cm in diameter.

NOTES.— The above treatment was based on the type series of 24 specimens and on 46 other specimens.

### 54. *Pseudothysanoes mancus* Wood

*Pseudothysanoes mancus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):24 (Holotype, male; 3 km E Armeria, Colima, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *spinura* Wood in the male by the steeper elytral declivity, with the circumdeclivital elevated costa higher and more acute particularly on the upper half, and, in the female, by the very deeply excavated frons.

MALE.— Length 1.0–1.2 mm, 2.4 (female 2.8) times as long as wide; color dark brown.

Frons as in *spinura* except impression slightly deeper.

Pronotum 0.97 times as long as wide, otherwise as in *spinura*.

Elytra evidently 1.5 times as long as wide, as in *spinura* except declivity slightly steeper, circumdeclivital costa more strongly, subacutely elevated from sutural margin above to sutural margin below; spinelike setae on declivital interstriae 1 six in number and at least as large; vestiture similar.

FEMALE.— As in the female of *spinura* except frons very deeply excavated on median three-fourths from epistoma to vertex, deepest point at upper level of eyes; general surface of elytral declivity more irregular.

DISTRIBUTION.— Colima.

MEXICO: Colima: 3 km E Armeria, 28-VI-65, 70 m, No. 131, S. L. Wood.

BIOLOGY.— Specimens were taken from phloem tissues of a recently cut limb of an unidentified thorn tree.

NOTES.— The above treatment was based on the type series of 36 specimens.

### 55. *Pseudothysanoes yuccae* (Wood)

*Cryptocleptes yuccae* Wood, 1956, Canadian Ent. 88:239 (Holotype, female; Tecamachalco, Puebla, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This and the following nine species form a more or less distinct group within the genus that is exceedingly difficult to classify. In general, characters that distinguish species are found only in the male; the females differ from one another, but by such minute characters their use in a key is impractical.

This species may be distinguished from the closely allied *minulus* Wood by characters summarized in the above key.

MALE.— Length 0.8–1.2 mm, 2.3 (female 2.7) times as long as wide; color very dark brown.

Frons convex, weakly impressed just above epistoma; surface somewhat rugose-reticulate, minute punctures and granules obscure; vestiture of sparse, coarse setae. Antennal scape elongate, slender; club small, oval, devoid of sutures.

Pronotum 0.96 times as long as wide; subcircular in outline; anterior margin armed by four teeth; summit high, at middle, anterior slope coarsely, sparsely asperate; posterior area almost smooth, with a few minute,

obscure punctures. Vestiture of sparse, stout setae.

Elytra 1.4 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures minute; interstriae almost smooth, punctures uniseriate, fine on anterior half, becoming granulate posteriorly. Declivity convex, rather steep, as on posterior part of disc. Vestiture of rows of minute strial hair and rows of erect interstrial scales, each scale about six times as long as wide, as long as distance between rows, spaced within a row by a slightly greater distance.

FEMALE.— Similar to male except more slender; frons somewhat flattened; anterior margin of pronotum unarmed; strial punctures virtually obsolete; interstrial punctures small, obscure, not granulate except minutely on declivity; elytral scales slightly longer, more slender, at least eight times as long as wide.

DISTRIBUTION.— Puebla.

MEXICO: Puebla: Tecamachalco, 2-VII-53, 2100 m, *Yucca*, S. L. Wood; 3 km E Tehuacán, 8-VII-67, 2000 m, No. 176, *Yucca* leaves, S. L. Wood.

HOST.— *Yucca* sp.

BIOLOGY.— Recently dead or dying leaves on a healthy, living plant were selected for attack. Entrance tunnels usually were found on the lower side of the leaf. The irregular larval and adult tunnels mined the tissues between the upper and lower epidermis.

NOTES.— The above treatment was based on 3 paratypes and on 69 other specimens.

### 56. *Pseudothysanoes minulus* (Wood)

*Cryptocleptes minulus* Wood, 1956, Canadian Ent. 88:238 (Holotype, 10 km W Zanatepec, Oaxaca, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species may be distinguished from the closely allied *yuccae* Wood by characters summarized in the above key and in the following description.

MALE.— Length 0.7–1.0 mm, 2.3 (female 2.8) times as long as wide; color very dark brown.

Frons as in *yuccae* except more shining and with a small, narrow, median impression. Pronotum also as in *yuccae* except more brightly shining, vestiture finer.

Elytra as in *yuccae* except interstrial granules very slightly larger and extending to anterior fourth, larger on declivity. Declivital scales three to four times as long as wide, slightly more slender on disc.

FEMALE.— Similar to female of *yuccae* except median fourth of frons sharply, rather shallowly impressed from epistomal area to upper level of eyes, shining; strial punctures minute, as in male; interstrial scales about six times as long as wide.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 11 km NE Tapanatepec, 9-VII-53, S. L. Wood; 10 km W Zanatepec, 9-VII-53, S. L. Wood.

BIOLOGY.— Specimens were taken from phloem tissues of unthrifty twigs of a small, living Malvaceous tree.

NOTES.— The above treatment was based on 10 paratypes.

### 57. *Pseudothysanoes acaciae* (Blackman)

Fig. 144

*Cryptocleptes acaciae* Blackman, 1943, Proc. U.S. Nat. Mus. 93:362 (Holotype, female; Brownsville, Texas; U.S. Nat. Mus., 56413)

DIAGNOSIS.— This species is distinguished from *subpilosus* (Wood) by characters summarized in the above key.

MALE.— Length 0.9–1.1 mm, 2.5 (female 2.7) times as long as wide; color dark reddish brown.

Frons as in *yuccae* (Wood) except more strongly, transversely impressed on lower half; more coarsely granulate above. Antenna and pronotum as in *yuccae* except asperities slightly smaller and more numerous; disc more nearly reticulate-granulate.

Elytra 1.6 times as long as wide; outline as in *yuccae*; striae not impressed, punctures very large, deep; interstriae half as wide as striae, smooth, punctures uniseriate, minute. Declivity rather steep, convex; strial punctures greatly reduced, obsolete on lower third; interstriae wider than striae, punctures minute, uniseriate. Vestiture of rows of minute strial hair and rows of erect interstrial scales; each scale about three to four times as long as wide, spaced within and between rows by distances greater than length of a scale.

FEMALE.— Similar to male except more slender; frons broadly, very shallowly concave to vertex, smooth and shining, a few

minute punctures on upper half, almost glabrous; anterior margin of pronotum unarmed; strial punctures very small, distinct on disc, obsolete on declivity; interstrial scales very slightly more slender.

DISTRIBUTION.— S Texas and Tamaulipas.

USA: Texas: Brownsville, *Acacia berlandieri*, H. S. Barber; Southmost, Cameron Co., 13-VI-53, *Mimosa*, S. L. Wood. MEXICO: Tamaulipas: Antiguo Morelos, 20-VI-53, 500 m, *Mimosa*, S. L. Wood; Llera, 15-VI-53, *Mimosa*, S. L. Wood.

HOST.— *Mimosa* sp.

BIOLOGY.— Specimens were taken from phloem tissues of small branches.

NOTES.— The above treatment was based on 29 specimens.

### 58. *Pseudothysanoes subpilosus* (Wood)

*Cryptocleptes subpilosus* Wood, 1956, Canadian Ent. 88:238 (Holotype, female; 32 km E Tehuantepec, Oaxaca, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *acaciae* Wood by characters summarized in the above key.

MALE.— Length 0.8–1.0 mm, 2.2 (female 2.5) times as long as wide; color dark reddish brown.

Frons as in *yuccae* Wood except very slightly more nearly flattened, finely reticulate-granulate, with a very shallow, narrow, median groove on lower half. Antenna and pronotum as in *acaciae* except anterior margin of pronotum armed by 8 to 10 teeth.

Elytra 1.3 times as long as wide; striae weakly impressed near declivity, punctures rather coarse, very deep; interstriae slightly narrower than striae, shining, fine punctures vulcanate on disc, granules as wide as interstriae, granules normal near declivity. Declivity steep, convex; striae not impressed on lower half, punctures decreasing in size and depth, very small near apex; interstrial granules decreasing in size, obsolete by middle of declivity, distinctly impressed punctures continue to apex. Vestiture of rows of minute strial hair and rows of interstrial scales; each scale about one and one-half times as long as wide, each slightly more than half as long as distance between scales within a row or between rows.

FEMALE.— Similar to male except more slender; frons broadly, shallowly concave to vertex, smooth and shining below, a dense patch of subpilose, coarse, short setae on upper half; anterior margin of pronotum unarmed; striae not impressed, punctures minute, rather shallow; interstriae almost smooth, subreticulate, punctures minute; declivital striae and interstriae as on disc; interstrial scales almost twice as long as wide.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 32 km E Tehuantepec, 8-VII-53, S. L. Wood.

BIOLOGY.— Specimens were taken from phloem tissues of cut branches of what presumably was *Celtis iguanae*.

NOTES.— The above treatment was based on four paratypes.

### 59. *Pseudothysanoes acares* (Wood)

*Cryptulocleptus acares* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):32 (Holotype, male; 30 km SE El Cameron, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is allied to *mirus* (Wood), but it may be distinguished by characters summarized in the above key.

MALE.— Length 1.1–1.2 mm (female 1.3–1.4 mm), 2.2 (female 2.7) times as long as wide; color yellowish brown, elytra darker.

Frons and pronotum as in *mendicus*, except posterior area of pronotum almost smooth and shining.

Elytra 1.3 times as long as wide, 1.5 times as long as pronotum; outline about as in *mendicus*; striae not impressed, punctures rather coarse; interstriae as wide as striae, punctures rather large, uniseriate. Declivity steep, convex; sculpture about as on disc except interstrial punctures closer. Vestiture consisting of minute strial hair and rows of erect interstrial scales; each scale two-thirds as long as distance between rows, similarly spaced within rows; each scale twice as long as wide.

FEMALE.— Similar to female of *mendicus* except 2.7 times as long as wide; frons somewhat more deeply impressed, with a few minute granules in upper third of impression; strial and interstrial punctures closer and more distinct, general surface more irregular; declivity much more coarsely, deeply punctured; interstrial scales much closer, each four to six times as long as wide, very slightly longer.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 30 km SE El Cameron, 21-VI-67, 1000 m, No. 80, S. L. Wood.

BIOLOGY.— Specimens were taken from phloem tissues of small branches of what appeared to be a leguminous tree.

NOTES.— The above treatment was based on the type series of 27 specimens.

### 60. *Pseudothysanoes mirus* (Wood)

*Cryptulocleptus mirus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):32 (Holotype, male; 38 km S Matías Romero, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *acares* Wood by the more deeply impressed upper areas of the female frons, by the more coarsely sculptured posterior areas of the pronotum, and by the much finer declivital punctures.

MALE.— Length 1.0–1.1 mm (female 1.2–1.4 mm), 2.2 (female 2.8) times as long as wide; color yellowish brown.

Frons similar to *acares* but more strongly convex. Pronotum as in *acares* except reticulation in posterior areas tending to be very slightly more rugose.

Elytra 1.3 times as long as wide, 1.4 times as long as pronotum; outline as in *acares*; striae not impressed, punctures rather coarse, more sharply impressed than in *acares*; interstriae irregular but much smoother than in *acares*, as wide as striae, punctures rather small and more widely spaced than in *acares*. Declivity steep, convex; surface smoother, punctures very slightly smaller than on disc. Vestiture as in *acares* except interstrial scales very slightly more widely spaced.

FEMALE.— Similar to female of *acares* except 2.8 times as long as wide; frons more abruptly impressed at upper limits of concavity; posterior areas of pronotum more strongly reticulate; elytral surface less rugose; declivital punctures reduced to very fine strial and interstrial punctures; elytral scales similar, but less abundant.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 38 km S Matías Romero, 24-VI-67, 250 m, No. 92, S. L. Wood.

BIOLOGY.— Specimens were removed from phloem tissues of a shrub having a *Mimosa*-like yellow flower.

NOTES.— The above treatment was based on the type series of 42 specimens.

### 61. *Pseudothysanoes aquilus* (Wood)

*Cryptulocleptus aquilus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):32 (Holotype, male; 26 km E Morelia, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *mendicus* (Wood) by the slightly larger size, by the darker color, by the much more broadly rounded anterior margin of the pronotum, by the much coarser male strial punctures, by the much more coarsely punctured female elytral declivity, and by the more extensive female frontal impression.

MALE.— Length 1.1 mm (female 1.2–1.4 mm), 2.3 (female 2.7) times as long as wide; color dark brown.

Frons and pronotum as in *mendicus* except anterior margin of pronotum much more broadly rounded, bearing eight teeth, and posterior area more clearly punctured.

Elytra 1.4 times as long as wide, 2.1 times as long as pronotum; outline as in *mendicus*; striae not impressed, punctures rather coarse, round, deep, interstriae as wide as striae, almost smooth, punctures minute, uniseriate. Declivity rather steep, convex; strial punctures decreasing rapidly in size, almost obsolete at apex; interstrial punctures minute. Vestiture consisting of fine, minute, strial hair and rows of erect interstrial scales; each scale almost as long as distance between rows, each about four times as long as wide.

FEMALE.— Similar to male except 2.7 times as long as wide; frons shallowly concave from epistoma to vertex, smooth and shining on median half below, not specially ornamented by setae; anterior margin of pronotum unarmed; elytral surface more irregular, strial punctures smaller, but distinct; interstrial punctures minute, mostly obscure; declivity more irregular, more coarsely punctured much as *acares* (Wood); interstrial scales more closely placed.

DISTRIBUTION.— Michoacán.

MEXICO: Michoacán: 26 km E Morelia, 14-VI-65, 2500 m, No. 56, *Acacia*, S. L. Wood.

BIOLOGY.— Specimens were taken from phloem tissues of a recently broken branch of a small tree.

NOTES.— The above treatment was based on the type series of 23 specimens.

### 62. *Pseudothysanoes dislocatus* (Blackman)
Fig. 143

*Cryptocleptes dislocatus* Blackman, 1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:51 (Lectotype, female; Agricultural College, Mississippi; U.S. Nat. Mus., 24742, present designation)

DIAGNOSIS.— This species may be distinguished from *aquilus* (Wood) by characters summarized in the above key.

MALE.— Length 1.0–1.3 mm, 2.4 (female 2.6) times as long as wide; color very dark reddish brown.

Frons convex, somewhat flattened on lower half, with an irregular median impression extending from upper level of eyes to level of antennal insertion, epistomal margin elevated; surface shining, finely reticulate-granulate, a few rather coarse, shallow punctures; vestiture inconspicuous, sparse. Antennal scape elongate, slender; club small, oval, devoid of sutures.

Pronotum 0.91 times as long as wide; widest on basal third, sides rather evenly, convergently arcuate to rather broadly rounded anterior margin; anterior margin armed by four teeth; summit at middle, high; anterior slope coarsely, closely asperate; posterior area shining, subreticulate, a few minute punctures. Vestiture of sparse, short scales and hair.

Elytra 1.5 times as long as wide; sides almost straight and parallel on basal two-thirds, narrowly rounded behind; striae not impressed, punctures rather small, deep; interstriae almost smooth, as wide as striae, punctures very fine, uniseriate. Declivity convex, steep; strial punctures smaller than on disc; interstrial punctures very finely granulate. Vestiture of rows of minute, fine, short strial hair and rows of erect, interstrial scales; each scale about three to four times as long as wide, each slightly shorter than distance between scales within a row or between rows.

FEMALE.— Similar to male except more slender; frons concave on median third to above upper level of eyes; scape ornamented by long hair; anterior margin of pronotum unarmed; strial punctures slightly smaller; interstrial scales slightly shorter.

DISTRIBUTION.— West Virginia to Florida and Louisiana.

USA: **Florida**: Sebring, 20-VI-51, Hickory, S. L. Wood. **Georgia**: Brunswick, 12-VII-51, Hickory, S. L. Wood. **Louisiana**: Covington, 12-VI-51, Hickory, S. L. Wood. **Mississippi**: Agricultural College, 10-IV, 6-22-VI-22; Electric Mills, 12-13-XI-19; Durant, 1-III-20; Maxie, 24-XII-19, 23-V-20, Fort Adams, 30-XII-19; Natchez, 16-III-20, M. W. Blackman. **North Carolina**: Tryon. **South Carolina**: Charleston, 20-XI-04, W. F. Fiske. **West Virginia**: Morgantown, 6-XI-1898.

HOST.— *Carya* spp.

BIOLOGY.— This bigamous species constructs longitudinal, biramous parental galleries in the cambium region of small, recently cut, or dying twigs or branches. Egg galleries are packed with frass as the female progresses; the male usually dies at the entrance hole or in the nuptial chamber. According to Blackman (1922:74) the eggs are not placed in niches, but are packed in frass along the edge of the tunnel. Each female produces 12 to 53 eggs, or an average of 29.6. Larval mines are long and irregular.

NOTES.— The above treatment was based on 159 specimens, including the type series. Blackman neglected to designate a type, although he labeled a female holotype. That female is here designated as the lectotype of *dislocatus* Blackman.

### 63. *Pseudothysanoes perseae* Wood

*Pseudothysanoes perseae* Wood, 1981, Great Basin Nat. 41:125 (Holotype, male; Cerro Chipinque, Monterrey, Nuevo León, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *dislocatus* (Blackman) by the more slender body, by the more distinct strial punctures on the disc, by the longer more slender elytral scales, and by other characters described below.

MALE.— Length 1.0 mm (female 1.2 mm), 2.4 (female 2.7) times as long as wide; color brown.

Frons more broadly, evenly convex than in *dislocatus*, fovea similar. Antenna as in *dislocatus*.

Pronotum as in *dislocatus* except more slender and scales stouter.

Elytra more slender than in *dislocatus*, discal punctures more clearly impressed, declivity steeper, declivital punctures not deeper but more clearly formed, interstrial scales distinctly longer, each six to eight times as long as wide.

FEMALE.— Similar to male except much more slender; frons moderately, concavely impressed to upper level of eyes (stronger and more extensive than in *dislocatus*) and

foveate at center, without setal ornamentation; scape with a tuft of long hair; anterior margin of pronotum unarmed; interstrial setae more slender, each at least eight times as long as wide.

DISTRIBUTION.— Nuevo León.

MEXICO: **Nuevo León**: Cerro Chipinque, Monterrey, 31-I-80, 1350 m, No. S-021, *Persea*, T. H. Atkinson.

NOTES.— The above treatment was based on the type series of five specimens.

### 64. *Pseudothysanoes huachucae* Blackman
Fig. 144

*Pseudothysanoes huachucae* Blackman, 1943, Proc. U.S. Nat. Mus. 93:355 (Holotype, male; Huachuca Mts., Arizona; U.S. Nat. Mus., 56407, presumably lost)

DIAGNOSIS.— This species appears to fit this species group rather well, near *dislocatus* Blackman, except that the antennal club has two well-defined sutures. Refer to the key for other characters that distinguish these species.

MALE.— Length 1.0–1.4 mm, 2.3 (female 2.7) times as long as wide; color very dark brown.

Frons as in *dislocatus* except slightly more extensively impressed. Antennal club elongate-oval, sutures 1 and 2 clearly indicated both by grooves and rows of setae. Pronotum as in *dislocatus* except anterior margin armed by six teeth.

Elytra as in *dislocatus* except declivity not quite as steep or as narrowly convex; declivital striae almost obsolete, strial and interstrial punctures not clearly evident; interstrial scales slightly longer and wider, about four times as long as wide, not present on central part of declivity.

FEMALE.— Similar to male except more slender; frons about as in male but more strongly impressed; anterior margin of pronotum unarmed; strial punctures slightly smaller, not as deep, reduced but present on declivity; interstrial scales slightly shorter and narrower, not absent on central part of declivity.

DISTRIBUTION.— Arizona.

USA: **Arizona**: Miller Canyon, Huachuca Mts., 25-VI-07, H. A. Kaeber; "Palmerlee," 15-VII, H. A. Wenzel.

NOTES.— The above treatment was based on seven paratypes and on my male homotype and a female, both labeled Palmerlee, Arizona. At some time between 1952 and 1961 the holotype was dislodged from its pin and was remounted; between 1961 and 1971 it was again dislodged from its pin and lost. Seven paratypes bearing data identical to that of the type remain in the U.S. National Museum.

### 65. *Pseudothysanoes mendicus* (Wood)

*Cryptulocleptus mendicus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):31 (Holotype, male; 11 km S Colima, Colima, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *pumilus* Wood by the smoother elytral surface, by the much more slender elytral scales, and, in the female, by the less strongly concave frons that is devoid of special setal ornamentation.

MALE.— Length 0.9–1.0 mm (female 1.1–1.3 mm), 2.4 (female 2.9) times as long as wide; color yellowish brown, some specimens darker.

Frons as in *pumilus*; pronotum also as in *pumilus* except six teeth on anterior margin larger, posterior area more finely reticulate.

Elytra 1.4 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, narrowly rounded behind; striae not impressed, fine punctures spaced by two diameters of a puncture; interstriae shining, marked by irregular lines, twice as wide as striae, punctures distinctly smaller than those of striae. Declivity rather steep, convex; essentially as on disc except punctures much smaller. Vestiture consisting of very minute strial hair and rows of erect interstrial scales; each scale three times as long as strial hair, slightly shorter than distance between rows of scales, each about three times as long as wide.

FEMALE.— Similar to male except 2.9 times as long as wide; frons concave on median two-thirds to upper level of eyes, not especially ornamented by setae; scape bearing a small tuft of long hair; anterior margin of pronotum unarmed; elytral punctures much more obscure; elytral scales more slender, each about six times as long as wide.

DISTRIBUTION.— Colima.

MEXICO: **Colima**: 53 km S Colima, 27-VI-65, 700 m, No. 122, S. L. Wood.

BIOLOGY.— Specimens were taken from phloem tissues of a broken branch of a shrubby, leguminous desert tree.

NOTES.— The above treatment was based on the type series of 58 specimens.

### 66. *Pseudothysanoes pumilus* (Wood)

*Cryptulocleptus pumilus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):31 (Holotype, male; 53 km S Colima, Colima, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *mendicus* (Wood) by characters summarized in the above key.

MALE.— Length 0.8–0.9 mm (females 1.0–1.1 mm), 2.3 (female 2.5) times as long as wide; color yellowish brown.

Frons convex, narrowly, transversely impressed just above epistomal margin, more strongly in median area; surface shining, rather coarsely reticulate; vestiture confined to epistomal margin. Antennal club rather narrowly ovate; devoid of sutures.

Pronotum 0.90 times as long as wide; widest a third pronotum length from base, sides evenly arcuate to rather broadly rounded anterior margin; anterior margin armed by four small teeth; summit just behind middle, rather well developed asperities on anterior slope coarse; posterior area shining, minutely rugulose-reticulate, fine punctures obscure; vestiture largely scalelike.

Elytra 1.4 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures very small but distinct; interstriae somewhat irregular, shining, twice as wide as striae, squamiferous punctures equal in size to those of striae but more widely spaced. Declivity rather steep, convex; sculpture as on disc but all punctures very slightly smaller. Vestiture consisting of minute, fine strial hair and rows of erect interstrial scales; each scale twice as long as strial hair, almost as long as distance between rows, about twice as long as wide, strongly tapered toward their bases.

FEMALE.— Similar to male except 2.5 times as long as wide; frons rather deeply concave on median two-thirds to well above eyes, with a row of stout, subplumose setae on upper margin; scape bearing a small tuft of long hair; anterior margin of pronotum unarmed; strial punctures equal in size but less distinct; elytral scales three times as long as wide.

DISTRIBUTION.— Colima.

MEXICO: **Colima**: 53 km S Colima, 27-VI-65, 700 m, No. 122, S. L. Wood.

BIOLOGY.— Specimens were taken from phloem tissues of an unidentified desert shrub.

NOTES.— The above treatment was based on the type series of 58 specimens.

## GENUS *STENOCLEPTUS* BLACKMAN

*Stenocleptus* Blackman, 1943, Proc. U.S. Nat. Mus. 94(3165):356 (Type-species: *Stenocleptus rhois* Blackman = *Pseudothysanoes sulcatus* Bruck, original designation)

DIAGNOSIS.— This genus is closely related to *Pseudothysanoes* Blackman, subgenus *Aphanocleptus* Wood, and eventually may have to be united with that group. It shares many of the *Pseudothysanoes* characters and has the short, somewhat flattened antennal scape and similar antennal club of *Aphanocleptus*, but the elytral declivity is subvertical on the lower two-thirds and rather strongly bisulcate with a rather strong, irregular impression on the lower half.

DESCRIPTION.— Length 1.0–1.5 mm, 2.5 times as long as wide; color brown to black, vestiture pale.

Frons sexually dimorphic, flattened to shallowly concave, impression strongest in female. Antennal scape short, flattened or not, little if any longer than pedicel; funicle 6-segmented; club small, widest near base, with two straight sutures clearly indicated. Pronotum as wide as long; asperate on anterior half; anterior margin unarmed, occasional submarginal serrations present. Elytra usually covered by an incrustation, sculpture on disc conservative; declivity subvertical, bisulcate, not sexually dimorphic.

DISTRIBUTION.— California and Puebla.

BIOLOGY.— The one species taken in the field by me, *ruficollis* Wood, was bigamous and constructed transverse, biramose parental galleries in the cambium region of small branches.

NOTES.— This genus is doubtfully distinct from the subgenus *Aphanocleptus* of *Pseudothysanoes*. In the absence of any intermediacy between these groups in the species presently available for study, *Stenocleptus* is retained as a distinct genus.

Key to the Species of *Stenocleptus*

1. Elytral vestiture consisting of rather coarse, pointed bristles; antennal scape longer than wide, feebly if at all flattened; female frons flat; mature color of pronotum black; S California; *Ceanothus* and *Rhus*; 1.2–1.5 mm ..... 1. ***sulcatus*** **(Bruck)**

– Elytral vestiture of flattened, subtruncate scales; antennal scape flattened in both sexes, very broad in female; female frons moderately concave; mature color of pronotum reddish brown; Puebla; 1.0–1.3 mm ..... 2. ***ruficollis*** **Wood**

### 1. *Stenocleptus sulcatus* (Bruck)

Fig. 147

*Pseudothysanoes sulcatus* Bruck, 1936, Bull. S. California Acad. Sci. 35:33 (Holotype, male; Mt. Wilson, Los Angeles Co., California; Ohio State Univ. Coll.)

*Stenocleptus sulcatus;* Wood, 1956, Canadian Ent. 88:240

*Stenocleptus ceanothi* Blackman, 1943, Proc. U.S. Nat. Mus. 93:358 (Holotype, female; Yosemite N.P., California; U.S. Nat. Mus.); Bright, 1966, Pan Pacific Ent. 42:305. *Synonymy*

*Stenocleptus rhois* Blackman, 1943, Proc. U.S. Nat. Mus. 93:357 (Holotype, female; Orange, Orange Co., California; U.S. Nat. Mus.); Wood, 1973, Great Basin Nat. 33:186. *Synonymy*

DIAGNOSIS.— This species is much more likely to be confused with species of *Pseudothysanoes* or with females of some species of *Cactopinus* than it is with *ruficollis* Wood, the only other representative of the genus recognized here. The confusion results from the similar size and color and elytral incrustations rather than from true relationship. The very short, antennal scape, together with the subvertical, sulcate elytral declivity, serve to distinguish it.

MALE.— Length 1.2–1.5 mm, 2.5 times as long as wide; color black, usually covered by an incrustation.

Frons transversely impressed above epistoma, flattened to weakly convex above; surface finely sculptured, largely obscured by abundant, coarse, subplumose, moderately long setae. Antennal scape short, slender, slightly longer than pedicel; club small, more than one and one-half times as long as wide, two straight sutures conspicuously marked.

Pronotum 0.90 times as long as wide; subcircular in outline; summit at center, rather high, asperities comparatively few in number except at summit; anterior margin usually armed medially by two submarginal teeth; surface of disc (usually encrusted), when visible, shining and obscurely subreticulate, punctures rather small, sparse.

Elytra 1.5 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on more than basal two-thirds, very broadly, irregularly rounded behind; surface usually encrusted; striae not impressed, punctures small, shallow, distinct; interstriae shining, almost twice as wide as striae, punctures not visible in specimens examined. Declivity confined to less than posterior fourth, vertical on more than lower half; narrowly, rather deeply bisulcate; surface irregular, strial punctures indistinctly impressed. Vestiture of sparse, short, stout interstrial bristles.

FEMALE.— Similar to male except antennal scape ornamented by about twice as many hairlike setae.

DISTRIBUTION.— S California.

USA: **California**: Big Pine Park, 13-IV-35, *Cercocarpus ledifolius*; 1 mile S Pinyon Flats, San Bernardino N.F., 6-VI-59, *Rhus laurina*, R. W. Stark; La Crescenta, 1-I-35, *Ceanothus divaricatus* C. R. Bruck; Mt. Wilson, Los Angeles Co., 13-I-34, *Ceanothus integerrimus*, C. R. Bruck; San Diego Co., 17-XII-90; 4 miles NW Jacumba, San Diego Co., 25-VIII-68, D. E. Bright; Orange, 24-X-34, *Rhus integrifolia*, W. Ebling; Yosemite, 28-II-34, 3800–4000 ft, *C. integerrimus*, D. DeLeon.

HOSTS.— *Ceanothus integerrimus, Rhus laurina.*

BIOLOGY.— This species was taken from phloem tissues of small branches.

NOTES.— The above treatment was based on the holotype, allotype, and 55 paratypes of *sulcatus*, on the type series of *ceanothi* and *rhois*, and on 180 other specimens.

### 2. *Stenocleptus ruficollis* Wood

*Stenocleptus ruficollis* Wood, 1956, Canadian Ent. 88:239 (Holotype, female; 20 km SE Matamoros, Puebla, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species may be distinguished from *sulcatus* (Bruck) by characters summarized in the above key.

MALE.— Length 1.0–1.3 mm, 2.4 times as long as wide; color of pronotum reddish brown, elytra black.

Frons transversely impressed above epistoma, subconcave at center, convex above; surface rather coarsely granulate-punctate; vestiture rather sparse, coarse, short. Antennal scape short, as wide as long, club moderately small, less than one and one-half times as long as wide, with two conspicuously marked sutures.

Pronotum 0.97 times as long as wide; essentially as in *sulcatus* except some setae on disc scalelike.

Elytra 1.4 times as long as wide; general features as in *sulcatus* except strial punctures larger, equal in width to interstriae, declivity more broadly impressed on lower half; interstrial bristles much stouter, slightly flattened.

FEMALE.— Similar to male except frons shallowly, broadly concave, with more abundant frontal vestiture; antennal scape ornamented by a much larger tuft of hair.

DISTRIBUTION.— Puebla.

MEXICO: Puebla: 20 km SE Matamoros, 3-VII-53, 1200 m, S. L. Wood.

BIOLOGY.— Specimens were taken from phloem tissues of unthrifty twigs of a large, living tree.

NOTES.— The above treatment was based on 65 paratypes.

## GENUS *THYSANOES* LECONTE

*Thysanoes* LeConte, 1876, Proc. American Philos. Soc. 15:369 (Type-species: *Thysanoes fimbricornis* LeConte, monobasic)

DIAGNOSIS.— This genus is allied to *Pseudothysanoes* Blackman, but it is distinguished by the pronotum being longer than wide, by the presence of antennal sutures in all species, by the much broader protibiae, and by the xylophagous habit.

DESCRIPTION.— Length 1.2–2.3 mm, females 2.6–3.0 and males 2.3–2.7 times as long as wide; color pale yellowish brown to almost black.

Frons sexually dimorphic, convex to weakly impressed on lower half in males, flattened to deeply, extensively, concavely impressed in females, rarely ornamented by hair. Antennal scape elongate, ornamented by sparse to abundant long hair; funicle six-segmented; club moderately large, distinctly constricted at suture 1, often also at 2, both sutures procurved, 2 much more strongly arched. Pronotum asperate on anterior half, anterior margin armed in male. Elytra conservatively sculptured, striate with strial hair and uniseriate rows of erect interstrial scales. Protibiae rectangularly flattened, rather broad, much as in *Micracis*.

DISTRIBUTION.— E Canada to Costa Rica; 13 species are known.

BIOLOGY.— All species apparently are bigamous, xylophagous, and construct a parental gallery system essentially as in *Micracis* and *Hylocurus*, having a central nuptial chamber with two extensions extending in opposite directions with the grain of the wood for a few millimeters, then each branching into two egg galleries. Larval mines usually are rather long and tend to follow the grain of the wood. They normally infest material about 2 to 6 cm in diameter; light colored, dense woods evidently are preferred.

NOTES.— Species in this genus exhibit very minor variations from one another and, consequently, are very difficult to classify either anatomically or biologically.

### Key to the Species of *Thysanoes*

1. Female frons rather weakly impressed, upper limits of impressed or excavated area ending well below upper level of eyes, convex above impressed area; interstrial granules on disc absent in both sexes (weakly developed in some females) ..... 2

— Female frons more strongly, extensively impressed, excavation or flattened continuation of it extending well above upper level of eyes; interstrial granules on disc well developed except in *epicaris* and female *fimbricornis* ..... 5

2(1). Female frontal excavation flattened or feebly concave on lower half, a strong median fovea invading convex area at middle of frons; male frons mostly convex; pronotal disc almost smooth, shining; body color rather light yellowish brown; Louisiana and Florida to Veracruz; *Quercus, Carya*; 1.3–1.5 mm ..... 1. ***pallens*** **Wood**

— Female frons convex on lower two-thirds, fovea at fundus of excavation; male frontal excavation less well developed, occupying lower half of frons; pronotal disc strongly reticulate, subshining; body color dark brown; larger species ..... 3

3(2). Scales on elytral declivity spaced within a row and between rows by distances about one and one-half times length of a scale; strial and interstrial punctures rather shallow, interstrial granules on declivity fine; female frons almost glabrous; *Aguascalientes* to Jalisco; *Canavelia*, etc.; 1.4–1.7 mm ..... 2. ***inornatus*** **Wood**

— Scales on elytral declivity spaced within a row or between rows by distances equal to or less than length of a scale; strial and interstrial punctures very slightly deeper, interstrial granules on declivity moderately coarse ..... 4

4(3). Female frons smooth and polished almost to upper level of eyes, vertex ornamented by only a few scattered setae; declivital granules fine, strial punctures reduced, almost obsolete in male; New Mexico; *Berberus*; 1.6–2.0 mm ..... 3. ***berbericolens*** **Wood**

— Female frons reticulate on upper two-thirds, vertex ornamented by rather abundant short setae; declivital granules rather coarse, strial punctures rather coarse, distinctly impressed; Hidalgo to Oaxaca; shrubs; 1.5–1.8 mm ..... 4. ***mexicanus*** **Wood**

5(1). Female frontal concave area entirely devoid of a median carina or tubercle on upper half ..... 6

— Female frons with a median carina or tubercle at upper level of eyes (very weakly developed in *texanus*); striae about as wide as interstriae ..... 12

6(5). Strial punctures reduced but visible on declivity, interstrial granules either present or absent in female, always present on male interstriae 1 ..... 7

— Strial punctures obsolete on declivity, interstrial granules always present except obsolete on lower half of 1 in male ..... 11

7(6). Interstrial scales on declivity four to eight times as long as wide in both sexes; interstrial granules on disc extend to base in both sexes; female frontal excavation not extending above upper level of eyes ..... 8

— Interstrial scales on declivity not more than four times as long as wide (except some specimens of *fimbricornis*); interstrial granules on disc absent in female, rarely attain base in male; female frontal excavation more extensive above ..... 9

8(7). Smaller; discal interstrial granules moderately large, little if any larger on declivity of male; male interstrial scales about as long as distance between rows; Virginia to Florida and Texas; 1.5–1.7 mm ..... 5. ***berchemiae*** **Blackman**

— Larger; discal interstrial granules minute, those on declivity very coarse, their diameters as great as that of strial punctures, each as high as wide; interstrial scales on declivity one to one and one-half times as long as distance between rows; Chiapas; 2.3 mm (see also 7. ***tuberculatus*** **Wood**) ..... 6. ***granulifer*** **Wood**

9(7). Female frons conspicuously reticulate, dull from epistomal margin to vertex; strial punctures on disc coarser, deeper; interstriae on male disc devoid of granules; Jalisco; 1.8–2.2 mm ..... 8. ***epicaris*** **Wood**

— Female frons smooth, polished from epistomal margin to level of antennal insertion, reticulate above; strial punctures on disc small, shallow, interstriae on male disc with fine, uniseriate granules ..... 10

10(9). Body color dark reddish brown; strial punctures and interstrial granules on disc slightly larger and deeper; declivital scales broader toward base; tuft of hair on female scape large; Costa Rica; *Calliandra confusa*; 1.5–2.2 mm ..... 9. ***neotropicalis*** **Wood**

— Body color pale yellowish brown (Florida and Mexican specimens darker); strial punctures and interstrial granules on disc finer; declivital scales averaging much more slender; tuft of hair on female scape larger; Illinois, Pennsylvania, and Florida to Hidalgo and Durango; 1.4–2.1 mm ..... 10. ***fimbricornis*** **LeConte**

11(6). Interstrial granules on male declivity rather small, close except decreasing in size on 1, becoming obsolete on lower half, strial punctures replaced by minute granules on upper half of declivity, becoming obsolete below; scales on male declivity six to eight times as long as wide; Michoacán; *Quercus*; 1.4–2.0 mm ..... 11. ***adonis*** **Wood**

— Interstrial granules on male declivity rather coarse except absent on 1, striae unmarked by granules; subsulcate between male interstriae 2 and suture on declivity; scales on male declivity large, about six times as long as wide; Hidalgo; *Quercus*; 1.9–2.3 mm ..... 12. ***subsucatus*** **Wood**

12(5). Smaller; female frons subglabrous, median carina very weakly developed; strial punctures on declivity moderately coarse, deeply impressed; Texas to Colima and Veracruz; *Prosopis*, etc.; 1.2–1.5 mm ..... 13. ***texanus*** **Blackman**

— Larger; female frons with median carina well developed at upper level of eyes; strial punctures reduced in size, shallow, obscure, almost obsolete ..... 13

13(12). Interstrial scales rather small, slender, each scale about four times as long as wide; female frontal carina long, gradually elevated, rather low; color reddish brown; Georgia and Florida to Louisiana (and Oaxaca?); *Quercus*, etc.; 1.4–1.7 mm ..... 14. ***lobdelli*** **Blackman**

— Interstrial scales short, broad, each scale about twice as long as wide or less; female frontal carina short, rather high, abrupt; color almost black; Arizona and New Mexico to Durango; *Quercus*; 1.8–2.2 mm ..... 15. ***xylophagus*** **Blackman**

### 1. *Thysanoes pallens* Wood

*Thysanoes pallens* Wood, 1956, Canadian Ent. 88:234 (Holotype, female; Sanford, Florida; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This is the most distinctive species in the genus, although both sexes superficially resemble males of *fimbricornis* LeConte. It is distinguished by the pale yellowish brown color, by the shallowly, less extensively impressed female frons, with a conspicuous central fovea, and by the simple sculpture and vestiture.

FEMALE.— Length 1.3–1.5 mm, 2.9 (male 2.7) times as long as wide; color pale yellowish brown to light brown.

Frons rather strongly convex on upper half, rather weakly impressed below, not concave, with a large, impressed, central fovea; upper area minutely granulate with a few larger granules intermixed, becoming almost reticulate below except smooth and shining on median line from fovea to epistoma; vestiture sparse, inconspicuous. Antennal scape ornamented by a few long hairlike setae.

Pronotum 1.06 times as long as wide; somewhat subquadrate, all margins moderately arcuate, widest just behind middle; anterior margin unarmed; summit slightly in front of middle; anterior slope moderately asperate; posterior area shining, subreticulate,

a few small punctures, those behind summit very feebly granulate. Vestiture sparse, of stout, delicate setae.

Elytra 1.8 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather broadly rounded behind; striae not impressed, punctures rather small, shallow; interstriae almost smooth to subreticulate, about as wide as striae; punctures fine, uniseriate, becoming finely granulate toward declivity. Declivity very steep, convex; striae very weakly impressed; interstrial granules slightly larger. Vestiture of rows of minute, very fine strial hair, and rows of erect interstrial scales; each scale about four to six times as long as wide, spaced within and between rows by distances about equal to length of a scale.

MALE.— Similar to female except very slightly stouter; frons more coarsely sculptured, impression slightly less extensive; anterior margin of pronotum more strongly arcuate, armed by six small teeth; interstrial granules extend to basal fourth; interstrial scales three to five times as long as wide.

DISTRIBUTION.— Louisiana and Florida to Veracruz.

USA: **Florida**: Dade City, 18-VI-51, *Rhizophora mangle*, S. L. Wood. Sanford, 11-VII-51, *Quercus*, S. L. Wood; Suanee Springs, 15-VI-51, Pecan, S. L. Wood; Oleno St. Pk., 16-VI-51, *Carya*, S. L. Wood. **Louisiana**: Madisonville, 11-VI-51, *Quercus*, S. L. Wood. MEXICO: **San Luis Potosí**: Pujal, 20-VI-53, S. L. Wood. ***Veracruz***: Lago Catemaco, 5-V-69, D. E. Bright.

HOSTS.— *Carya* spp., *Quercus* spp., *Rhizophora mangle*.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on 22 paratypes.

### 2. *Thysanoes inornatus* Wood

*Thysanoes inornatus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):24 (Holotype, female; Volcán Colima, Jalisco, Mexico)

DIAGNOSIS.— This species is distinguished from the closely allied *mexicanus* Wood by the greatly reduced strial punctures on the declivity, by the shorter, more widely spaced interstrial scales, by the finer interstrial granules on the declivity, and by the almost glabrous female frons.

FEMALE.— Length 1.4–1.7 mm, 2.7 (male 2.3) times as long as wide; color very dark brown.

Frons moderately, rather broadly concave from epistoma to upper level of eyes; surface above concavity reticulate-granulate, becoming reticulate on upper part of concavity, smooth and shining over lower areas; a fovea at center; almost glabrous except near lateral margins of epistoma. Antennal scape bearing numerous long setae.

Pronotum 1.04 times as long as wide; widest one-third length from base, sides arcuate, not converging on basal half, rather strongly constricted in front of middle, moderately rounded in front; anterior margin armed by six teeth; summit at middle; posterior area reticulate to obscurely rugose-reticulate, a few minute, obscure punctures. Vestiture sparse, consisting of a few short, stout setae.

Elytra 1.6 times as long as wide; sides almost straight and parallel on basal three-fourths, rather narrowly rounded behind; striae not impressed, punctures small, shallow; interstriae almost smooth, with obscure lines, almost three times as wide as striae, punctures sparse, uniseriate, very finely granulate. Declivity steep, convex; strial punctures reduced, minute to obsolete; interstrial granules regularly spaced, fine. Vestiture of rows of very minute, fine, strial hair, and rows of erect interstrial scales; each scale three to four times as long as wide, spaced within a row by one and one-half to three times length of a scale, between rows by about one and one-half to three times length of a scale.

MALE.— Similar to female except stouter, 2.3 times as long as wide; frontal impression smaller, about two-thirds as large, reticulation extending almost to epistomal area; scape sparsely pubescent; teeth on anterior margin of pronotum larger; interstrial scales wider, each two to three times as long as wide.

DISTRIBUTION.— Aguascalientes to Jalisco.

MEXICO: **Aguascalientes**: Aguascalientes, 12-VI-65, 2100 m, *Mimosa*, S. L. Wood. **Jalisco**: Volcán Colima, 23-VI-65, 2500 m, No. 103, unknown shrub, and No. 106, *Rhus*, S. L. Wood.

HOSTS.— *Mimosa* sp., *Rhus* sp.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 25 specimens. The series of males from Aguascalientes was somewhat

more variable than those from Jalisco; in some the interstrial scales were as slender as in the females from Jalisco.

### 3. *Thysanoes berbericolens* Wood

*Thysanoes berbericolens* Wood, 1971, Great Basin Nat. 31:73 (Holotype, female; Nogal Lake, Lincoln Co., New Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the closely related *inornatus* Wood by the more extensively impressed female frons that is smooth and polished to above the upper level of the eyes, by the unarmed anterior margin of the female pronotum, by the absence of interstrial granules on the disc, and by the more closely spaced interstrial scales.

FEMALE.— Length 1.6–2.0 mm, 2.6 times as long as wide; color dark brown.

Frons shallowly concave from epistoma to slightly above eyes, upper fourth minutely punctured, smooth and shining, obscurely foveate at center. Scape as in *inornatus*.

Pronotum 0.96 times as long as wide; as in *inornatus* except very broadly rounded in front; and posterior area obscurely, finely reticulate.

Elytra 1.7 times as long as wide, 1.9 times as long as pronotum; outline as in *ornatus*; striae not impressed, punctures rather small, impressed; interstriae twice as wide as striae, punctures fine, uniseriate, not at all granulate except at base of declivity. Declivity steep, convex; strial punctures minute to obsolete; interstrial punctures finely granulate. Vestiture of rows of fine strial hair, and interstrial rows of erect scales; each scale four to five times as long as wide; spaced within and between rows by distances equal to length of a scale.

MALE.— Similar to female except frontal impression not as deep or as extensive; anterior margin of pronotum armed by six teeth; declivital strial punctures completely obsolete; interstrial scales slightly shorter, each about four times as long as wide.

DISTRIBUTION.— New Mexico.

USA: **New Mexico**: 16 km (10 miles) SE Bingham, No. 28, and Nogal Lake, Lincoln Co., No. 30, 1-VI-69, 2300 m, *Berberus fremontii*, S. L. Wood.

HOST.— *Berberus fremontii*.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 27 specimens.

### 4. *Thysanoes mexicanus* Wood

*Thysanoes mexicanus* Wood, 1956, Canadian Ent. 88:234 (Holotype, female; 40 km SE Oaxaca, Oaxaca, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *berbericolens* Wood by the slightly less extensive frontal impression, with the surface of the upper area more coarsely sculptured and pubescent, and by the larger punctures on the declivital striae.

FEMALE.— Length 1.5–1.8 mm, 2.9 times as long as wide; color dark brown.

Frons as in *inornatus* Wood except upper area more coarsely granulate and pubescence on vertex, longer and more abundant, a moderately large tuft of hair on antennal scape. Pronotum 1.0 times as long as wide, otherwise as in *berbricolens*.

Elytra as in *berbericolens* except discal strial punctures deeper, declivital strial punctures less strongly reduced, and interstrial granules very slightly larger; vestiture identical.

MALE.— As in male *berbericolens* except 2.6 times as long as wide; strial punctures on disc deeper, interstrial punctures larger; punctures of declivital striae reduced but visible; declivital scales as long as those of female, each three to four times as long as wide.

DISTRIBUTION.— Hidalgo to Oaxaca.

MEXICO: **Hidalgo**: 26 km N Ixmiquilpan, 10-VII-67, 1900 m, Nos. 187, 188, *Acacia*, S. L. Wood. **Oaxaca**: 40 km SE Oaxaca, 6-VII-53, shrub branches, S. L. Wood; 184 km S Oaxaca on Highway 131, 27–30-V-71, 2000 m, mistletoe on alder, D. E. Bright.

HOSTS.— *Acacia* sp. and other shrubs.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on 20 paratypes and on three other specimens.

### 5. *Thysanoes berchemiae* Blackman

Fig. 143

*Thysanoes berschemiae* Blackman, 1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:44 (Lectotype, female; Vicksburg, Mississippi; U.S. Nat. Mus., 24738, present designation)

*Thysanoes berchemiae* Blackman, 1922, Mississippi Agric. Expt. Sta. Tech. Bull. 11:73 (emendation)

DIAGNOSIS.— This species is distinguished from the allied *epicharis* Wood by the small, shining, impressed area just below the female central frontal fovea; interstrial punctures more coarsely granulate; all surfaces more brightly shining; elytral scales much more slender.

FEMALE.— Length 1.5–1.7 mm, 2.8 times as long as wide; color very dark reddish brown.

Frons shallowly concave from epistoma to slightly above upper level of eyes; surface finely reticulate-granulate above, becoming reticulate below except smooth and brightly shining in median area from epistoma to central fovea, part of this area near fovea weakly impressed. Antennal scape ornamented by more than a dozen long, hairlike setae.

Pronotum 1.1 times as long as wide; widest near middle; sides very weakly arcuate on posterior two-thirds, almost parallel, very broadly rounded in front; anterior margin unarmed; summit in front of middle, moderately high; anterior area asperate; reticulate behind, with a few small, shallow punctures. Vestiture very sparse, of short, stout setae.

Elytra 1.8 times as long as wide; outline as in *inornatus*; striae not impressed, punctures small, moderately deep; interstriae shining, two to three times as wide as striae, punctures rather coarsely granulate. Declivity steep, convex; strial punctures slightly reduced in size, not as deep as on disc; interstrial granules slightly higher. Vestiture of rows of minute strial hair and rows of erect interstrial scales; each scale six to eight times as long as wide, each very slightly longer than distance between scales within a row and between rows.

MALE.— Similar to female except stouter, 2.6 times as long as wide; frontal impression confined to lower half, upper area more coarsely granulate; anterior margin of pronotum armed by six small teeth; interstrial granules slightly larger; interstrial scales four to six times as long as wide.

DISTRIBUTION.— Virginia to Florida and Texas.

USA: **Florida**: Dade City, East River, Snead. **Louisiana**: Greenwell Springs. **Mississippi**: Agricultural College, Durant, Vicksburg. **Texas**: Victoria. **Virginia**: Len Haver, Princess Anne.

HOSTS.— *Berchemia scandens, Quercus* sp., *Ulmus* sp.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 20 specimens and on 57 other specimens. In the original publication Blackman misspelled the generic name of the host on which this name was based. He made the correction in 1922; the amended spelling should be continued as the correct name for this species. The female syntype from Vicksburg that has been labeled as the type is here designated the lectotype of this species.

### 6. *Thysanoes granulifer* Wood

*Thysanoes granulifer* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):15 (Holotype, male; San Cristobal de las Casas, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *berchemiae* Blackman by the larger size, by the smaller discal interstrial tubercles, by the much larger declivital interstrial tubercles, and by the much larger declivital scales.

MALE.— Length 2.3 mm, 2.9 times as long as wide; color dark reddish brown.

Frons on holotype largely concealed by pronotum, evidently as in *berchemiae*. Pronotum as in *berchemiae*.

Elytra 1.8 times as long as wide; outline as in *berchemiae*; striae not impressed, punctures moderately coarse, deep; interstriae smooth, shining, slightly narrower than striae, punctures fine, slightly granulate, uniseriate, granules coarse near declivity. Declivity steep, convex; strial punctures slightly smaller than on disc, deep; interstrial tubercles as wide as diameter of a strial puncture, as high as wide on interstriae 1–7, very slightly smaller on lower half of declivity. Vestiture of rows of minute, fine strial hair, and rows of erect interstrial scales; scales on disc about three times as long as wide, shorter than distance between rows, on declivity four to eight times as long as wide, one to one and one-half times as long as distance between rows.

DISTRIBUTION.— Chiapas.

MEXICO: **Chiapas**: San Cristobal de las Casas, 7-V-69, J. E. H. Martin.

NOTES.— The above treatment was based on the holotype.

### 7. *Thysanoes tuberculatus* Wood

*Thysanoes tuberculatus* Wood, 1975, Great Basin Nat. 35:29 (Holotype, male; 85 km or 53 miles S Valle Nacional, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *granulifer* Wood by the smaller size and by the very different elytral declivity as described below.

MALE.— Length 1.8 mm, 2.7 times as long as wide; color rather dark yellowish brown.

Frons and pronotum as in *granulifer* and *berchemiae* Blackman.

Elytra 1.6 times as long as wide; disc as in *granulifer* except granules slightly larger. Declivity steep, convex; striae 1 and 2 with punctures minute, visible almost to apex; suture slightly elevated, with a row of small granules on basal half; interstriae 2 with two or three tubercles on less than basal fourth, broadly impressed below and entirely devoid of punctures and granules; interstriae 3 moderately elevated on middle third and armed with a row of six to eight rather coarse tubercles, lower third without punctures or granules; lateral interstriae each with a row of tubercles on basal area but none of them attaining normal apex for these interstriae. Vestiture of rows of interstrial scales, scales on disc largely abraded, little if any longer than wide, longer at base of declivity; those on 3 up to three times as long as on disc and four times as long as wide, slightly shorter on other interstriae; declivital interstriae 2, 4, lower two-thirds of 1, and lower half of 3 glabrous.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 85 km or 53 miles S Valle Nacional, 24-V-71, 3300 m, D. E. Bright.

NOTES.— The above treatment was based on the holotype.

### 8. *Thysanoes epicaris* Wood

*Thysanoes epicaris* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):35 (Holotype, female; 39 km S Mazamitla, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is allied to *fimbricornis* LeConte, but it is distinguished by the less deeply impressed, more strongly reticulate female frons, by the more coarsely sculptured elytral disc, by the almost obsolete declivital striae, and by the much broader scales on the elytral declivity.

FEMALE.— Length 1.8–2.2 mm, 3.0 times as long as wide; color yellowish brown.

Frons rather strongly, transversely impressed from epistomal margin to well above eyes, a small, median impression just below center; entire surface rather strongly rugose-reticulate; vestiture fine, short, sparse. Scape bearing a rather dense fringe of long hair.

Pronotum 1.08 times as long as wide; sides almost straight and parallel on basal half, distinctly constricted on anterior half, broadly rounded in front; anterior margin unarmed; summit in front of middle; posterior area reticulate, punctures moderately abundant, rather small, shallow; vestiture of fine hair and stout bristles, rather short.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal three-fourths, broadly rounded behind; striae not impressed, punctures small, distinct; interstriae twice as wide as striae, irregularly subrugose, punctures small, obscure. Declivity convex, steep, confined to posterior fourth; striae very weakly impressed, punctures minute, distinct; interstriae almost smooth, with very fine, uniseriate, squamiferous granules, those on 3 very slightly larger. Vestiture of minute strial hair and uniseriate rows of erect interstrial scales; each scale on disc half as long as distance between rows, three times as long as wide; declivital scales three-fourths as long as distance between rows, two to three times as long as wide; a partial supplemental row along suture.

MALE.— Similar to female except frontal impression reduced, not reaching upper level of eyes, central impression more pronounced, sculpture of upper half granulate; anterior margin of pronotum armed by six teeth; declivital granules very slightly larger.

DISTRIBUTION.— Jalisco.

MEXICO: Jalisco: 24 km S Mazamitla, 22-VI-65, 2500 m, No. 94, S. L. Wood.

BIOLOGY.— Specimens were cut from wood of branches of a leguminous tree with bipinnately compound leaves. The tunnels were as described for the genus.

NOTES.— The above treatment was based on the type series of 10 specimens.

### 9. *Thysanoes neotropicalis* Wood

*Thysanoes neotropicalis* Wood, 1969, Brigham Young Sci. Bull., Biol. Ser. 10(2):35 (Holotype, female; San Ignacio de Acosta, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the closely allied *fimbricornis* LeConte by characters summarized in the above key.

FEMALE.— Length 2.0–2.2 mm (males 1.5–1.9 mm), 3.2 (male 2.6) times as long as wide; color medium brown.

Frons broadly, somewhat transversely impressed from epistoma to upper level of eyes, central area more narrowly impressed, subfoveate; epistomal area smooth and shining to subfoveate impression, sides and above finely, obscurely punctured and finely, closely, subaciculately granulate; vestiture inconspicuous. Tuft of setae on scape much smaller than in *mexicanus*.

Pronotum 1.2 times as long as wide; slightly wider near middle, sides straight and diverging anteriorly on basal half, converging slightly anteriorly toward broadly rounded, subserrate, anterior margin; summit almost one-third pronotum length from anterior margin; posterior area reticulate and very finely punctured; vestiture confined to marginal areas consisting of flattened bristles.

Elytra 2.1 times as long as wide, 1.8 times as long as pronotum; sides straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures small, shallow; interstriae about twice as wide as striae, subshining, irregular but not clearly marked by lines or punctures. Declivity convex, steep; surface dull, strial punctures smaller than on disc, perhaps deeper; interstriae with occasional fine granules. Vestiture confined to declivity, consisting of erect interstrial scales, with an additional, partial row at suture; each scale three to four times as long as wide.

MALE.— Similar to female except smaller, stouter, 2.6 times as long as wide; frons less extensively impressed; anterior margin of pronotum armed by 10 serrations; elytra with strial punctures much larger and deeper, interstrial punctures uniseriately granulate toward declivity, both strial punctures and moderately large interstrial granules continuing to apex of declivity; declivital vestiture longer and extending well onto disc.

DISTRIBUTION.— Costa Rica.

COSTA RICA: San Ignacio de Acosta, San José, 5-V-63, 1500 m, *Calliandra confusa*, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 24 specimens.

### 10. *Thysanoes fimbricornis* LeConte
Fig. 143

*Thysanoes fimbricornis* LeConte, 1876, Proc. American Philos. Soc. 15:370 (Lectotype, female; Lancaster Co., Pennsylvania; Mus. Comp. Zool., No. 964, present designation)

DIAGNOSIS.— This is the most common and widely distributed species in the genus. It is distinguished from all other species by the pale yellowish brown color, by the large tuft of hair on the female scape, by the female frontal excavation extending above the eyes, and by other characters summarized in the above key.

FEMALE.— Length 1.4–2.1 mm, 3.0 (male 2.5) times as long as wide; color light yellowish brown.

Frons shallowly concave to upper level of eyes; rather finely rugose-reticulate above, smooth, shining on lower third, foveate at center; glabrous. Antennal scape ornamented by abundant, long hair.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on basal half, rather narrowly rounded in front; anterior margin unarmed; summit in front of middle; posterior area reticulate, with a few fine, shallow punctures. Vestiture sparse, short, stout, confined to margins and asperate area.

Elytra 1.9 times as long as wide, 1.7 times as long as pronotum; outline as in *inornatus*; striae not impressed, punctures small, very shallow; interstriae smooth, twice as wide as striae, punctures uniseriate, minute. Declivity very steep, convex; strial punctures reduced, almost obsolete; interstrial punctures replaced by very fine granules. Vestiture of rows of minute strial hair and rows of erect, interstrial scales; each scale about four times as long as wide, spaced by distances within a row and between rows equal to length of a scale.

MALE.— Similar to female except not as slender; frons less extensively impressed; scape ornamented by only about a dozen setae; anterior margin of pronotum armed by eight teeth; interstrial granules larger,

extending almost to base; interstrial scales slightly longer, each about four times as long as wide.

DISTRIBUTION.— Illinois, Pennsylvania, and Florida to Durango and Hidalgo.

USA: **District of Columbia**: Washington. **Florida**: Oleno St. Pk., Sebring. **Illinois**: E St. Louis. **Maryland**: College Park. **New Jersey**: Haddon Heights, Westville. **Mississippi**: Corinth, Duko, Iuka, Trimcane Swamp. **North Carolina**: Monroe, Tryon. **Pennsylvania**: Dauphin, Frankford, Harrisburg Gap, Hummelstown, Indiantown, Iroquois, Linglestown, Philadelphia, Rockville, Swarthmore. **Texas**: Brownsville, College Station, Dallas, Victoria. **Virginia**: Arlington, Falls Church, Rosslyn. **West Virginia**: Kanawha Station, Monongalia. MEXICO: **Durango**: 32 km SW EL Salto. **Hidalgo**: 45 km S Jacala. **Tamaulipas**: 8 km W Aniguo Morelos. **Veracruz**: 35 km SE Jalapa.

HOSTS.— *Acacia* sp., *Acer rubrum*, *Carya* sp., *Celtis* sp., *Gleditsia triacanthos*, *Morus rubra*, *Quercus* spp.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on LeConte's syntypes and on 287 other specimens. LeConte named this species from a syntypic series. Because a lectotype has never been designated, I here designate the female in his series presently bearing the type label Type No. 964, in the LeConte Collection at the Museum of Comparative Zoology, as the lectotype of *Thysanoes fimbricornis* LeConte.

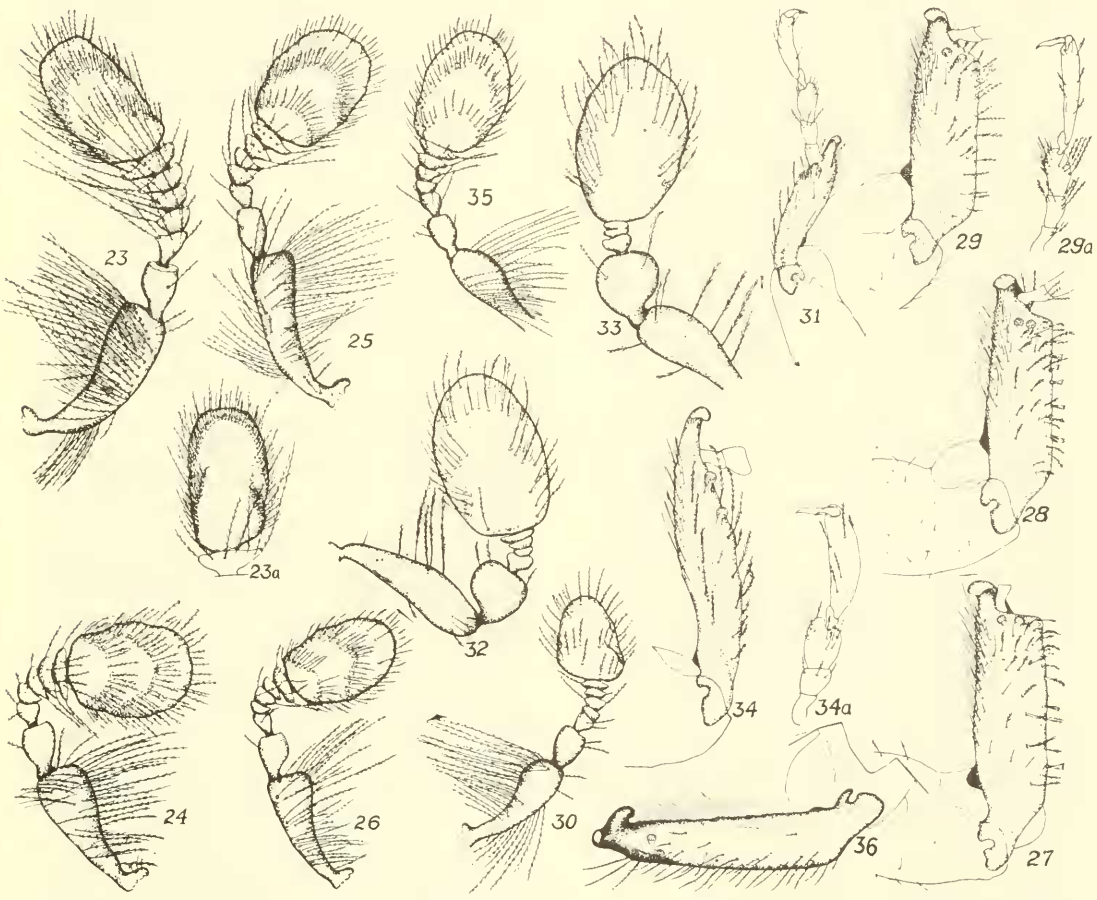



Fig. 143. Micracini spp., antenna and protibiae: 23, 23a, *Thysanoes fimbricornis*, female, anterior and posterior faces, 24, same, male, anterior face, 27, same, female, posterior face; 25, *Thysanoes lobdelli*, female, anterior face, 28, same, posterior face; 26, *Thysanoes berchimiae*, female, anterior face, 29, 29a, same, posterior face, tarsus; 30, *Pseudothysanoes dislocatus*, female, 31, same; 32, *Liparthrum squamosum*, female, posterior face, 33, same, anterior face, 34, same, posterior face; 35, *Pseudothysanoes rigidus*, female, anterior face, 35, same, posterior face. (After Blackman 1920:pl. III.)

### 11. *Thysanoes adonis* Wood

*Thysanoes adonis* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):36 (Holotype, female; 47 km W Quiroga, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the allied *subsulcatus* Wood by characters summarized in the above key.

FEMALE.— Length 1.4–2.0 mm, 2.6 times as long as wide; color dark brown, summit of pronotum reddish brown.

Frons convex above, transversely impressed on lower half of area below upper level of eyes, a small median, subfoveate impression at center, ascending toward epistomal margin; surface densely, minutely, evidently subrugosely punctured in convex area, becoming almost smooth toward epistoma; vestiture of sparse, moderately long, very stout bristles uniformly distributed on convex area. Scape bearing about a dozen long hairs.

Pronotum 1.04 times as long as wide; sides almost straight and parallel on basal half, moderately constricted on anterior half, rather broadly rounded in front; anterior margin subserrate; summit at middle, rather broad; asperities on anterior slope rather coarse; posterior areas reticulate, punctures minute, sparse, a few behind summit minutely granulate; vestiture of stout bristles.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather broadly rounded behind; striae not impressed, punctures small, distinct; interstriae about three times as wide as striae, surface irregular, subrugose, punctures small, uniseriate, finely granulate on posterior half. Declivity convex, steep, restricted to posterior fourth; strial punctures obsolete, except some of them very finely granulate; interstriae uniseriately, finely granulate; general surface somewhat dull. Vestiture of very minute strial hair, and uniseriate rows of much longer, interstrial scales; each scale on disc about two-thirds as long as distance between rows, about four times as long as wide; scales on declivity slightly longer than distance between rows, about six times as long as wide, with a smaller supplemental row at suture.

MALE.— Similar to female except anterior margin of pronotum more distinctly serrate; elytral granules smaller; declivital strial punctures minute but visible; declivital scales broader, about four to five times as long as wide.

DISTRIBUTION.— Michoacán.

MEXICO: Michoacán: 29 km W Quiroga, 17-VI-65, 2200 m, *Quercus*, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of nine specimens.

### 12. *Thysanoes subsulcatus* Wood

*Thysanoes subsulcatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):35 (Holotype, female; 8 km W Tulancingo, Hidalgo, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *fimbricornis* LeConte by the larger size, by the more deeply impressed female frons, by the rather large interstrial declivital granules, and by the much longer, more slender declivital scales.

FEMALE.— Length 1.9–2.3 mm, 3.0 times as long as wide; color dark reddish brown.

Frons shallowly, broadly concave from epistoma to vertex, with a small, median impression near upper level of eyes; surface strongly reticulate, almost subrugose, except transversely etched on a rather large area above epistomal margin; vestiture short, stout, sparse, uniformly distributed. Scape with a small fringe of hair.

Pronotum 1.2 times as long as wide; sides straight and parallel on slightly less than basal two-thirds, very broadly rounded in front, anterior margin unarmed; summit well in front of middle, broad; surface strongly reticulate, punctures minute, very feebly granulate behind summit; vestiture fine, hairlike in posterior areas, stout bristles in asperate areas.

Elytra 2.0 times as long as wide, 1.9 times as long as pronotum; sides straight and parallel on slightly more than basal two-thirds, broadly rounded behind; striae not impressed, punctures very fine, shallow, distinct; interstriae more than twice as wide as striae, minutely irregular, punctures fine, obscure. Declivity steep, convex; strial punctures almost obsolete; interstriae 2 slightly elevated, each interstriae uniseriately, rather finely granulate, except punctures and granules obsolete on lower three-fourths of 1. Vestiture consisting of very minute, fine,

strial hair, and uniseriate rows of longer, erect, interstrial scales; each scale on disc about half as long as distance between rows and three times as long as wide, on declivity slightly longer than distance between rows and up to six times as long as wide, obsolete on middle half of declivital interstriae 1.

MALE.— Similar to female except frontal concavity deeper, extending only to upper level of eyes; anterior margin of pronotum armed by eight small teeth; discal strial punctures slightly larger, interstrial punctures granulate on posterior third; declivital granules much larger; declivital scales slightly wider and longer.

DISTRIBUTION.— Hidalgo.

MEXICO: **Hidalgo**: 8 km W Tulancingo, 11-VI-67, 2400 m, *Quercus*, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 10 specimens.

### 13. *Thysanoes texanus* Blackman
Fig. 144

*Thysanoes texanus* Blackman, 1943, Proc. U.S. Nat. Mus., 93:353 (Holotype, female; Brownsville, Texas; U.S. Nat. Mus., 56404)

*Thysanoes vachelliae* Blackman, 1943, Proc. U.S. Nat. Mus. 93:353 (Holotype, female; Brownsville, Texas; U.S. Nat. Mus., 56405); Wood, 1973, Great Basin Nat. 33:186. *Synonymy*

*Thysanoes ratamae* Blackman, 1943, Proc. U.S. Nat. Mus. 93:354 (Holotype, female; Mexico; U.S. Nat. Mus., 56406); Wood, 1973, Great Basin Nat. 33:186. *Synonymy*

DIAGNOSIS.— The female of this species has a weak longitudinal carina in the upper half of the frontal concavity indicating a relationship to *lobdelli* Blackman and *xylophagus* Blackman. The relationship to those species, however, is remote. It is distinguished from them by the smaller size, by the weakly developed female frontal carina, by the less extensive female frontal impression, and by the larger, more deeply impressed strial punctures on the declivity.

FEMALE.— Length 1.2–1.5 mm, 2.7 (male 2.6) times as long as wide; color yellowish brown.

Frons broadly, rather deeply concave from epistoma to slightly above upper level of eyes, upper half with a weak median carina; finely reticulate-granulate above, gradually reduced until entirely smooth and shining on epistomal area; vestiture fine, minute, inconspicuous. Antennal scape sparsely pubescent.

Pronotum 1.1 times as long as wide; widest at middle, sides weakly arcuate on basal half, slightly constricted anteriorly, then rather narrowly rounded in front; anterior margin unarmed; summit anterior to middle, rather well developed; disc reticulate, with a few very fine granules, lateral areas with an occasional, minute puncture. Vestiture of moderately abundant, stout, suberect setae.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; outline as in *inornatus*; striae not impressed, punctures rather large, deep; interstriae smooth, as wide as striae, punctures granulate. Declivity very steep, convex; striae slightly impressed, punctures smaller than on disc, deep; interstriae closely, uniseriately granulate. Vestiture of minute strial hair and rows of erect, interstrial scales; each scale three to five times as long as wide on declivity, spaced by distances within and between rows by length of a scale; scales shorter and more widely spaced on disc.

MALE.— Similar to female except frontal impression not concave, limited to lower half, with several large, isolated granules in convex area above, carina absent; anterior margin of pronotum armed by about six small teeth (variable); interstrial granules slightly larger; declivital scales up to one-half longer, four to six times as long as wide.

DISTRIBUTION.— S Texas to Colima and Veracruz.

USA: **Texas**: Beeville, Brownsville, Southmost. MEXICO: **Colima**: 51 km S Colima. **Jalisco**: 8 km W Juchitlán, 24 km S Mazamitla, Volcán Colima. **Nayarit**: Los Corchos, 48 km N Rosamorada. **Sinaloa**: Isla de la Piedra. **Tamaulipas**: Jimenez, Llera. **Veracruz**: Cotaxtla, 5 km E Orizaba, 3 km S Rinconada.

HOSTS.— *Acacia* spp., *Mimosa* spp., *Prosopis juliflora*.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotypes of *texanus* Blackman, *vachelliae* Blackman, and *ratamae* Blackman, and on 177 other specimens.

### 14. *Thysanoes lobdelli* Blackman
Fig. 143

*Thysanoes lobdelli* Blackman, 1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:43 (Lectotype, female; Trimcane Swamp, Mississippi; U.S. Nat. Mus., 24739, present designation)

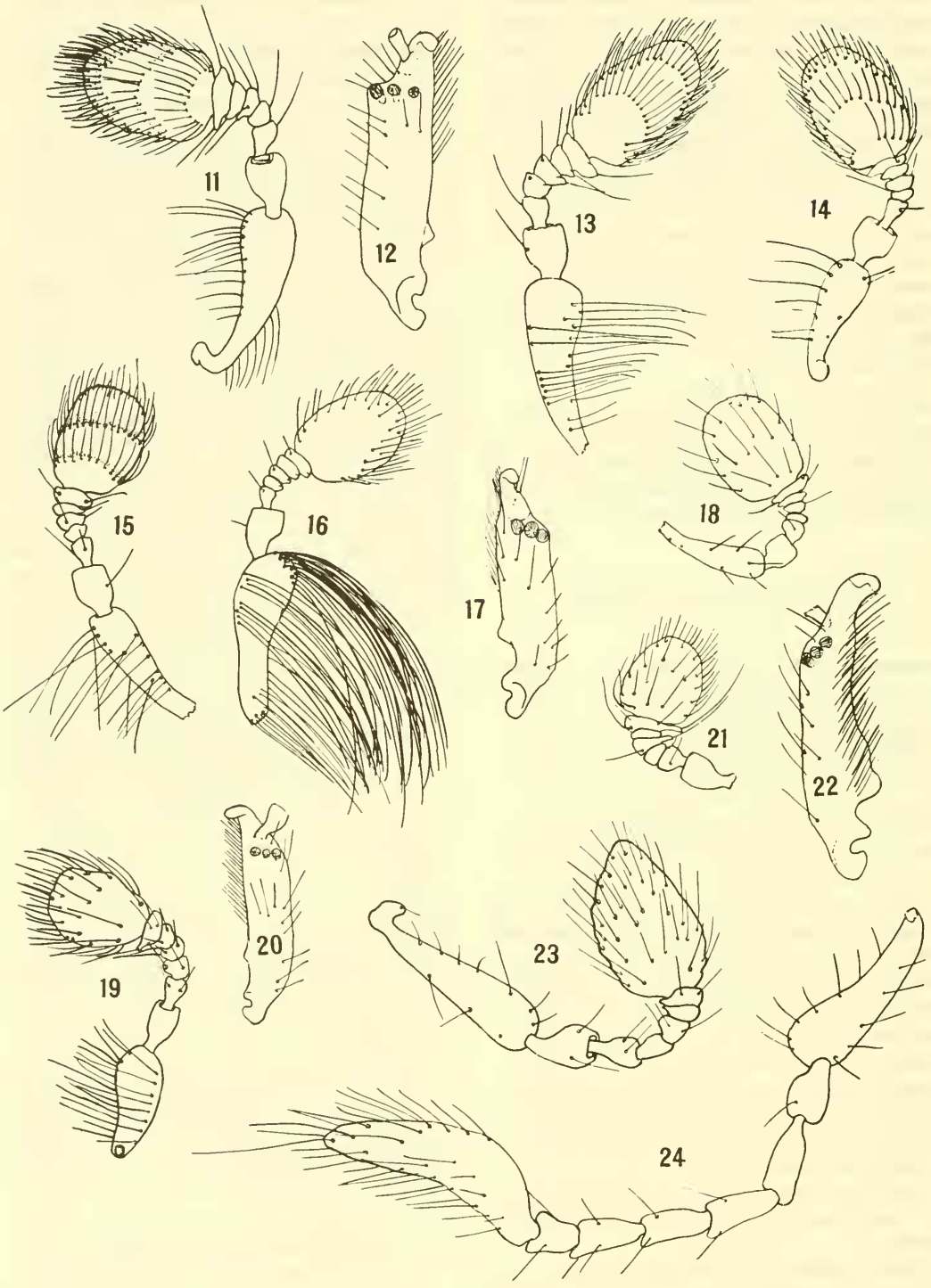



Fig. 144. Micracini spp., antennae and protibiae: 11–14, *Thysanoes texanus*; 15, *Pseudothysanoes huachucae*; 16–17, *Pseudothysanoes insularis* (Cuba); 18, *Pseudothysanoes colombianus* (Colombia); 19–20, *Pseudothysanoes acaciae*; 21, *Pseudothysanoes murilloi* (Colombia); 22–24, *Pseudothysanoes securigerus* (Puerto Rico). (After Blackman 1943:pl. 30.)

DIAGNOSIS.— This species evidently is distinguished from *texanus* Blackman and *xylophagus* Blackman in the female by the shallow, frontal concavity that extends well above the upper level of the eyes; it is provided with a long, uniformly elevated, median carina on its upper half, by the smaller strial punctures, and by the intermediate size and color.

FEMALE.— Length 1.4–1.7 mm, 2.7 times as long as wide; color dark reddish brown.

Frons shallowly, broadly concave from epistoma to well above eyes, upper half with a low, acutely elevated median carina; surface finely, obscurely reticulate and minutely punctured above, smooth and shining on median third of lower half; vestiture fine, moderately long, rather inconspicuous. Antennal scape moderately pubescent.

Pronotum 1.05 times as long as wide; widest just behind middle, sides weakly arcuate on more than basal half, weakly constricted on anterior half, broadly rounded in front; anterior margin unarmed; summit in front of middle, rather high; posterior area strongly reticulate, with a very few minute punctures and granules. Vestiture consisting of a few stout setae, mostly in marginal areas.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; outline as in *inornatus*; striae not impressed, punctures small, rather deep; interstriae shining, rather irregular, about one and one-half times as wide as striae, uniseriately granulate. Declivity steep, convex; strial punctures much smaller, shallow; interstrial granules slightly smaller. Vestiture of rows of minute strial hair and rows of erect interstrial scales; each scale about four to six times as long as wide, spaced within a row by distances equal to length of a scale, between rows by three-fourths length of a scale.

DISTRIBUTION.— Georgia and Florida to Louisiana and possibly Oaxaca.

USA: **Florida**: Monticello, 20-II-57, pecan. **Georgia**: Brunswick, *Quercus*. **Louisiana**: Greenwell Springs, 10-VI-51, *Quercus*, S. L. Wood. **Mississippi**: Picayune, 13-I-45, *Quercus*; Nicholson, 8-XII-44, *Quercus nigra*, 30-I-45, *Castanea pumila*; Trimcane Swamp, 27-III-20; Vicksburg, 5-III-20. MEXICO: **Oaxaca**: Totolapan, 7-VII-53, 1100 m, S. L. Wood.

HOSTS.— *Carya* sp., *Castanea pumila*, *Quercus* sp.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotype and on 65 other specimens, including 3 females taken in Oaxaca. I see no characters that will separate the Oaxaca specimens into distinct taxa. Presumably future collecting will narrow the distributional gap. Blackman's "holotype" in the U.S. National Museum is actually a syntype; it is here designated as the lectotype of this species.

### 15. *Thysanoes xylophagus* Blackman

*Thysanoes xylophagus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Bull. 25:198 (Holotype, female; Williams, Arizona; U.S. Nat. Mus., 27135)

DIAGNOSIS.— This species is distinguished from all other representatives of the genus by the abundant, short, broad interstrial scales, by the long, conspicuous female frontal vestiture, and by the short, strongly elevated, female, frontal carina.

FEMALE.— Length 1.8–2.2 mm, 2.8 times as long as wide; color almost black.

Frons deeply concave on median three-fourths from epistoma to vertex, upper fourth with a short, strongly elevated, median carina; surface finely granulate above, obscurely reticulate in most of concavity, smooth and shining in median area below; vestiture coarse, long, conspicuous, usually concealing upper surface and carina. Antennal scape moderately pubescent.

Pronotum 1.04 times as long as wide; about as described for *lobdelli* except posterior area very finely, densely granulate-punctate. Vestiture of moderately abundant, fine, short, recumbent setae posteriorly, a few scales near summit, a few coarse bristles in asperate area.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; outline as in *inornatus*; striae not impressed, punctures moderately coarse, deep; interstriae somewhat smooth, shining, slightly wider than striae, punctures uniseriate, close fine. Declivity steep, convex; strial punctures less definite, slightly smaller; interstrial punctures finely granulate, granules reduced and confused on lower third.

Vestiture of rows of minute strial hair and rows of erect, interstrial scales; each scale as short or shorter than strial hair, about twice as long as wide, spaced within a row by distances less than length of a scale, between rows by about one and one-third times length of a scale.

MALE.— Similar to female except frontal excavation shallow, less extensive, carina absent; anterior margin of pronotum armed by about 10 teeth; interstrial punctures on disc weakly granulate; interstrial scales slightly shorter, each almost as wide as long.

DISTRIBUTION.— Arizona and New Mexico to Durango.

USA: **Arizona**: Graham Mts., 5-VIII-60, 2400 m, *Quercus*, S. L. Wood; Miller Canyon, Huachuca Mts., 10-VII-62, 7-VI-69, *Quercus*, S. L. Wood; Santa Catalina Mts., 13-IV-08, *Quercus*; Williams, 1, 6-VI, E. A. Schwarz. **New Mexico**: Emery Pass, Gila N.F., 5-VI-69, 2600 m, No. 60, *Quercus*, S. L. Wood; Peloncillo, VI-1907, *Quercus*, J. L. Webb. MEXICO: **Durango**: 37 km W Durango, 4-VI-65, 2000 m, *Quercus*, S. L. Wood.

HOSTS.— *Quercus* spp.

BIOLOGY.— This species usually breeds in twigs of branches girdled by cerambycid beetles. The gallery system is modified into pith tunnels in tiny twigs.

NOTES.— The above treatment was based on 2 paratypes and on 78 other specimens.

## GENUS *PHLOEOCLEPTUS* WOOD

*Phloeocleptus* Wood, 1956, Canadian Ent. 88:147 (Type-species: *Phloeocleptus caudatus* Wood, original designation)

DIAGNOSIS.— This genus superficially resembles *Hylocurus* Eichhoff, but it may be distinguished by the smaller antennal club, with two straight sutures indicated only at the sides, by the absence of tubercles on the posterior face of the prothoracic tibiae, by the phloeophagous habit, and, in those species with declivital interstriae 9 elevated, by the elevated crest of interstriae 9 continuing posteriorly to join costal margin.

DESCRIPTION.— Length 1.0–1.8 mm, 1.4–1.7 times as long as wide; color black. Frons convex, shallowly impressed in one species, not conspicuously dimorphic, simple. Antennal scape short, simple to strongly flattened, conspicuously sexually dimorphic, much more broadly flattened in female; funicle 6-segmented; club small, narrow, widest on basal half, sutures 1 and 2 indicated by setae at sides, entirely obsolete in central area. Pronotum asperate on anterior slope, anterior margin armed in males of some species, females unarmed. Elytra striate-punctate, declivity sexually dimorphic, varying from simple to elaborately adorned in male of one species. Vestiture of fine hair and slender bristles.

DISTRIBUTION.— N Mexico to Costa Rica; 11 species are known.

BIOLOGY.— The species are bigamous and phloeophagous. Parental tunnels include a nuptial chamber that very lightly scores the surface of the wood and two egg galleries that extend in opposite directions from the nuptial chamber parallel to the grain of the wood. The egg galleries stain the surface, but evidently do not engrave the wood; they are tightly packed with frass as the female progresses. The male remains in the nuptial chamber or abandons the tunnel. The egg galleries are unusually long for a beetle of this size. Larval mines wander indiscriminately and vary from short to rather long, presumably depending on environmental conditions. The beetles infest cut or broken branches 1–7 cm in diameter.

NOTES.— Schedl (1959:42) proposed that this genus be made a synonym of *Hylocurus* Eichhoff, presumably without seeing a specimen. Although the male of the type-species bears a superficial resemblance to males of some *Hylocurus*, they are sufficiently distinct anatomically and biologically that two genera can be recognized without hesitation.

### Key to the Species of *Phloeocleptus*

1. Female frons broadly, moderately concave, male (apparently) with at least a slight impression; scape slender, longer than club ..... 2
— Frons convex in both sexes; scape strongly compressed, shorter than club ..... 3

2(1). Vestiture at upper margin of female frontal concavity short, inconspicuous; interstriae on posterior half of disc twice as wide as striae; Tres Marías Islands (Mexico); 1.9–2.0 mm ..... 1. ***tresmariae*** **(Schedl)**

— Vestiture at upper margin of female frontal concavity dense, one-third as long as diameter of concave area; posterior half of discal interstriae narrower than striae; Costa Rica; tree branch; 1.6–1.7 mm ..... 2. ***punctatus*** **Wood**

3(1). Anterior margin of male pronotum unarmed; male discal interstriae devoid of granules ..... 4

— Anterior margin of male pronotum armed by two to four teeth; male discal interstriae uniseriately granulate ..... 5

4(3). Strial punctures on declivity sharply impressed, interstriae 1 and 2 devoid of granules; declivital surface brightly shining; Nayarit; 1.4–1.8 mm ..... 3. ***plagiatus*** **Wood**

— Strial punctures on declivity obscure to obsolete on lower half, interstriae 1 and 2 each with several fine granules; Nayarit; 1.3 mm ..... 4. ***parvus*** **Wood**

5(3). Discal interstriae 9 usually less strongly elevated, elevation apically not joining costal margin; base of male declivity never with a circumdeclivital ring of tubercles; anterior margin of male pronotum with two to four serrations ..... 6

— Declivital interstriae 9 more strongly elevated, elevation apically joining costal margin; base of male declivity (except *nanulus*) with a circumdeclivital ring of tubercles poorly to strongly developed; anterior margin of male pronotum usually armed by four serrations ..... 8

6(5). Declivital interstriae 9 slightly elevated only at base, 2 reduced and without tubercles or interstrial setae except at extreme base; anterior margin of male pronotum armed by two large serrations; San Luis Potosí; *Persea americana*; 1.0–1.2 mm ..... 5. ***obscurus*** **Wood**

— Declivital interstriae 9 moderately elevated, continuing on a descending course to suture (sometimes represented near suture only by granules), 2 armed by tubercles and with interstrial setae at least on upper half; anterior margin of male pronotum armed by two to four serrations ..... 7

7(6). Smaller; declivital interstriae 9 moderately elevated, anterior and posterior ends of crest very gradual; declivity more evenly convex, tubercles on 7 and 8 smaller, extending further from base; strial punctures on disc coarser, interstrial granules larger; Michoacán; *Persea*; 1.1–1.2 mm ..... 6. ***atkinsoni*** **Wood**

— Larger; declivital interstriae 9 strongly elevated, anterior and posterior ends of crest rather abrupt; declivity somewhat impressed in posterolateral areas, tubercles on 7 and 8 larger, nearer base; strial punctures on disc smaller, interstrial granules smaller; Morelos; *Persea*; 1.2–1.4 mm ..... 7. ***cristatus*** **Wood**

8(5). Declivital interstriae 2 armed by a row of fine tubercles, declivital interstrial setae moderately to strongly flattened, at least in male; discal interstriae in male with rather coarse tubercles on more than posterior half; serrations on anterior margin of male pronotum rather coarse, conspicuous ..... 9

— Declivital interstriae 2 unarmed, interstrial setae hairlike in both sexes; male discal interstriae with tubercles much smaller, confined to posterior half; serrations on anterior margin of male pronotum almost obsolete ..... 10

9(8). Male declivity strongly convex, without a circumdeclivital ring of interstrial tubercles; posterolateral margin of declivity feebly serrate; frons convex in both sexes; Nayarit; tree branches; 1.5–1.6 mm ..... 8. ***nanulus*** **Wood**

— Male declivity strongly excavated in lateral areas, with a very strongly elevated, circumdeclivital ring of large nodules; posterolateral margin of declivity rather coarsely serrate in both sexes; female frons shallowly concave in small median area; Puebla; tree branches; 1.4–1.6 mm ..... 9. ***caudatus*** **Wood**

10(8). Frons more strongly convex and moderately punctured; male scape with a sparse tuft of hair; male declivity with interstrial denticles in circumdeclivital row slightly larger and more sharply pointed; Nuevo León; *Persea*; 1.0–1.2 mm ..... 10. ***spicatus*** **Wood**

— Male frons distinctly flattened in central area, punctures sparse, minute; male scape with a large tuft of long hair; tubercles in male circumdeclivital ring smaller, less sharply pointed; Nuevo León; *Persea*; 1.7–1.9 mm ..... 11. ***ardis*** **Wood**

### 1. *Phloeocleptus tresmariae* (Schedl)

*Hylocurus tresmariae* Schedl, 1956, Pan Pacific Ent. 32:32 (Holotype, female?; village on María Madre, Tres Marías Islands, Gulf of California; California Acad. Sci.)

DIAGNOSIS.— Generic characters clearly place this species in *Phloeocleptus* near *plagiatus* Wood. It is distinguished, however, by the slender, elongate scape, by the absence of an elevation on declivital interstriae 9, by the more broadly, evenly convex elytral declivity, and by several other characters.

FEMALE (?).— Length 1.9–2.0 mm, 2.5 times as long as wide; color very dark brown, vestiture almost white.

Frons moderately, rather broadly concave from epistoma to upper level of eyes; surface smooth, shining in concavity, with a few minute punctures, marginal areas subreticulately etched; vestiture very fine, sparse, inconspicuous. Antennal scape long, slender, slightly longer than club, ornamented by several long setae; club with two complete, straight to feebly recurved sutures.

Pronotum 1.07 times as long as wide; widest on basal half, sides weakly arcuate, feebly converging at middle, weakly constricted on anterior half, rather narrowly rounded on unarmed anterior margin; summit at middle, anterior area asperate; posterior area reticulate-granulate behind summit, with a few isolated granules, becoming more finely reticulate with a few, fine punctures laterally. Vestiture of sparse, stout setae.

Elytra 1.4 times as long as wide, 1.4 times as long as pronotum; outline as in *plagiatus*; striae not impressed, punctures moderately coarse, rather deep; interstriae smooth, shining, twice as wide as striae, punctures uniseriate, half as large as those of striae. Declivity steep, evenly convex except for apical mucro; striae indistinctly impressed, punctures slightly smaller; interstriae as wide as striae, each with a uniseriate row of rather coarse, rounded granules. Vestiture of rows of minute strial hair, and rows of erect interstrial scales; each scale about five times as long as wide, spaced between rows by length of a scale, closer within a row.

DISTRIBUTION.— Tres Marías Islands, Gulf of California.

MEXICO: Tres Marías Islands: María Madre, 15-V-25, H. H. Keifer.

NOTES.— The above treatment was based on the holotype and a male paratype. In my opinion the holotype could be a male, not a female as stated by Schedl.

In the original description Schedl clearly designated a holotype that was deposited in the California Academy of Sciences collection along with one male paratype; therefore, the "holotype" and "allotype" in his collection have status only as paratypes, contrary to the labels they bore when I examined them in 1965.

### 2. *Phloeocleptus punctatus* Wood

*Phloeocleptus punctatus* Wood, 1980, Great Basin Nat. 40:355 (Holotype, female; Santa Rosa N.P., Guanacaste Prov., Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *tresmariae* (Schedl) by the slightly smaller size, by the fringe of long setae at the upper margin of the female frontal concavity, by the coarser strial punctures, and by other characters cited below.

MALE.— Length 1.6–1.7 mm (female 1.8 mm), 2.4 (female 2.6) times as long as wide; color very dark brown.

Frons convex, a slight transverse impression just above epistoma; surface rugose-reticulate on lower half, more irregularly rugose above, punctures moderately coarse, rather close. Antennal scape slender, elongate, ornamented by fewer than a dozen long setae.

Pronotum about as in *tresmariae* except anterior margin finely serrate and sparse vestiture on posterior half a mixture of fine, slender hair and stout scales.

Elytral outline about as in *tresmariae*; striae distinctly impressed on posterior third of disc, punctures at base rather small, gradually increasing to twice as large and very deep at base of declivity; interstriae slightly wider than striae at base, narrower than striae at base of declivity, punctures uniseriate, fine at base, becoming replaced by rounded granules near base of declivity. Declivity broadly, strongly convex, steep; strial punctures decrease in size from base, moderately coarse at apex; interstriae as wide as striae on lower half, all uniseriately granulate to apex. Vestiture of erect, uniseriate scales, each three to four times as long as wide, almost as long as distance between rows, spaced within a row by about two-thirds length of a scale.

FEMALE.— Similar to male except more slender; frons moderately concave almost from eye to eye from epistoma to vertex, its surface minutely irregular, punctures fine, obscure, its upper margin ornamented by a dense fringe of long hair, these setae equal in length to about one-third diameter of concave area; scape with a larger tuft of long setae; anterior margin of pronotum unarmed; elytral punctures and granules distinctly smaller, interstrial scales each four to five times as long as wide.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Santa Rosa N.P., Guanacaste Prov., 15-XII-79, 6-I-80, phloem of tree branch, G. Stevens.

NOTES.— The above treatment was based on the type series of five specimens.

### 3. *Phloeocleptus plagiatus* Wood

*Phloeocleptus plagiatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):45 (Holotype, male; 7 km W Tepic, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *obscurus* Wood by the much larger size, by the transverse impression of the lower frons and presence of a low median elevation above, by the absence of teeth on the anterior margin of the male pronotum, and by the somewhat more strongly elevated declivital interstriae 9.

MALE.— Length 1.4–1.8 mm, 1.4 times as long as wide; color very dark brown, almost black in mature specimens.

Frons convex above, a moderate, transverse impression at level of antennal insertion; a short, longitudinal, median carina at upper level of eyes; surface smooth and shining at center below, becoming coarsely reticulate elsewhere, finely punctured toward smooth area, a few fine granules laterally and above; vestiture inconspicuous except near epistoma. Antennal scape short, about two and one-half times as long as wide, bearing a small tuft of hair; club small, two straight sutures indicated by setae only at lateral margins.

Pronotum 1.0 times as long as wide; sides almost straight on posterior half, converging to a feeble constriction just anterior to middle, rather broadly rounded on unarmed anterior margin; anterior slope asperate to summit; summit at middle; posterior area rather coarsely reticulate, with small, isolated granules decreasing in abundance toward basal margin, granules replaced by minute punctures in lateral areas. Vestiture moderately abundant, consisting of stout, hairlike setae, longer in median area behind summit.

Elytra 1.4 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, subacutely mucronate behind; striae feebly if at all impressed, punctures of moderate size and depth; interstriae shining, as wide as striae, punctures fine, uniseriate. Declivity convex, steep; strial punctures reduced, obscured by subgranulate reticulation of entire declivital surface; interstriae each armed on upper half by a series of small tubercles, 1 and 3 feebly elevated, 9 more strongly raised and subcarinate on basal half; apex gradually extended toward poorly developed mucro. Vestiture on disc and declivity consisting of fine, erect strial hair, and slightly longer, moderately stout interstrial bristles; more conspicuous on declivity.

FEMALE.— Similar to male except antennal scape triangular and bearing a larger tuft of hair; elytral vestiture finer and somewhat shorter.

DISTRIBUTION.— Nayarit.

MEXICO: Nayarit: 7 km W Tepic, 13-VII-65, 1000 m, No. 240, S. L. Wood.

BIOLOGY.— Specimens were removed from the cambium region of a cut branch of a large roadside shade tree. The tunnels were biramous, longitudinal, and mostly in the phloem.

NOTES.— The above treatment was based on the type series of 35 specimens.

### 4. *Phloeocleptus parvus* Wood

*Phloeocleptus parvus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):46 (Holotype, male; Los Corchos, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *plagiatus* Wood by the more slender antennal scape, by the presence of several rather large punctures on the base of the pronotum, and by the reduced number of tubercles on the elytral declivity.

MALE.— Length 1.3 mm, 2.6 times as long as wide; color dark brown (probably not fully mature).

Frons not visible. Scape little if any wider than pedicel, about three times as long as wide.

Pronotum 1.16 times as long as wide; widest behind middle, sides feebly arcuate, almost straight and parallel on basal two-thirds, broadly rounded in front; anterior margin unarmed; summit in front of middle; posterior area reticulate, a few small, isolated granules near summit, several moderately large, deep punctures toward basal margin and in entire lateral area; vestiture fine, largely abraded.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; outline and disc as in *plagiatus*. Declivity steep, convex, shining to apex; strial punctures slightly confused; interstriae 1 and 2 unarmed, 2 greatly narrowed near middle, 3 armed by a tubercle at middle and another at junction with 7, 7 also bearing a small tubercle at declivital base, 9 more strongly elevated than in *plagiatus*. Vestiture confined to declivity, consisting of very short strial and moderately long, stout interstrial bristles.

DISTRIBUTION.— Nayarit.

MEXICO: Nayarit: Los Corchos, 10-VII-65, 10 m, No. 206, S. L. Wood.

BIOLOGY.— The type specimen was taken from a broken branch of an unidentified tree.

NOTES.— The above treatment was based on the unique holotype.

### 5. *Phloeocleptus obscurus* Wood

*Phloeocleptus obscurus* Wood, 1956, Canadian Ent. 88:148 (Holotype, male; El Salto, San Luis Potosí, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *nanulus* Wood by the smaller size, by the presence of granules on the upper part of the declivital face, and by other characters mentioned in the above key.

MALE.— Length 1.0–1.2 mm, 2.5 times as long as wide; color dark brown to almost black.

Frons convex, a weak, transverse impression just above epistoma; surface shining, subreticulate on marginal areas, almost smooth at center, with moderately sparse, isolated, minute granules widely distributed; vestiture fine, inconspicuous. Antennal scape short, flattened; club about as in *caudatus* Wood.

Pronotum 1.0 times as long as wide; as in *plagiatus* Wood except anterior margin armed by two coarse teeth, posterior area less distinctly reticulate.

Elytra 1.5 times as long as wide, 1.4 times as long as pronotum; outline as in *plagiatus*; striae not impressed, punctures moderately large, impressed; interstriae shining, narrower than striae, uniseriately granulate. Declivity very steep, convex; strial punctures reduced, rather obscure; interstrial granules extend to upper fourth, obsolete below except extended to near or below middle on 1 and 3, 9 not joining costal margin. Interstrial bristles on declivity slightly longer and distinctly stouter than in *plagiatus*.

FEMALE.— Similar to male except declivital scales wider, more strongly pubescent; anterior margin of pronotum unarmed; interstrial granules almost obsolete on disc.

DISTRIBUTION.— San Luis Potosí.

MEXICO: San Luis Potosí: El Salto, 19-VI-53, Avocado, S. L. Wood.

HOST.— *Persea americana*.

BIOLOGY.— Specimens were taken from small, unthrifty twigs of a living avocado tree.

NOTES.— The above treatment was based on nine paratypes.

### 6. *Phloeocleptus atkinsoni* Wood

*Phloeocleptus atkinsoni* Wood, 1981, Great Basin Nat. 41:124 (Holotype, male; Uruapan, Michoacán, Mexico.

DIAGNOSIS.— This species is distinguished from *obscurus* Wood by the elevated crest of declivital interstriae 9 continuing almost to the suture, by the presence of tubercles on declivital interstriae 2, and by the presence of four serrations on the anterior margin of the pronotum.

MALE.— Length 1.1–1.2 mm, 2.7 times as long as wide; color almost black except summit of pronotum almost reddish brown.

Frons broadly convex; surface apparently finely granulate-punctate.

Pronotum similar to *obscurus* except constriction on anterior half more pronounced and posterior areas conspicuously reticulate-granulate; anterior margin armed by four equal, subcontiguous serrations.

Elytra similar to *obscurus* except strial punctures on disc conspicuously larger, deeper, interstrial granules larger, moderately elevated, crest of interstriae 9 continuing at least to striae 2, declivital interstriae 2 armed by granules and bearing setae similar to those of 1 and 3, vestiture more slender and longer.

FEMALE.— Similar to male except antennal scape more strongly expanded and ornamented by a larger tuft of hair, anterior margin of pronotum unarmed by serrations, and declivital interstriae 9 less strongly elevated.

DISTRIBUTION.— Michoacán.

MEXICO: Michoacán: Uruapan, 17-II-80, No. S-026, 1600 m, *Persea*, T. H. Atkinson.

NOTES.— The above treatment was based on the type series of five specimens.

### 7. *Phloeocleptus cristatus* Wood

*Phloeocleptus cristatus* Wood, 1981, Great Basin Nat. 41:125 (Holotype, male; Tepoztlan, Morelos, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *obscurus* Wood by the larger size and by the very different elytral declivity as described below.

MALE.— Length 1.2–1.4 mm, 2.4 times as long as wide; color almost black except summit of pronotum almost reddish brown.

Frons and pronotum about as in *obscurus* except anterior margin of pronotum armed by four rather widely spaced serrations, lateral pair submarginal.

Elytral disc about as in *obscurus* except most interstrial punctures obscurely or incompletely replaced by granules; declivity more broadly convex, somewhat impressed in ventrolateral areas, interstriae 9 strongly, acutely elevated, anterior and posterior limits of this elevation rather abrupt, elevation ending posteriorly at striae 3 but with tubercles on interstriae 1 and 2 suggesting a continuation of it, interstriae 2 with a row of fine tubercles and setae on upper half, vestiture more slender.

FEMALE.— Similar to male except antennal scape slightly larger and with a larger tuft of setae, anterior margin of pronotum unarmed, declivital interstriae 9 less strongly elevated, more conspicuously serrate.

DISTRIBUTION.— Morelos.

MEXICO: Morelos: Tepoztlan, 20-VI-80, No. S-071, *Persea*, T. H. Atkinson.

NOTES.— The above treatment was based on the type series of five specimens.

### 8. *Phloeocleptus nanulus* Wood

*Phloeocleptus nanulus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):45 (Holotype, male; 7 km W Tepic, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is allied to *caudatus* Wood, but it is much more likely to be confused with *plagiatus* Wood, from which it differs by the uniformly convex frons, by the armed anterior margin of the pronotum in both sexes, by the interstrial granules on the male disc, by the greater development of tubercles at the base of the elytral declivity, and by the more strongly elevated interstriae 9.

MALE.— Length 1.5–1.6 mm, 2.5 times as long as wide; color almost black.

Frons convex except epistomal margin weakly elevated; surface subreticulate, with small isolated granules (except almost smooth in median epistomal area); vestiture inconspicuous. Antennal scape short, about twice as long as wide, bearing a small tuft of hair.

Pronotum 1.0 times as long as wide; outline as in *plagiatus* except anterior margin

armed by four teeth, median pair larger; sculpture as in *plagiatus*, vestiture coarser.

Elytra about 1.6 times as long as wide, 1.6 times as long as pronotum; outline as in *plagiatus*; striae perhaps feebly impressed, punctures rather small, deep, larger posteriorly; interstriae almost as wide as striae, punctures finely granulate (subvulcanate), granules slightly larger near declivity. Declivity steep, convex; as in *plagiatus* except all tubercles slightly larger, particularly those at base of declivity in lateral areas; interstriae 9 much more strongly elevated. Interstrial bristles on declivity longer and coarser than in *plagiatus*.

FEMALE.— Similar to male except antennal scape longer, wider, and bearing a larger tuft of hair; anterior margin of pronotum armed by two small teeth; discal interstriae not granulate; lateral declivital tubercles smaller, interstriae 9 not as strongly elevated; declivital vestiture not as coarse.

DISTRIBUTION.— Nayarit.

MEXICO: Nayarit: 7 km W Tepic, 13-VI-65, 1000 m, No. 240, S. L. Wood.

BIOLOGY.— The type series was taken from the same cut branch that contained the type series of *plagiatus*. The gallery system was similar to *plagiatus*.

NOTES.— The above treatment was based on the type series of three specimens.

### 9. *Phloeocleptus caudatus* Wood

Fig. 145

*Phloeocleptus caudatus* Wood, 1956, Canadian Ent. 88:147 (Holotype, male; 9 km NE Teziutlán, Puebla, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from the allied *nanulus* Wood by the more strongly impressed strial punctures, by the shallowly concave female frons, by the strongly developed circumdeclivital row of tubercles on the male declivity, and by the larger size.

MALE.— Length 1.4–1.6 mm, 2.5 times as long as wide; color black.

Frons as in *obscurus* except somewhat flattened in central area, central area with minute punctures rather than granules. Scape weakly flattened.

Pronotum 1.0 times as long as wide; as in *plagiatus* except anterior margin armed by four teeth and granules behind summit larger.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides straight to widest point at declivital margin, abruptly converging behind to obtusely angulate apical mucro; striae impressed near declivital margin, punctures deep, moderately small at base, gradually increasing posteriorly until very large near declivity; interstriae shining, as wide as striae at base, half as wide at declivital margin, granules at base fine, moderately large toward declivity, last tubercle on each interstriae at declivital margin extremely large, forming part of a circumdeclivital ring. Declivity truncate, very steep, protruding somewhat in median area below; striae 1 and 2 clearly punctured, others confused; interstriae 1, 2, and 3 each bearing on upper half a row of small, pointed tubercles; acute elevation of interstriae 9 joining costal margin and continuing to apex, serrate. Vestiture about as in *plagiatus* but longer and coarser on declivital margin.

FEMALE.— Similar to male except central area of frons shallowly concave; anterior margin of pronotum unarmed; elytra as in female of *obscurus* except strial punctures larger, vestiture longer, and declivity more flattened and impressed in lower, lateral areas.

DISTRIBUTION.— Puebla.

MEXICO: Puebla: 8 km NE Teziutlán, 27-VI-53, 1600 m, S. L. Wood.

BIOLOGY.— Specimens were taken from the cambium region of a broken branch of a roadside tree that superficially resembled magnolia.

NOTES.— The above treatment was based on nine paratypes.

### 10. *Phloeocleptus spicatus* Wood

*Phloeocleptus spicatus* Wood, 1981, Great Basin Nat. 41:125 (Holotype, male; Cerro Chipinque, Monterrey, Nuevo León, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *caudatus* Wood by the smaller size, by the antennal scape being wider than long in both sexes, by the absence of tubercles on declivital striae 2 in both sexes, and by the very different male declivity.

MALE.— Length 1.0–1.2 mm, 2.4 times as long as wide; color almost black except summit of pronotum almost reddish brown.

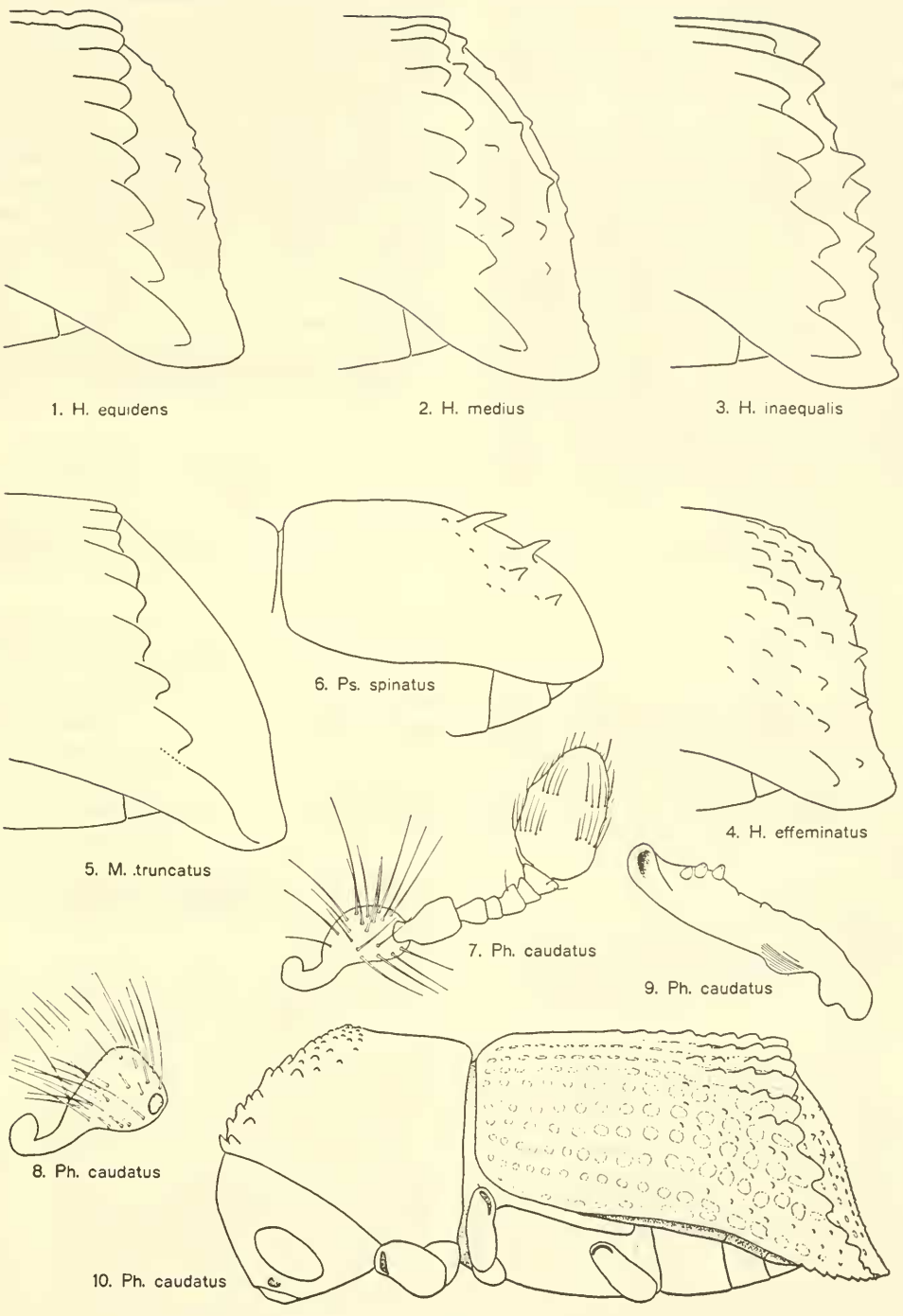



Fig. 145. Micracini spp., elytral declivities, antennae, and protibiae: 1, *Hylocurus equidens*, male; 2, *Hylocurus medius*, male; 3, *Hylocurus inaequalis*, male; 4, *Hylocurus effeminatus*, male; 5, *Micracis lignator* (= *truncatus*), male; 6, *Pseudothysanoes spinatus*, male; 7–10, *Phloeocleptus caudatus*, 7, 10, male, 8–9, female. (After Wood 1956:145.)

Frons broadly convex, finely, unevenly rugose. Antennal scape as wide as long, ornamented by a small tuft of hair.

Pronotum about as in *caudatus* except serrations on anterior margin poorly, irregularly formed.

Elytra with sides almost straight and parallel on basal three-fourths, abruptly subtruncate at declivity, submucronate behind; striae weakly impressed on posterior half of disc, punctures sharply, deeply impressed, increasing in size posteriorly; interstriae slightly wider than striae at base, slightly narrower at base of declivity, punctures small, obscure, apparently uniseriate, granulate near declivity, except on 1 and 2 extending to middle of disc. Declivity moderately abrupt, steep, convex; basal margin with a circumdeclivital ring of moderately large, sharply pointed spines on 2 to 8, spine on 3 positioned slightly behind others, subserrate on 9 to apex; strial punctures continuing to declivity, coarse deep; interstriae 1 and 3 weakly elevated, each with a row of fine denticles on basal half. Vestiture of rows of short strial and longer interstrial hair.

FEMALE.— Similar to male except scape much more strongly widened and with a larger tuft of hair; anterior margin of pronotum unarmed; strial punctures small, not enlarged posteriorly; declivity more gradually, evenly convex, without a circumdeclivital row of spines, interstriae 9 only slightly elevated.

DISTRIBUTION.— Nuevo León.

MEXICO: **Nuevo León**: Cerro Chipinque, Monterrey, 30-I-80, 1300 m, No. S-020, *Persea*, T. H. Atkinson.

NOTES.— The above treatment was based on the type series of four specimens.

### 11. *Phloeocleptus ardis* Wood

*Phloeocleptus ardis* Wood, 1981, Great Basin Nat. 41:124 (Holotype, male; Cerro Chipinque, Monterrey, Nuevo León, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *spicatus* Wood by the larger size, by the slightly flattened, smoother, more finely punctured frons, by the less abrupt, more evenly convex male declivity, and by the smaller circumdeclivital male spines.

MALE.— Length 1.7–1.9 mm, 2.5 times as long as wide; almost black except pronotal summit reddish brown.

Frons as in *spicatus* except central third almost subconcavely impressed, smooth, shining, with a few obscure, minute punctures. Scape broad, with a large tuft of long, yellow hair.

Pronotum as in *spicatus*.

Elytra about as in *spicatus* except discal punctures slightly smaller, base of declivity less abrupt, spines in circumdeclivital ring distinctly smaller, much less sharply pointed, declivital punctures slightly smaller, vestiture finer.

DISTRIBUTION.— Nuevo León.

MEXICO: **Nuevo León**: Cerro Chipinque, Monterrey, 30-I-80, 1300 m, No. S-020, *Persea*, T. H. Atkinson.

NOTES.— The above treatment was based on the type series of five males.

## GENUS *MICRACIS* LECONTE

*Micracis* LeConte, 1868, Trans. Amer. Ent. Soc. 2:164 (Type-species: *Micracis suturalis* LeConte, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:125)

DIAGNOSIS.— This genus is allied to *Hylocurus* Eichhoff and *Micracisella* Blackman, with which it shares the procurved sutures of the antennal club and the strongly acuminate and mucronate elytral apex. It differs from these genera by the more strongly flattened antennal scape, by the much more strongly procurved sutures of the antennal club, and by the more strongly flattened anterior tibiae, with all teeth on the distal margin; its posterior face is smooth. It also differs from *Micracisella* in having the anterior margin of the eye entire.

DESCRIPTION.— Length 1.6–3.4 mm, females averaging very slightly larger than males; females 3.0–3.5, males 2.6–3.0 times as long as wide; color light to dark yellowish or reddish brown.

Frons dimorphic, in females broadly impressed and shallowly to strongly concave from epistoma at least to upper level of eyes, convex in males; sculpture and vestiture conservative. Eye elongate-oval, entire; rather coarsely faceted. Antennal scape rather short, triangularly flattened, strongly so in females, and elaborately ornamented by long hair; funicle 6-segmented; club elongate-oval with two strongly procurved sutures indicated by setae, suture 1 extending one-third to two-thirds club length from base. Pronotum

longer than wide, summit anterior to middle; anterior area asperate; anterior margin armed by eight to 12 teeth in male, often unarmed in female; posterior area variously reticulate, with a few isolated granules. Scutellum large. Elytra with sides straight and parallel on basal three-fourths, strongly acuminate and mucronate behind; declivity confined to posterior fourth; striae usually not at all impressed, punctures fine but always present in rows; interstrial punctures fine, uniseriate, commonly granulate. Declivity steep, convex; conservatively sculptured. Vestiture of rows of very fine, short strial hair, and rows of longer, erect, interstrial setae; interstrial setae hairlike to scalelike.

Anterior coxae contiguous in a few species, separated in most.

DISTRIBUTION.— United States to Panama, South America, and Africa; 18 species are known to occur north of Panama, and several others have been named from South America and Africa.

BIOLOGY.— The habits are basically as in *Thysanoes* and *Hylocurus*. Weakened, unthrifty, broken, or cut branches or seedlings about 2–4 cm in diameter are selected for attack, except up to 15 cm in *lepidus* Wood. The male extends the entrance tunnel through the bark and well into the wood, where an elongated nuptial chamber is formed. He is normally joined by two females, each of which constructs two rather long egg tunnels extending from the ends of the nuptial chamber in a more or less diagonal direction, always in the xylem but most commonly rather close to the cambium. The small eggs are placed in niches. The larvae progress very slowly; their mines almost always parallel the grain of the wood and they usually are rather long for a beetle of this size. Young adults commonly feed just below the cambium for a considerable period of time before emerging through individual exit holes.

Key to the Species of *Micracis*

1. Frons convex in both sexes, female frons often with a large, shining, median elevation on lower half; elytral vestiture partly or entirely of scales, except in *torus*; mostly larger species ..... 2

— Female frons shallowly to very strongly concave from epistoma to upper level of eyes, male frons weakly to strongly impressed on a much smaller area; elytral vestiture of hair or slender scales; mostly smaller species ..... 9

2(1). Female frons evenly convex except for a narrow, shallow, transverse impression just above epistoma; some tubercles on male declivity usually larger; larger species ..... 3

— Female frons with a large, median, brightly shining elevation on lower half; tubercles on male declivity usually smaller; smaller species ..... 7

3(2). Male declivital interstriae 9 very strongly, acutely elevated, other interstriae each with a conspicuous tubercle at base of declivity forming a rather definite circumdeclivital ring; female scape elaborately ornamented by long hair, longest setae three times as long as club; Arizona to Oaxaca; *Quercus*; 2.2–2.8 mm ..... 1. ***lignator*** **Blackman**

— Male declivital interstriae 9 weakly elevated, tubercles on other interstriae smaller, not specially oriented; vestiture on female scape usually less well developed, longest setae seldom as much as twice as long as club (some exceptions in *lignicolus*) ..... 4

4(3). Costal margin at elytral apex ascending abruptly, eliminating terminal mucro; declivital interstriae 3 weakly elevated, in male armed by a row of pointed tubercles; male interstrial nodules at base of declivity, forming a low, indefinite circumdeclivital row; female scape ornamented by abundant, long hair; Chiapas to Honduras; *Quercus*; 2.5–3.3 mm ..... 2. ***lignicolus*** **Wood**

— Costal margin at elytral apex descending or horizontal, terminal mucro well developed; declivital interstriae 3 not elevated, granules rounded; pubescence on female scape much less abundant ..... 5

5(4). Larger; discal striae impressed, interstriae weakly convex; declivital scales less than twice as long as wide; Durango to Hidalgo; *Quercus*; 3.2–3.3 mm ..... 3. ***amplinis*** **Wood**

— Smaller; discal striae not at all impressed, interstriae almost flat; declivital scales more than four times as long as wide (except male *lepidus*) ..... 6

6(5). Pronotal disc in female with shallow punctures, distinct granules in male; interstrial tubercles on declivity larger in both sexes, smaller toward suture; Durango; *Quercus*; 2.0–2.4 mm ..... 4. ***incertus*** **Wood**

— Pronotal disc in both sexes, with a few minute granules; declivital scales in male two to four times as long as wide; interstrial granules almost obsolete in female, small in male, of uniform size; Panama; *Inga*; 2.3–3.0 mm ..... 5. ***lepidus*** **Wood**

7(2). Elytral vestiture of rather short, coarse, hairlike setae, not flattened, strial setae on declivity much shorter but otherwise similar to those of interstriae; female frontal elevation occupying more than median third on lower two-thirds, all margins declivous but none sharply defined; strial punctures fine, shallow; Jalisco, *Quercus*; 1.8–2.2 mm ..... 6. ***torus*** **Wood**

— Elytral vestiture of rows of minute, fine, strial hair and rows of longer, flattened, interstrial scales; female frontal elevation abruptly, angulately margined on lower third; strial punctures rather deep, moderately large ..... 8

8(7). Female frontal elevation occupying median third, sharply defined on lower half, its sides gradually descending on upper half, almost reaching upper level of eyes; suture 1 reaching middle of antennal club; scape narrowly triangular, elaborately ornamented by abundant, long hair; male interstriae near declivity each with two to four rather large, rounded nodules; Durango to Oaxaca; *Quercus*; 2.1–2.7 mm ..... 7. ***evanescens*** **Wood**

— Female frontal elevation ovate, occupying slightly less than median third on lower half, sharply, angulately defined on all sides; suture 1 more broadly arched, not reaching middle of club; scape broadly triangular, almost quadrate, much less elaborately ornamented by long hair; male discal interstriae with a few fine granules near declivital base; Puebla; 1.9–2.4 mm ..... 8. ***ovatus*** **Wood**

9(1). Lower frons in both sexes smooth to epistomal margin, a separate epistoma not evident ..... 10

— Lower frons with a rather conspicuously impressed transverse line between epistomal margin and more or less elevated epistoma (in two species the piece bearing epistomal margin abruptly bent toward mandibles, line seen with difficulty) ..... 13

10(9). Female frons bearing a rather dense tuft of short, white hair on median third between epistomal margin and level of antennal insertion; New York and California to Honduras; many hosts; 1.6–2.2 mm ..... 9. ***swainei*** **Blackman**

— Female frons smooth, shining, and glabrous on median third below level of antennal insertion, a few setae often present in lateral areas near epistoma ..... 11

11(10). Female frons rather deeply, more extensively excavated; female scape more broadly triangular, distance from pedicel insertion to base greater than to apex

of extension; strial and interstrial punctures larger, impressed, discal interstriae subrugose; Chiapas to Costa Rica; *Calliandra*, *Salix*; 2.2–2.8 mm ..... 10. ***grandis*** **Schedl**

— Female frons less strongly excavated; scape narrowly triangular, distance from pedicel insertion to apex of extension greater than to base; strial and interstrial punctures minute, interstriae almost smooth ..... 12

12(11). Female frons toward epistoma moderately protuberant on median third, this area smooth, shining, areas lateral to it minutely reticulate-granulate; anterior margin of female pronotum armed by eight or more small teeth; setae on female vertex short; Chihuahua to Chiapas; 1.8–2.3 mm ..... 11. ***detentus*** **Wood**

— Female frons not protruding on median third, smooth and shining on more than median half; anterior margin of female pronotum unarmed, an occasional small tooth sometimes present; setae on female vertex very long; Costa Rica to Panama; *Rheedia*; 1.6–2.1 mm ..... 12. ***carinulus*** **Wood**

13(9). Female frons less strongly, less extensively excavated, its surface reticulate to reticulate-granulate with fine granules; female epistomal process not forming a sharp margin of concavity, narrow marginal piece between epistomal process and epistomal margin in same plane as lower area of concavity; male interstrial setae either hairlike or scalelike ..... 14

— Female frons rather deeply, extensively excavated to well above eyes, its surface reticulate, with fine punctures, devoid of granules; lower third of female frontal excavation with an additional, shallowly concave area; female epistomal process forming an acute margin of concavity, narrow marginal piece between this process and epistomal margin bent at an abrupt angle to surface of concavity; male interstrial setae on declivity scalelike ..... 17

14(13). Female frons on or immediately above epistomal processes bearing a conspicuous median elevation ..... 15

— Female frons devoid of a median elevation above epistomal process ..... 16

15(14). Epistomal process in both sexes extended into a large, pointed, median tubercle; elytral vestiture of coarse, pointed setae; Michoacán; 2.1–2.7 mm ..... 13. ***unicornis*** **Wood**

— Elevation above epistoma large, transversely folded or ridged, in female only; interstrial setae of blunt scales; Guatemala; 2.0–2.5 mm ..... 14. ***inimicus*** **Wood**

16(14). Strial punctures rather coarse, moderately deep, interstriae about twice as wide as striae; Michigan, E Kansas, and Mississippi to Pennsylvania and Virginia; 2.1–2.5 mm ..... 15. ***suturalis*** **LeConte**

— Strial punctures small, shallow, interstriae about four or more times as wide as striae; epistomal area of female frons virtually glabrous; body more slender, less brightly shining; Chiapas to Honduras; *Calliandra*, *Celtis*; 1.7–2.3 mm ..... 16. ***festivus*** **Wood**

17(13). Female frontal excavation with rather numerous, very shallow, small punctures obscurely indicated; female impression just above epistoma shallow, less well defined; anterior margin of female pronotum finely serrate; strial punctures small; interstriae smooth, shining; Arizona; *Salix*; 1.9–2.5 mm ..... 17. ***carinulatus*** **Wood**

— Female frontal excavation devoid of punctures; female impression just above epistoma abrupt, deeper; anterior margin of female pronotum unarmed; strial punctures minute; interstriae minutely subrugose, subshining; Puebla; *Salix*; 2.2–2.8 mm ..... 18. ***tribulatus*** **Wood**

### 1. *Micracis lignator* Blackman
Figs. 145, 146

*Micracis lignator* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:195 (Holotype, female; Tucson, Arizona; U.S. Nat. Mus., 27134)

*Micracis truncatus* Wood, 1956, Canadian Ent. 88:152 (Holotype, female; 17 km NE Jacala, Hidalgo, Mexico; Snow Ent. Mus., Univ. Kansas); Wood, 1973, Great Basin Nat. 33:178. *Synonymy*

DIAGNOSIS.— This distinctive species in the male has a circumdeclivital row of interstrial tubercles resembling that of some *Hylocurus* species, with no denticles on the convex declivital face; female frons convex and antennal scape rather elaborately ornamented by long hair.

FEMALE.— Length 2.6–2.8 mm (male 2.2–2.7 mm), 3.2 (male 2.9) times as long as wide; color very dark brown.

Frons weakly convex, a feeble, transverse impression just above epistoma; surface reticulate, more coarsely so in upper and lateral areas, a few minute granules above; vestiture sparse below, of abundant, coarse, moderately long setae across area above upper level of eyes. Antennal scape moderately long, rather broadly triangular, extension shorter than distance from pedicel insertion to base, bearing numerous long setae, those at apex of extension more than twice as long as club.

Pronotum 1.25 times as long as wide; sides very feebly arcuate and almost parallel on more than basal half, rather broadly rounded in front; anterior margin or submargin irregularly, finely serrate; summit anterior to middle; anterior area asperate; posterior area rugose-reticulate, dull, a few minute, shining granules toward summit. Vestiture of sparse, elongate scales.

Elytra 2.0 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather broadly rounded behind except apex strongly acuminate; striae not impressed, punctures fine; interstriae shining, minutely irregular, three times as wide as striae, punctures fine, obscure. Declivity steep, convex, apex produced; striae moderately impressed, punctures slightly larger, deeper; interstriae convex, punctures confused, almost as large as those of striae. Vestiture of rows of minute strial hair and rows of erect interstrial scales; each scale about three to five times as long as wide, slightly shorter than distance between rows.

MALE.— Similar to female except frons more strongly convex, with granules over most of its surface; scape weakly triangular, its vestiture greatly reduced; anterior margin of pronotum coarsely serrate; strial punctures slightly larger, interstrial punctures larger, feebly granulate; each interstriae with a strong nodule at base of declivity forming a circumdeclivital ring, interstriae 9 on declivity strongly elevated, apically joining costal margin; declivital interstrial punctures larger, deeper; declivital scales much larger, broader.

DISTRIBUTION.— Arizona to Oaxaca.

USA: **Arizona**: Tucson, Hopk. US 670c, *Quercus*, Chrisman; Miller Canyon, Huachuca Mts., 22-VIII-58, *Quercus*, S. L. Wood. MEXICO: **Durango**: 4 km E El Palmito, 15-VI-71, *Quercus*, D. E. Bright. **Hidalgo**: 17 km NE Jacala, 22-VI-53, 1700 m, *Quercus*, S. L. Wood; 16 km E Pachuca, 10-VI-67, 2700 m, No. 6, *Quercus*, S. L. Wood; 8 km W Tulancingo, 11-VI-67, 2400 m, No. 11, *Quercus*, S. L. Wood. **Oaxaca**: 51 km SE Nochixtlán, 16-VI-67, No. 51, *Quercus*, S. L. Wood. **Querétaro**: 16 km E Landa de Matamoros, 11-VI-71, 1400 m, at light, D. E. Bright. **Tlaxcala**: km 41 Apizaco-Mexico Highway, 9-II-80.

HOSTS.— *Quercus* sp.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotype, on 11 other specimens from Arizona, and 57 from Mexico. As the disjunct distribution suggests, there are small consistent differences between specimens from the two areas; for example, males from the southern area have slightly larger nodules in the circumdeclivital ring, and the elytral disc is smoother in both sexes, etc. In all cases the differences are in the degree of development of a character, not in the kind of characters exhibited.

### 2. *Micracis lignicolus* Wood

*Micracis lignicolus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):41 (Holotype, male; Cerro Peña Blanca, Morazán, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *lignator* Blackman by the less strongly elevated interstriae 9 at the base of the male declivity, and by the less strongly tuberculate interstriae at the margin of the declivity, by the slightly elevated, subserrate, male declivital interstriae 3 on the basal third, by the

different arrangement of setae on the female frons and scape, and by the narrower interstrial scales in both sexes.

MALE.— Length 2.5–3.3 mm, 2.8 (female 3.2) times as long as wide; color reddish brown.

Frons convex above, transversely impressed on lower half, epistomal margin slightly elevated; surface reticulate-granulate, with sparse, smooth granules on convex area; vestiture sparse, limited to lateral areas. Scape about twice as long as pedicel, distal width equal to length, bearing a small tuft of long hair; club 1.8 times as long as wide, suture 1 extending three-fifths of club length from base.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on basal half, weakly constricted just in front of middle, anterior margin rather broadly rounded and armed by 12 teeth; summit at middle, broad; posterior areas reticulate-granulate, punctures fine, inconspicuous, some minutely granulate; vestiture consisting of minute hair and slender scales.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides straight and parallel on basal three-fourths, narrowly rounded behind; striae moderately impressed on posterior third of disc, punctures rather coarse and deep; interstriae as wide as striae, shining, somewhat irregular, punctures uniseriate, rather fine. Declivity rather abrupt, convex, steep; striae not impressed, punctures smaller and squamiferous; interstriae 1–8 each with one or two rounded nodules at base of declivity, about as in *lignator*, 9 weakly elevated but elevation ending just behind base of declivity, 3 bearing a row of about six pointed tubercles on upper two-thirds, 5 bearing two similar tubercles near base; apex extended slightly but terminated by ascending costal margins that form a pseudoemargination; interstrial punctures coarse, two-thirds as large as those of striae, squamiferous. Vestiture consisting of minute strial hair and interstrial rows of slender, erect scales on disc; on declivity strial setae and some interstrial setae form moderately short scales, each about four times as long as wide, other erect, interstrial scales in rows, much longer at declivital base, some more than twice as long as ground scales.

FEMALE.— Similar to male except 3.2 times as long as wide; frons convex to epistoma, median half glabrous, devoid of granules; scape triangularly extended, bearing a much larger tuft of hair, but shorter than in *lignator*; striae not impressed toward declivity; declivity devoid of tubercles or nodules, 3 weakly convex; vestiture less dense on declivity, scales more slender, not longer than on disc.

DISTRIBUTION.— Chiapas to Honduras.

MEXICO: Chiapas: 13 km NE San Cristóbal, 15-V-69, *Quercus*, D. E. Bright. GUATEMALA: Volcán de Agua, 19-V-64, 1000 m, No. 598, S. L. Wood. HONDURAS: Cerro Peña Blanca, Morazán, 23-IV-64, 2000 m, No. 529 in *Miconia schlectendalii*, No. 533 in *Quercus williamsi*, S. L. Wood; Zamorano, Morazán, 18-IV-64, 700 m, No. 539, *Quercus sapotaefolia*, S. L. Wood.

HOSTS.— *Miconia schlectendalii*, *Quercus sapotaefolia*, and *Q. williamsi*.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 57 specimens and on one other specimen; 44 additional specimens from the Chiapas series are in the Canadian National Collection.

### 3. *Micracis amplinis* Wood

*Micracis amplinis* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):25 (Holotype, male; 5 km W El Salto, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This is the largest species in the genus; it is also distinguished from all other representatives of the genus by the moderately impressed discal striae, and by the very broad interstrial scales on the declivity.

MALE.— Length 3.2–3.3 mm, 3.0 times as long as wide; color reddish brown.

Frons convex, with a moderate, transverse impression just above epistoma; surface finely reticulate-granulate, with rather numerous large, low, rounded granules widely distributed on convex area; epistomal area smooth, shining; glabrous except for a few setae lateral to epistoma. Antennal scape only slightly flattened; suture 1 reaching middle of club.

Pronotum 1.03 times as long as wide; widest on basal third, sides weakly arcuate, slightly constricted on anterior third, rather broadly rounded in front; anterior margin armed by 10 coarse serrations; summit in front of middle; anterior area coarsely

serrate; posterior area reticulate-subgranulate, dull, a few small, shining granules to base. A few stout setae in lateral areas.

Elytra 1.8 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on basal three-fourths, strongly, acutely acuminate and mucronate behind; striae impressed except on basal fourth, punctures moderately small, deep; interstriae shining, almost smooth, three times as wide as striae, punctures very minute, almost obsolete, each with two or three large granules at base of declivity. Declivity rather steep, convex, apex produced; entire surface minutely granulose; strial punctures small, deep; interstriae 1 and 3 weakly elevated, punctures on all interstriae as large as those of striae, confused, deep. Vestiture confined to declivity (possibly abraded on disc), of large interstrial scales; each scale about as wide as long, a few as wide as an interstriae.

DISTRIBUTION.— Durango to Hidalgo and Morelos.

MEXICO: **Durango**: 5 km W El Salto, 7-VI-65, 2500 m, No. 41, *Quercus*, S. L. Wood. **Hidalgo**: 7 km E Tlahuelumpa, Zacualtipan, 16-X-80, 2050 m, *Quercus*, T. H. Atkinson. **Morelos**: Xochimilco, X-1979, *Quercus*, T. H. Atkinson.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 2 specimens and on six other specimens.

### 4. *Micracis incertus* Wood

*Micracis incertus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):26 (Holotype, female; 37 km W Durango, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *lepidus* Wood by the presence of a few shallow punctures on the pronotal disc, by the larger interstrial tubercles on the declivity, and by the distribution.

FEMALE.— Length 2.0–2.4 mm, 3.0 times as long as wide; color very dark brown.

Frons convex, a moderate, transverse impression just above epistoma; surface finely reticulate-granulate, dull, upper half with rather abundant, shallow punctures of moderate size; a few stout setae in lateral and epistomal areas. Antennal scape moderately triangular, ornamented by rather abundant, long hair; suture 1 not quite reaching middle of club.

Pronotum 1.1 times as long as wide, as in *amplinus* except moderately large, shallow, rather abundant punctures intermixed with shining granules on disc. Vestiture of sparse scales and minute hair.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; outline as in *amplinis*; striae not impressed, punctures moderately large; interstriae shining, subrugose, twice as wide as striae, punctures moderately large; uniseriate, anterior margins finely granulate. Declivity steep, convex, apex produced; surface dull; strial punctures small, deep, reduced toward apex; interstrial punctures on 1 and 2 fine, irregular and reduced on lower half, on 3 and lateral areas moderately large, rounded. Vestiture of rows of interstrial scales, largely abraded on disc, each scale about five times as long as wide, as long as distance between rows.

MALE.— Similar to female except frons more strongly convex, punctures replaced by granules; discal interstrial granules smaller except larger near declivity, declivital granules larger, extending to apices of 1 and 2; interstrial scales on upper fourth of declivity longer, some six or eight times as long as wide.

DISTRIBUTION.— Durango.

MEXICO: **Durango**: 37 km and 64 km W Durango, 4-VI-65, No. 4 at 2000 m, No. 18 at 2500 m, *Quercus*, S. L. Wood; 5 km W El Salto, 7-VI-65, 2500 m, No. 41, *Quercus*, S. L. Wood.

HOST.— *Quercus* sp.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of eight specimens.

### 5. *Micracis lepidus* Wood

*Micracis lepidus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):41 (Holotype, female; Cerro Punta, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is not closely related to any species known to me, although there may be a remote relationship to *lignator* Blackman. The size, scalelike elytral setae, armed anterior margin of the female pronotum, and the unexcavated female frons distinguish it.

FEMALE.— Length 2.3–3.0 mm, 3.2 (male 2.6) times as long as wide; color dark brown to black with white scales.

Frons convex above, somewhat flattened on lower third; surface reticulate and finely punctured above, smooth, shining on lower part of flattened area; vestiture subplumose, erect, rather abundant to vertex except on shining epistomal area, short below, moderately long above. Scape broadly triangular, ornamented by a marginal fringe of long hair; club 1.6 times as long as wide, suture 1 reaching middle.

Pronotum 1.3 times as long as wide; sides almost straight and parallel on basal half, rather broadly rounded in front; anterior margin armed by 12 low teeth; summit in front of middle, distinct; posterior area reticulate-granulate, very minute granules indicated toward summit in median area; vestiture short, of minute hair and slender scales.

Elytra 2.0 times as long as wide, 1.6 times as long as pronotum; sides straight and parallel on basal three-fourths, rather narrowly mucronate behind; striae not impressed, punctures minute; interstriae about four times as wide as striae, undulating slightly and with numerous indefinite points, punctures fine. Declivity steep, convex, confined to posterior fourth; strial and interstrial punctures of equal size, close, confused, rows of minute granules on all interstriae except 1; apex obtusely mucronate. Vestiture consisting of minute strial hair and erect scales; scales on disc in interstrial rows, more abundant and confused on declivity, each scale three to four times as long as wide; base of declivity also with several pointed bristles longer than scales, sides with some slender, long hair.

MALE.— Similar to female except averaging slightly smaller; 2.6 times as long as wide; frons more strongly convex, not flattened below, surface with many rounded granules; scale less strongly expanded, tuft of hair smaller; teeth on anterior margin of pronotum larger; elytral scales shorter, broader, mostly twice as long as wide, bristles and interstrial hair also scalelike and slightly larger than other scales.

DISTRIBUTION.— Panama.

PANAMA: Cerro Punta, Chiriquí, 19-XII-63, Nos. 315, 371, 387, 404, *Inga*, S. L. Wood.

BIOLOGY.— This species bred in the bole and larger limbs of standing, partly dying trees up to 15 cm in diameter. The gallery system was as described for the genus.

NOTES.— The above treatment was based on the type series of 52 specimens.

### 6. *Micracis torus* Wood

*Micracis torus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):26 (Holotype, female; Volcán Colima., Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the allied *evanescens* Wood by the smaller size, by the stout, hairlike elytral setae, and by the absence of a sharply defined lower margin of the female frontal elevation.

FEMALE.— Length 1.8–2.2 mm, 3.1 (male 2.7) times as long as wide; color dark reddish brown.

Frons planoconvex to vertex, median half on lower half elevated and brightly shining, its margins rounded, not sharply defined, remaining area minutely reticulate-granulate; vestiture fine, short, uniformly distributed on upper area, slightly longer toward vertex. Antenna about as in *evanescens* except hair on scape slightly shorter.

Pronotum 1.2 times as long as wide; as in *evanescens* except reticulation in posterior areas finer.

Elytra 1.8 times as long as wide, 1.4 times as long as pronotum; outline as in *evanescens*; striae not impressed, punctures small, shallow; interstriae about three times as wide as striae, almost smooth, punctures very fine, uniseriate. Declivity steep, convex, apex produced; strial punctures reduced, obscure; interstrial punctures small, indistinct. Vestiture of rows of fine, short, strial hair, and rows of longer, coarse, pointed, interstrial hair; slightly longer on declivity, longest interstrial setae equal in length to distance between rows, all setae somewhat confused on declivity.

MALE.— Similar to female except body stouter; frons convex; a transverse impression on lower third, elevation absent, surface with several rounded granules.

DISTRIBUTION.— Jalisco.

MEXICO: Jalisco: Volcán Colima 23-VI-65, 2500 m, No. 102, leguminous tree, S. L. Wood.

BIOLOGY.— As described for the genus. The host was a leguminous tree with bipinnately compound leaves.

NOTES.— The above treatment was based on the type series of 19 specimens.

### 7. *Micracis evanescens* Wood
Fig. 146

*Micracis evanescens* Wood, 1956, Canadian Ent. 88:152 (Holotype, female; 48 km SW El Salto, Durango, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from the closely allied *ovatus* Wood by the larger size, by suture 1 reaching the middle of the antennal club, and by the much larger, female, frontal elevation, which is not sharply defined above.

FEMALE.— Length 2.1–2.7 mm, 3.2 (male 2.8) times as long as wide; color reddish brown.

Frons weakly convex, with central half occupied by a large, low, smooth, shining elevation, its margins on upper two-thirds descending gradually, abruptly margined on lower third; surface at sides and above reticulate, several isolated granules above; vestiture of coarse setae in marginal areas, longer and more abundant above. Antennal scape narrowly triangular, distance from pedicel insertion to apex of extension almost as long as basal portion, elaborately ornamented by abundant, very long hair; suture 1 reaching middle of club.

Pronotum 1.2 times as long as wide; sides almost straight and parallel on more than basal half, rather broadly rounded in front; anterior margin finely serrate; posterior area reticulate-subgranulate, a few shining granules behind summit. Vestiture of sparse scales.

Elytra 2.0 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal three-fourths, strongly acuminate and mucronate behind; striae not impressed, punctures moderately small; interstriae almost rugose, twice as wide as striae, punctures rather small, uniseriate. Declivity steep, convex, produced at apex; surface granulose, dull; strial punctures reduced in size and depth toward apex; interstrial punctures feebly granulate on 1 and 2, more strongly granulate on 3 and lateral areas. Vestiture of rows of interstrial scales, strial hair almost never visible; each scale about four to six times as long as wide, longest about equal in length to distance between rows.

MALE.— Similar to female except slightly stouter and smaller; frons more strongly convex, granules larger and more widely distributed, elevation absent; scape weakly triangular with few setae; 10–12 teeth on anterior margin of pronotum larger; declivital granules and scales very slightly larger.

DISTRIBUTION.— Durango to Oaxaca.

MEXICO: **Durango**: 48 km SW El Salto, 23-VII-53, 2800 m. **Michoacán**: 33 km W Morelia, 16-VI-65, 2200 m, No. 65, 29 km W Quiroga, 17-VI-65, 2200 m, No. 73. **Oaxaca**: 51 km SE Nichixtlán, 5-VII-53, 2300 m. **Sinaloa**: 32 km NE Copala, 22-VII-53, 1900 m. All from *Quercus*, by me.

HOSTS.— *Quercus* spp.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on 6 paratypes and on 36 other specimens.

### 8. *Micracis ovatus* Wood
Fig. 146

*Micracis ovatus* Wood, 1956, Canadian Ent. 88:150 (Holotype, female; 8 km NE Teziutlan, Puebla, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from the allied *evanescens* Wood by characters summarized in the above key and in the diagnosis of that species.

FEMALE.— Length 1.9–2.4 mm, 3.5 (male 3.0) times as long as wide; color reddish brown.

Frons as in *evanescens* except elevation smaller, higher, occupying less than median third on lower half, its outline ovate, sharply margined on all sides, its summit flat, smooth, shining. Antennal scape broadly triangular, ornamented by long hair; suture 1 not reaching middle of club.

Pronotum 1.35 times as long as wide; about as in *evanescens* except posterior areas more finely reticulate; sparse, short vestiture hairlike.

Elytra 2.3 times as long as wide, 1.7 times as long as pronotum; as in *evanescens* except discal interstriae more nearly smooth and interstrial punctures near declivity granulate; declivital surface obscurely reticulate, interstrial granules on 1 and 2 slightly larger.

MALE.— Similar to female except slightly smaller, stouter; frons convex, finely

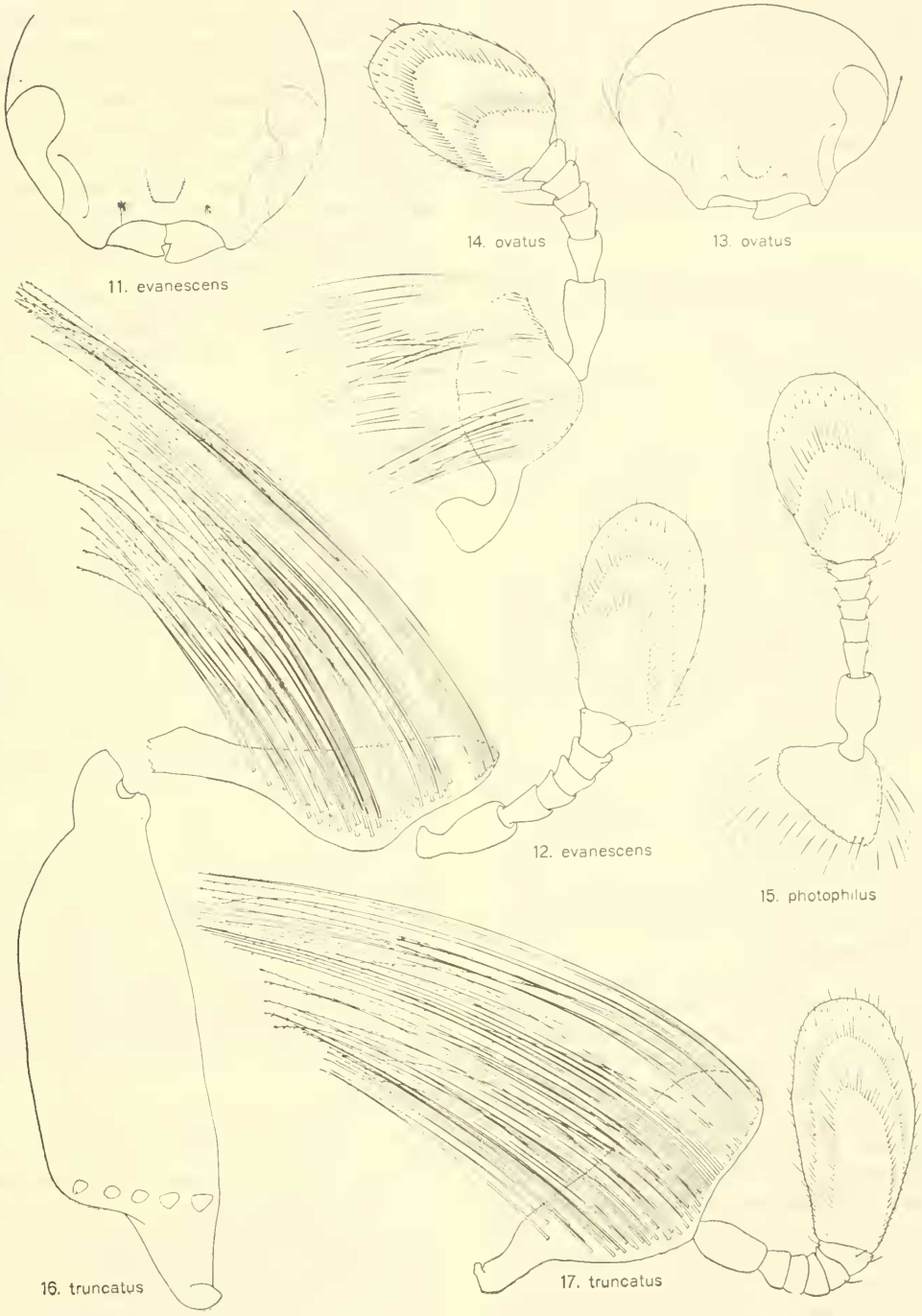



Fig. 146. *Micracis* spp., female heads, antennae, tibiae: 11–12, *evanescens*; 13–14, *ovatus*; 15, *swainei* (=*photophilus*); 16–17, *lignator* (=*truncatus*). (After Wood 1956:151.)

granulate, elevation reduced to a very small epistomal elevation; eight rather coarse teeth arm anterior margin of pronotum; scales on declivity distinctly longer.

DISTRIBUTION.— Puebla.

MEXICO: Puebla: 8 km NE Tezíutlán, 27-VI-53, 2-VII-67, 1600 m, No. 146, S. L. Wood.

BIOLOGY.— As described for the genus. Both series were taken from broken branches of an unidentified tree.

NOTES.— The above treatment was based on 24 paratypes and on 10 other specimens.

### 9. *Micracis swainei* Blackman

Figs. 146, 148–150

*Micracis swainei* Blackman, 1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:32 (Lectotype, female; Iuka, Mississippi; U.S. Nat. Mus., 24735, designated by Wood, 1973, Great Basin Nat. 33:178)

*Micracis populi* Swaine, 1920, *in* Blackman, Mississippi Agric. Expt. Sta. Tech. Bull. 9:31 (Holotype, female; Ithaca, New York; Canadian Nat. Coll., 154); Wood, 1957, Canadian Ent. 89:399. *Synonymy*

*Micracis robustus* Schedl, 1948, Rev. de Ent. 19:576 (Holotype, male; Esmeralda, Chiapas, Mexico; Schedl Coll.); Wood, 1974, Great Basin Nat. 34:283. *Synonymy*

*Micracis pygmaeus* Schedl, 1948, Rev. de Ent. 19:577 (Holotype, male; Huehuetán, Chiapas, Mexico; Schedl Coll.); Wood, 1974, Great Basin Nat. 34:283. *Synonymy*

*Micracis photophilus* Wood, 1956, Canadian Ent. 88:149 (Holotype, female; El Salto, San Luis Potosí, Mexico; Snow Ent. Mus., Univ. Kansas); Wood, 1973, Great Basin Nat. 33:178. *Synonymy*

DIAGNOSIS.— This species evidently is distinguished from *festivus* Wood by the presence of a distinct tuft of pale hair on the female epistoma and by other characters noted in the above key.

FEMALE.— Length 1.6–2.2 mm, 3.2 (male 2.7) times as long as wide; color yellowish brown.

Frons strongly impressed, shallowly concave from epistoma to upper level of eyes; surface reticulate-subrugose, with fine granules above; epistoma with a dense tuft of moderately long yellowish hair, a few setae on marginal areas above. Antennal scape narrowly triangular, bearing numerous long setae; suture 1 not attaining middle of club.

Pronotum 1.3 times as long as wide; as in *suturalis* LeConte except anterior margin unarmed by serrations, posterior area more finely sculptured. Sparse vestiture hairlike.

Elytra 1.9 times as long as wide, 1.4 times as long as pronotum; outline as in *suturalis*; striae not impressed, punctures small, shallow; interstriae smooth, shining, punctures very fine. Declivity steep, convex, apex produced; surface shining, granulate at apex; strial punctures deeper; interstriae about equally, rather finely granulate. Vestiture of moderately coarse hair.

MALE.— Similar to female except slightly smaller, stouter; frons convex on upper two-thirds, granules on convex area; anterior margin of pronotum armed by eight coarse teeth; punctures on discal interstriae finely granulate; elytral vestiture slightly longer.

DISTRIBUTION.— S California, S Ontario, and New York to Florida, Texas, and Honduras.

CANADA: Ontario (Port Colborne). USA: S California, District of Columbia, Florida, Georgia, E Kansas, Louisiana, Maryland, Mississippi, New York, Pennsylvania, Tennessee, Texas, West Virginia. MEXICO: Chiapas, Jalisco, Nayarit, San Luis Potosí, Sinaloa, Veracruz. HONDURAS: Morazán (Zamorano).

HOSTS.— *Baccharus* sp., *Celtis iguanae*, *Cercis canadensis*, *Inga* sp., *Miconia* sp., *Populus* sp., *Salix* spp., *Trichlia arborea*, etc.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the lectotype of *swainei*, on the holotypes of *populi*, *robustus*, and *photophilus*, and on 571 other specimens. The manuscript name *mexicanus* Schedl has appeared in the literature as a nomen nudum in references to this species.

The material south of central Texas has smaller strial punctures, coarser elytral hair, coarser frontal hair, and the female frontal impression does not reach the upper level of the eyes as it does in specimens from the eastern United States. These characters appear to change on a gradual clinal gradient and do not clearly distinguish geographical races.

### 10. *Micracis grandis* Schedl

*Micracis grandis* Schedl, 1948, Rev. de Ent. 19:575 (Holotype, female; San José de Ixtepec, Chiapas, Mexico; Schedl Coll.)

*Micracis costaricensis* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):39 (Holotype, female; Volcán Poas, Heredia, Costa Rica; Wood Coll.); Wood, 1974, Great Basin Nat. 34:283. *Synonymy*

DIAGNOSIS.— This species may be distinguished from the allied *detentus* Wood and

*carinulus* Wood by characters summarized in the above key.

FEMALE.— Length 2.2–2.8 mm, 3.2 (male 2.8) times as long as wide; color rather dark reddish brown.

Frons strongly, transversely impressed and slightly concave from epistoma to well above eyes, upper half of impressed area with a fine, low, median carina; surface coarsely reticulate except smooth just above epistoma; vestiture consisting of sparse, short setae in reticulate area, with a fringe of long subplumose hair along margin of impressed area above level of eyes. Scape flattened, triangular, ornamented by a fringe of long hair; sutures of club strongly procurved, 1 reaching middle, 2 extending three-fourths of club length from its base.

Pronotum 1.3 times as long as wide; widest on basal half, sides almost straight and parallel on slightly more than basal half, rather broadly rounded in front; anterior margin armed by 12 rather coarse, isolated teeth; summit in front of middle; rather coarsely reticulate behind summit with rather sparse, fine, subgranulate punctures. Vestiture consisting of rather short, stout, delicate white setae.

Elytra 1.9 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather broadly rounded behind to short, projecting sutural apex; striae not impressed, punctures small, shallow, distinct; interstriae about three times as wide as striae, irregular, punctures and other features obscured by irregular surface features. Declivity evenly convex, very steep; striae slightly impressed, punctures deeper than on disc; interstriae weakly convex, with lower half of 2 somewhat impressed; all interstriae bearing median rows of fine, rounded granules, those in lateral areas a little larger; terminal mucro as in other species of this genus. Vestiture consisting of rows of fine strial hair and delicate, very slender interstrial scales of equal length; each scale almost equal in length to distance between rows of scales; easily abraded.

MALE.— Similar to female except slightly smaller, 2.4 mm, stouter, 2.8 times as long as wide; frons convex with a slight transverse impression just above epistoma, surface finely granulate, vestiture greatly reduced; scape not dilated, tuft of hair almost obsolete; pronotum and elytra very slightly more coarsely sculptured.

DISTRIBUTION.— Chiapas to Costa Rica.

MEXICO: Chiapas: San José de Ixtepec. HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 559, *Salix guatemalensis*, S. L. Wood. COSTA RICA: Volcán Poas, Heredia, 19-VI-66, 2000 m, No. 7, leguminous shrub, S. L. Wood; Santa Ana, San José, 4-X-63, 1400 m, No. 226, *Calliandra confusa*, S. L. Wood; San Ignacio de Acosta, San José, 5-VII-63, 1500 m, No. 25, *Calliandra confusa*, S. L. Wood; Tapantí, Cartago, 17-VIII-63, 1400 m, No. 102, *Calliandra confusa*, S. L. Wood.

HOSTS.— *Calliandra confusa*, and *Salix guatemalensis*.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotype of *grandis*, on 89 specimens in the type series of *costaricensis*, and on 11 other specimens.

### 11. *Micracis detentus* Wood

*Micracis detentus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):42 (Holotype, female; 24 km S Mazamitla, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is very closely related to *carinulus* Wood, but it may be distinguished by the larger size, by the larger granules behind the pronotal summit, by the more deeply impressed female frons with a more prominent median elevation below, and by the coarser interstrial bristles on the declivity.

FEMALE.— Length 1.8–2.3 mm, 3.2 (male 2.7) times as long as wide; color yellowish brown.

Frons transversely, subconcavely impressed from epistoma to upper level of eyes, median third of epistoma moderately elevated, smooth, impunctate, shining elevation extending about one-third of distance to upper level of eyes; remaining surface reticulate-granulate, punctures minute, obscure; vestiture of minute subplumose hair, becoming longer toward upper margin of impression. Scape narrowly triangular, ornamented by a tuft of long hair; club 1.7 times as long as wide, suture 1 extending slightly beyond middle.

Pronotum 1.3 times as long as wide; sides straight and parallel on slightly more than basal half, rather broadly rounded in front; anterior margin unarmed; summit in front of middle; posterior area reticulate-granulate,

with rather sparse, fine, isolated granules; vestiture hairlike, inconspicuous.

Elytra 2.0 times as long as wide, 1.6 times as long as pronotum; sides straight and parallel on basal three-fourths, acuminate behind; striae not impressed, punctures small, distinct; interstriae at least twice as wide as striae, with lines and points, punctures uniseriate, very fine. Declivity steep, convex, confined to posterior fourth; surface minutely granulose, strial punctures deeper but somewhat obscure; interstrial punctures replaced by fine granules; apex rather strongly acuminate. Vestiture consisting of very fine strial hair and rows of erect, interstrial bristles, slightly longer and coarser on declivity; each bristle on declivity slightly longer than distance between rows.

MALE.— Similar to female except 2.7 times as long as wide; frons convex above, a moderate transverse impression on lower half, median elevation obsolete; scape not as wide as long, bearing a small tuft of shorter hair; anterior margin of pronotum armed by eight teeth; declivital vestiture slightly coarser.

DISTRIBUTION.— Chihuahua to Chiapas.

MEXICO: **Chiapas**: 13 km N Ocosingo, 2-VI-69, *Salix*, D. E. Bright. **Chihuahua**: Maguarichic, 13-VII-60, at light, S. L. Wood. **Jalisco**: 8 km S Atenquique, 25-VI-65, 1000 m, No. 118, shrub, S. L. Wood; 24 km S Mazamitla, 22-VI-25, 2500 m, No. 94, leguminous tree, S. L. Wood.

HOST.— *Salix* sp., etc.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 20 specimens and on 6 other specimens.

### 12. *Micracis carinulus* Wood

*Micracis carinulus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):40 (Holotype, female; Playón, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— Similar to *grandis* Schedl, but smaller, the declivital striae not impressed, the impression of the female frons not reaching the upper level of the eyes, with the median carina rather sharply elevated.

FEMALE.— Length 1.6–2.1 mm, 3.1 times as long as wide; color yellowish brown.

Frons broadly concave from epistoma to upper level of eyes, upper half divided by a fine, low carina, surface smooth and shining just above epistoma, then finely punctured and becoming coarsely reticulate on upper half; vestiture consisting of short, stout, close setae in concave area, and long, curved, subplumose hairs along upper margin of concavity. Antenna as in *grandis* except wider.

Pronotum as in *grandis* except anterior margin unarmed.

Elytra as in *grandis* except surface of disc a little more irregular and strial punctures less distinct. Declivity evenly convex except for terminal mucro; strial punctures very slightly impressed; interstriae with small, rather obscure granules. Vestiture consisting of moderately long, rather abundant, coarse strial and interstrial setae; those on median row of each interstriae slightly longer.

MALE.— Similar to female except frons convex and finely granulate, with a slight transverse impression above epistoma; scape less strongly dilated; anterior margin of pronotum armed by about eight small serrations; median rows of elytral setae more nearly scalelike.

DISTRIBUTION.— Costa Rica and Panama.

COSTA RICA: Playón, Puntarenas, 22-II-64, 50 m, No. 450, *Rheedia edulis*, S. L. Wood. PANAMA: Ft. Clayton, Canal Zone, 22-XII-63, 30 m, No. 331, S. L. Wood.

HOST.— *Rheedia edulis*

BIOLOGY.— This species was taken from branches 2–6 cm in diameter. The galleries were as described for the genus.

NOTES.— The above treatment was based on the type series of 22 specimens.

### 13. *Micracis unicornis* Wood

*Micracis unicornis* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):42 (Holotype, male; 6 km W Quiroga, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This unique species evidently is somewhat allied to *inimicus* Wood, although the relationship appears remote. It is distinguished by the large, pointed epistomal tubercle in both sexes, and by other characters mentioned in the above key.

FEMALE.— Length 2.1–2.7 mm, 3.2 (male 2.9) times as long as wide; color dark reddish brown.

Frons moderately concave from epistoma to slightly above eyes; epistoma armed by a large, pointed, median tubercle; surface reticulate, almost subrugose, a few minute granules obscurely indicated in marginal areas; vestiture rather sparse, fine, except longer

toward vertex. Antennal scape rather broadly triangular, rather sparsely ornamented by long hair; suture 1 exceeding middle of club.

Pronotum 1.3 times as long as wide; sides straight and parallel on basal two-thirds, broadly rounded on unarmed anterior margin; posterior area reticulate, with moderately coarse granules almost to base. Vestiture of rather coarse hair.

Elytra 1.9 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal three-fourths, obtusely produced and mucronate behind; striae not impressed, punctures small, shallow, interstriae almost smooth, about three times as wide as striae, punctures fine. Declivity steep, convex, apex acuminately produced; surface obscurely reticulate; strial punctures as large but deeper than on disc; interstrial punctures very finely, obscurely impressed on 1 and 2, more coarsely granulate on 3 and lateral areas. Vestiture of rows of fine, short, strial hair and rows of longer, much coarser, pointed interstrial hair.

MALE.— Similar to female except very slightly smaller, stouter; frons convex, a rather strong, transverse impression just above epistomal tubercle, a strong median fovea in impression; scape less strongly expanded, 10 teeth arm anterior margin of pronotum.

DISTRIBUTION.— Michoacán.

MEXICO: **Michoacán**: 6 km W Quiroga, 17-VI-65, Nos. 67, 72, shrubs, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the 2 males in the type series and on 30 other specimens.

### 14. *Micracis inimicus* Wood

*Micracis inimicus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):42 (Holotype, female; Volcán de Agua, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— Evidently this species is allied to *festivus* Wood, but it may be distinguished by characters summarized in the above key.

FEMALE.— Length 2.0–2.5 mm, 3.5 (male 2.7) times as long as wide; color medium to dark brown.

Frons broadly concave to upper level of eyes, lower third with unusual sculpture; epistomal margin slightly elevated, smooth on a narrow band on median fourth, then a slight, narrow ridge, then above this a narrow, transverse, slit-like impression, rather strongly abruptly, transversely elevated above impression on more than median half, upper slope of this elevation marked by two or three minute, transverse ridges in its gradual descent to concavity; vestiture short, sparse, inconspicuous; surface reticulate-granulate. Scape narrowly triangular, ornamented by a tuft of long hair; club 1.9 times as long as wide, widest on distal half, suture 1 extending two-thirds of club length from base.

Pronotum 1.3 times as long as wide; as in *detentus* Wood, except some setae stout, almost scalelike.

Elytra 2.1 times as long as wide, 1.75 times as long as pronotum; outline and disc as in *detentus* except strial punctures rather obscure. Declivity steep, convex, confined to posterior fourth; striae weakly impressed, punctures larger, deeper; interstrial punctures subgranulate, except reduced on 2; granules larger in some paratypes. Vestiture consisting of very fine strial hair and rows of erect interstrial scales, slightly longer on declivity; each scale on declivity as long as distance between scales, spaced more closely within each row, truncate at their apices, each about five times as long as wide.

MALE.— Similar to the female except 2.7 times as long as wide; frons convex, transversely impressed on lower half, epistoma elevated on median third, without elaborate sculpture of female; anterior margin of pronotum armed by six teeth; declivital tubercles more distinct except on interstriae 2 and 3.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán de Agua, Esquintla, 19-V-64, 1000 m, No. 603, shrub, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 23 specimens.

### 15. *Micracis suturalis* LeConte

Figs. 148–150

*Micracis suturalis* LeConte, 1868, Trans. Amer. Ent. Soc. 2:165 (Lectotype, female; Illinois; Mus. Comp. Zool., 1014, designated by Wood, 1973, Great Basin Nat. 33:179)

*Micracis aculeata* LeConte, 1868, Trans. Amer. Ent. Soc. 2:165 (Lectotype, male; Virginia; Mus. Comp. Zool., 1013, present designation); Blackman,

1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:29. *Synonymy*

*Micracis meridianus* Blackman, 1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:29 (Lectotype, female; Agricultural College, Mississippi; U.S. Nat. Mus., 24733, designated by Wood, 1973, Great Basin Nat. 33:179)

DIAGNOSIS.— Within the species group having an obscure median carina on the upper half of the female frontal concavity, this species is distinguished by the rather coarse strial punctures, by the somewhat larger size, and by the distribution.

FEMALE.— Length 2.1–2.5 mm, 3.2 (male 2.8) times as long as wide; color very dark reddish brown.

Frons broadly, rather shallowly concave from epistoma to above eyes, upper third with an obscure median carina; surface reticulate, almost rugose except shining on median third below level of antennal insertion. Antennal scape broadly triangular, ornamented by abundant, long hair; suture 1 reaching middle of club.

Pronotum 1.2 times as long as wide; sides almost straight and parallel on basal two-thirds, rather narrowly rounded in front; anterior margin irregularly armed by about eight small serrations; posterior area reticulate, with a few isolated, small granules.

Elytra 2.0 times as long as wide, 1.6 times as long as pronotum; sides straight and parallel on basal three-fourths, acuminately produced at apex; striae not impressed, punctures moderately fine, impressed; interstriae shining, slightly irregular, less than twice as wide as striae, punctures fine, shallow. Declivity steep, convex, apex produced; surface less shining; strial punctures smaller, deeper; interstriae 1 and 3 weakly elevated, punctures on 1 and 2 feebly granulate, those on 3 and lateral areas larger. Vestiture of rather fine, short strial and interstrial hair.

MALE.— Similar to female except slightly stouter; frons convex on upper half, granules on convex area large; scape less strongly flattened, with fewer setae; anterior margin of pronotum more coarsely serrate; interstrial punctures on disc rather finely granulate to base; declivital granules slightly larger; interstrial setae scalelike, each scale about four to six times as long as wide.

DISTRIBUTION.— Michigan, Kansas, and Mississippi to the Atlantic Coast.

USA: Illinois, Kansas, Maryland, Michigan, Mississippi, Ohio, Pennsylvania, Virginia, West Virginia.

HOST.— *Cercis canadensis.*

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the syntypes of *suturalis, aculeata*, and *meridianus* and on 139 other specimens. It might also be construed that *aculeata* was based on more than one specimen, because of LeConte's use of "Southern States" instead of Virginia, where the only specimen now in his collection and fitting his description was taken. As the lectotype of *aculeata* LeConte, I designate the male from "Va." in the LeConte collection and bearing type No. 1013. To my knowledge this male is the only known original specimen; it is designated a lectotype only because LeConte did not state how many specimens were in his series and because he used "Southern States" (plural) instead of Virginia, as indicated on his specimen.

### 16. *Micracis festivus* Wood

*Micracis festivus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):43 (Holotype, female; Zamorano, Morazán, Honduras; Wood Coll.)

DIAGNOSIS.— Apparently the only known species allied to this one is *inimicus* Wood, but it is easily distinguished by the slender elytral setae and by the very different frontal sculpture of the female.

FEMALE.— Length 1.7–2.3 mm, 3.4 (male 2.7) times as long as wide; color dark brown.

Frons concavely impressed from epistoma to above upper level of eyes; epistomal margin elevated, median half with a narrow, slitlike impression just above margin and a low, elevated, transverse, subcarinate ridge immediately above slit; surface reticulate-granulate, punctures fine, obscure; vestiture sparse, fine, short below, longer above. Scape narrowly triangular, ornamented by a tuft of long hair; club 1.6 times as long as wide, suture 1 extending beyond middle.

Pronotum 1.2 times as long as wide; as in *detentus* Wood except granules in posterior areas larger and anterior margin armed by six small teeth.

Elytra 2.1 times as long as wide, 1.8 times as long as pronotum; outline and disc as in *detentus* except strial punctures very slightly deeper. Declivity steep, convex, confined to

posterior fourth; striae feebly impressed, punctures deeper and slightly larger than on disc; interstriae each armed by a row of rounded granules similar to but slightly larger than in *inimicus*; apex strongly acuminate or mucronate. Vestiture consisting of fine strial hair and rows of longer interstrial bristles, slightly longer on declivity; each bristle up to one and one-half times as long as distance between rows of bristles, more closely spaced within each row.

MALE.— Similar to female except 2.7 times as long as wide; frons as in male of *inimicus*; interstrial punctures on disc as large as those of striae, very feebly granulate; strial punctures smaller on disc and declivity, somewhat obscure on declivity; vestiture with interstrial setae on disc rather narrowly scalelike, truncate, those on declivity longer, more slender and almost pointed at their apices.

DISTRIBUTION.— Chiapas to Honduras.

MEXICO: Chiapas: 13 km N Ocosingo, 2-VI-69, *Salix*, D. E. Bright. HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 506 in *Celtis iguanae*, No. 534 in *Calliandra houstoniana*, S. L. Wood.

HOSTS.— *Calliandra houstoniana*, *Celtis iguanae*.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 32 specimens and on one other specimen.

### 17. *Micracis carinulatus* Wood

*Micracis carinulatus* Wood, 1960, Great Basin Nat. 20:62 (Holotype, female; Cave Creek Canyon, Chiricahua Mts., Arizona; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *tribulatus* Wood by characters summarized in the above key. These two species are unique in having the female frons very strongly excavated and an additional impression just above the epistoma.

FEMALE.— Length 1.9–2.5 mm, 3.2 (male 2.8) times as long as wide; color dark reddish brown.

Frons very strongly impressed, moderately concave from epistoma to vertex, median half of lower third with an additional impression, median line on upper third acutely carinate; surface reticulate, with fine, distinct punctures; epistoma acutely raised at lower limits of concavity, a narrow piece bearing epistomal margin acutely separated from frontal area; vestiture fine, short, sparse, except very long on vertex. Antennal scape rather broadly triangular, extended portion longer than basal area measured from point of pedicel insertion, with numerous setae; suture 1 not reaching middle of club.

Pronotum 1.3 times as long as wide; as in *suturalis* except posterior area shining, subreticulate, vestiture of fine and stout setae.

Elytra 2.0 times as long as wide, 1.7 times as long as pronotum; outline as in *suturalis*; striae not impressed, punctures moderately coarse, rather deep; interstriae one and one-half times as wide as striae, shining, smooth, punctures fine, feebly granulate. Declivity steep, convex, apex produced; surface subshining; strial punctures slightly smaller; interstrial granules minute on 1 and 2, moderately large on 3 and lateral areas. Vestiture of rows of minute strial hair and rows of long bristles, some almost scalelike.

MALE.— Similar to female except frons moderately convex except for median impression on lower half, epistomal margin as in female; scape much less strongly flattened, sparsely pubescent; anterior margin of pronotum armed by 8–10 coarse teeth; interstrial granules slightly larger on disc and declivity; interstrial scales longer, about eight times as long as wide.

DISTRIBUTION.— Arizona.

USA: Arizona: Oak Creek Canyon, Coconino Co., 1-VIII-62, *Salix*, S. L. Wood; Cave Creek Canyon, Chiricahua Mts., 4-VIII-60, *Salix*, S. L. Wood; Sabino Canyon, Pima Co., 6-VIII-68, *Salix*, D. E. Bright.

HOST.— *Salix*.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 66 specimens and on 16 other specimens.

### 18. *Micracis tribulatus* Wood

*Micracis tribulatus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):40 (Holotype, female; 26 km W Texmelucan, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is very closely related to *carinulatus* Wood, from which it is distinguished by characters summarized in the above key and in the following description.

FEMALE.— Length 2.2–2.8 mm, 3.6 (male 2.9) times as long as wide; color very dark brown.

Frons as in *carinulatus* except punctures not evident, and impression on lower third more abrupt and deeper. Antenna as in *carinulatus*. Pronotum as in *carinulatus* except posterior area strongly reticulate, dull. Elytra as in *carinulatus* except strial punctures very small, interstriae four times as wide as striae.

MALE.— Similar to male of *carinulatus* except pronotal disc more strongly reticulate, dull; strial punctures and interstrial granules on disc much smaller.

DISTRIBUTION.— Puebla.

MEXICO: **Puebla**: 25 km W Texmelucan, 13-VI-67, 2900 m, No. 29, *Salix*, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 11 specimens.

## GENUS *MICRACISELLA* BLACKMAN

*Pseudomicracis* Blackman, 1920 (December) (nec Eggers, 1920), Mississippi Agric. Expt. Sta. Tech. Bull. 9:20 (Type-species: *Micracis opacicollis* LeConte, original designation)

*Micracisella* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Bull. 25:192. *Replacement name*

DIAGNOSIS.— This genus is closely related to *Micracis* LeConte and, although it is not easily characterized, biologically it is very distinct. From *Micracis* it is distinguished by the smaller size of most species, by the emarginate eyes, by the extremely large eyes of several species, by the stouter antennal club with sutures 1 and 2 more broadly arched, suture 1 never exceeding the middle of the club, by the poorly developed, often divaricate sutural apex of the elytra, and by the presence of at least one tooth on the outer apical margin of the protibia. The frontal vestiture is one of the most distinctive generic characters; also the antennal scape is short, and feebly if at all flattened in either sex.

DESCRIPTION.— Length 1.2–2.5 mm, 2.8–3.2 times as long as wide; color yellowish brown to black.

Frons usually sexually dimorphic, female convex to shallowly concave, impression usually less pronounced, less extensive or sculpture coarser in male, frontal vestiture short to moderately long, not abundant or uniquely arranged. Eye emarginate, varying from normal to exceedingly large and coarsely faceted. Antennal scape short, not flattened, ornamented by a large tuft of hair in female, a small tuft in male; funicle 6-segmented; club about one and one-half times as long as wide, two sutures clearly indicated by setae, suture 1 never extending beyond middle of club. Pronotum rather conservatively sculptured, anterior margin armed by two to six teeth. Scutellum present. Elytra elongate, weakly striate, apex slightly produced, usually not clearly mucronate in any species, weakly divaricate in some. Anterior tibiae moderately flattened, with five subapical teeth, at least one of these on lateral margin.

DISTRIBUTION.— United States to Colombia; 20 species are known from North and Central America, one of which also occurs in Colombia.

BIOLOGY.— All species breed in cut, broken, or dying twigs smaller than 1 cm in diameter. The beetles are monogamous. The male constructs the entrance tunnel and a small pith cavity. The pith tunnel is extended in both directions by the female; a few eggs are deposited along its margins, evidently in indefinite niches. The larvae extend the pith tunnel in congress, often entirely consuming the available pith. A pair of adults rarely produces more than a dozen offspring.

### Key to the Species of *Micracisella*

| | | |
|---|---|---|
| 1. | Anterior margin of pronotum armed by four (six in *adnata*) teeth; elytral apex usually more acutely mucronate; eyes commonly elongate, often very narrowly separated below | 2 |
| — | Anterior margin of pronotum armed by two basally contiguous teeth (widely separated in *squamatula*); elytral apex commonly weakly to strongly devaricate, mucro usually absent; eyes usually shorter, more widely separated below | 12 |
| 2(1). | Eyes rather finely faceted, little more than twice as long as wide, separated below by a distance at least as great as width of an eye | 3 |
| — | Eyes very coarsely faceted, about three times as long as wide, very narrowly separated below by a distance less than half width of an eye | 9 |

3(2). Declivital interstriae 2 devoid of granules, 3 and usually 1 uniseriately granulate and/or slightly elevated; larger species except *subnitida* ..... 4

— Declivital interstriae 2 similar in sculpture to 1 and 3, each with a row of small granules; smaller species ..... 7

4(3). Anterior margin of pronotum armed by six teeth; declivital interstriae 3 not at all elevated; interstrial scales on declivity less than three times as long as wide; Veracruz; *Quercus*; 1.9–2.0 mm ..... 1. ***adnata*** **Wood**

— Anterior margin of pronotum armed by four teeth (six in *mimetica*); declivital interstriae 3 distinctly, rather weakly elevated or not; interstrial scales on declivity more than six times as long as wide ..... 5

5(4). Declivital interstriae 3 very feebly elevated; frons weakly, transversely impressed on lower third, several conspicuous granules on upper area, pubescence inconspicuous; elytral vestiture shorter, more slender, not conspicuously different on declivity; Arizona, New Mexico; 1.7 mm ..... 2. ***subnitida*** **Blackman**

— Declivital interstriae 3 distinctly elevated; frons without an evident impression, vestiture rather abundant; elytral vestiture longer, broader, conspicuously longer on declivity ..... 6

6(5). Upper two-thirds of frons with about 30 granules; elytral scales shorter, broader; denticles on declivital interstriae 3 smaller to obsolete; Oaxaca; mistletoe on *Quercus*; 2.3–2.4 mm ..... 3. ***mimetica*** **Wood**

— Upper frons without granules; elytral scales longer, more slender; declivital interstriae 3 more coarsely serrate; Arizona to Michoacán and Hidalgo; *Quercus*; 2.0–2.5 mm ..... 4. ***knulli*** **(Blackman)**

7(3). Declivital striae deeply impressed; strial punctures on disc rather coarse, each puncture with its central point elevated, giving appearance of an eye; Oaxaca; *Arbutus*; 1.9–2.3 mm ..... 5. ***ocellata*** **Wood**

— Declivital striae not impressed; strial punctures on disc smaller, normally concave ..... 8

8(7). Strial punctures very small, shallow, interstriae more than twice as wide as striae; interstrial scales about four to six times as long as wide; Michoacán and Puebla to Chiapas; *Arbutus*, *Rubus*; 1.7–2.2 mm ..... 6. ***nitidula*** **Wood**

— Strial punctures moderately large, distinctly impressed, interstriae as wide as striae; interstrial scales about three times as long as wide; Veracruz; *Quercus*; 1.5 mm ..... 7. ***scitula*** **Wood**

9(2). Strial punctures small, but distinctly larger, impressed; interstrial punctures on declivity smaller than those of striae, obsolete in some females, devoid of granules; Chiapas to Honduras; 1.4–1.8 mm ..... 8. ***hondurensis*** **Wood**

— Strial punctures minute, shallow; strial and interstrial punctures on declivity rather deeply impressed, subequal in size ..... 10

10(9). Declivital interstriae devoid of granules; scales on declivital interstriae 3 moderately to very strongly confused, each scale about two to four times as long as wide; Minnesota and Massachusetts to Kansas and North Carolina; many hosts; 1.6–1.9 mm ..... 11. ***opacicollis*** **(LeConte)**

— Declivital interstriae 3 and occasionally others uniseriately granulate; declivital scales in definite rows, except supplemental scales at suture, each scale two to six times as long as wide ..... 11

11(10). Declivital scales four to six times as long as wide; setae on epistoma, frons and scape less abundant, finer; body 3.1–3.2 times as long as wide; South Carolina and Florida to E Texas; 1.5–1.7 mm ..... 9. ***nanula*** **(LeConte)**

— Declivital scales two to three times as long as wide; setae on epistoma, frons, and scape more abundant, longer; body 2.9–3.0 times as long as wide; S Texas to Veracruz; 1.7–1.9 mm ..... 10. ***opacithorax*** **Schedl**

12(1). Strial punctures on disc fine to moderately large, distinctly, concavely impressed; interstriae up to one and one-half times as wide as striae; color usually light to dark brown ..... 13

— Strial punctures minute, feebly if at all impressed, their interiors flat; interstriae two to four times as wide as striae; color entirely or mostly black ..... 17

13(12). Strial punctures on disc coarse, rather deep, interstriae very slightly narrower than striae; interstrial punctures very small, diameters less than one-third those of strial punctures, regularly spaced, rather close; frons convex in both sexes, very finely sculptured, reticulate, vestiture confined to lateral areas near eyes, very short; Oaxaca to Honduras; various lianas; 1.2–1.5 mm ..... 12. ***striata*** **Wood**

— Strial punctures on disc smaller, interstriae distinctly wider than striae; diameters of interstrial punctures about half those of strial punctures; frons of both sexes flattened or impressed (except *serjaniae*); frontal pubescence more abundant, usually longer ..... 14

14(13). Frons convex in both sexes, a feebly transverse impression just above male epistoma, frontal vestiture rather sparse, very short; vestiture on pronotal disc of slender, almost hairlike setae, a few scales near base; Honduras; *Serjania*; 1.2–1.3 mm ..... 13. ***serjaniae*** **Wood**

— Frons flattened or impressed in both sexes, vestiture longer, more abundant ..... 15

15(14). Male frons with a narrow, rather deep, transverse impression, impression on median third extending almost half distance to upper level of eyes; female frons broadly flattened to upper level of eyes, glabrous, impunctate, almost smooth; elytral disc subglabrous, scales widely spaced on declivity; Jalisco; *Phoradendron*; 1.5–1.7 mm ..... 14. ***monadis*** **Wood**

— Male frons less strongly, more broadly impressed, female frons less extensively flattened; interstrial scales more closely, more regularly spaced from base to apex ..... 16

16(15). Declivital interstriae uniseriately granulate; interstrial scales on declivity smaller, about half as long as distance between rows; pronotal scales on disc slender, about four times as long as wide; Nayarit; *Serjania*, 1.4–1.5 mm ..... 15. ***similis*** **Wood**

— Declivital interstriae punctured, not at all granulate; interstrial scales on declivity larger, each about three-fourths as long as distance between rows; scales on pronotal disc more abundant, each about twice as long as wide; Veracruz; *Serjania*; 1.3–1.4 mm ..... 16. ***vescula*** **Wood**

17(12). Strial setae on disc and declivity scalelike, similar in shape to interstrial scales but only half as large; female frons concavely impressed on small area just above epistoma; female scape without tuft of long hair; Puebla to Oaxaca; *Serjania*; 1.3–1.5 mm ..... 17. ***squamatula*** **Wood**

— Strial setae hairlike if present; female frons flattened or convex; female scape bearing a small tuft of long hair ..... 18

18(17). Frons convex in both sexes, impunctate and glabrous except near eyes; eyes coarsely faceted, separated above by less than one and one-half times width of an eye; Honduras and Colombia; 1.3–1.5 mm ..... 18. ***nigra*** Wood

— Frons flattened at least on limited area, pubescence more generally distributed, longer; eyes widely separated, finely faceted ..... 19

19(18). Elytral apex moderately divaricate, emargination joining costal margin at a point in line with granules on interstriae 1; pronotal disc dull, deeply reticulate, granules fine; male frons convex, narrowly flattened in female, sparsely pubescent in both; Guatemala; shrub; 1.5–1.8 mm ..... 19. ***nigrella*** Wood

— Elytral apex deeply, broadly divaricate, emargination joining costal margin at a point in line with granules on interstriae 2; pronotal disc subshining, shallowly reticulate, granules rather coarse; male frons less strongly convex, flat in female, more conspicuously pubescent in both; Veracruz; *Serjania*; 1.5–1.6 mm .. ..... 20. ***divaricata*** Wood

### 1. *Micracisella adnata* Wood

*Micracisella adnata* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):24 (Holotype, female; 14 km E Huatusco, Veracruz, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the allied *knulli* (Blackman) by the presence of six teeth on the anterior margin of the pronotum, by the finely tuberculate, almost unelevated declivital interstriae 3, by the wider interstrial scales, and by the median impression on the female frons.

FEMALE.— Length 1.9–2.0 mm, 2.8 times as long as wide; color very dark reddish brown.

Frons convex, with a narrow, subtriangular, median impression from near upper level of eyes to level of antennal insertion; surface reticulate-granulate, apparently with a few larger granules; vestiture of moderately abundant, coarse, moderately short setae. Eye slightly more than twice as long as wide; antenna as in *knulli*.

Pronotum 1.1 times as long as wide; as in *knulli* except anterior margin armed by six teeth, and posterior area rugulose-reticulate, punctures fine, shallow, obscurely subtuberculate. Vestiture abraded in type series.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; outline as in *knulli*; striae not impressed, punctures fine, shallow; interstriae twice as wide as striae, subrugosely marked by irregular lines, punctures uniseriate, very fine, shallow, obscure. Declivity steep, convex, apex protruding, minutely divaricate, mucro absent; surface on lower two-thirds rugose-reticulate; striae obscure but visible; interstriae 1 obscurely, very minutely, uniseriately granulate, 2 with a few granules on upper fourth, 3 with larger granules to junction with 9, 7 and 9 with granules similar to 3. Vestiture abraded on disc; on declivity consisting of rows of minute strial hair and rows of suberect, interstrial scales; each scale with a slight arch or curl toward posterior, two to four times as long as wide; almost as long as distance between rows, slightly closer within a row, scales absent on lower half of interstriae 2.

MALE.— Similar to female except (head concealed) strial punctures slightly deeper; declivital interstriae 1 and 3 feebly elevated, 9 distinctly elevated; interstrial scales averaging slightly more slender.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: 14 km E Huatusco, 7-VII-67, 270 m, No. 173, *Quercus*, S. L. Wood.

NOTES.— The above treatment was based on the type series of 3 specimens.

### 2. *Micracisella subnitida* Blackman

Fig. 147

*Micracisella subnitida* Blackman, 1943, Proc. U.S. Nat. Mus. 93:350 (Holotype, male; Santa Rita Mts., Arizona; U.S. Nat. Mus., 56403)

DIAGNOSIS.— This species is distinguished from *knulli* (Blackman) by the smaller size, by the slightly impressed frons just above the epistoma, by the less conspicuous frontal vestiture, by the shorter, more slender vestiture, and by declivital interstriae 3, which is not elevated.

MALE.— Length 1.7 mm, 3.0 times as long as wide; color dark brown, pronotum slightly lighter.

Frons convex above, distinctly, transversely impressed on lower third; surface

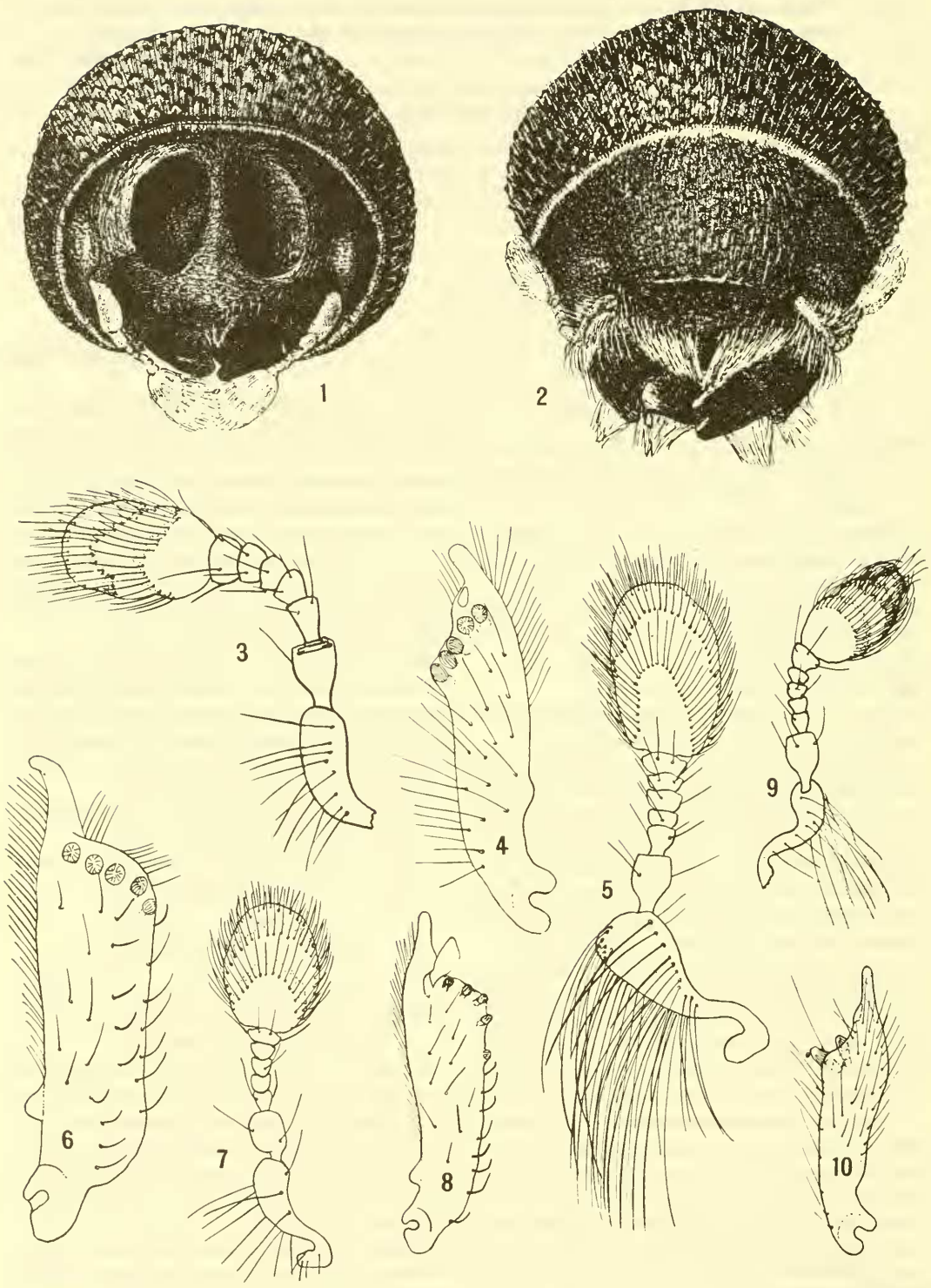



Fig. 147. Micracini spp., heads antennae, protibiae: 1, *Hylocurus biconcavus*; 2, *Hylocurus flaglerensis*; 3–4, *Hylocurus hirtellus*; 5–6, *Micracisella knulli*; 7–8, *Micracisella subnitida*; 9–10, *Stenocleptus sulcatus*. (After Blackman 1943:pl. 29.)

rugose-reticulate laterally and above, convex area with several conspicuous granules; vestiture sparse, rather inconspicuous except for a conspicuous epistomal brush. Eye large, coarsely faceted, anterior margin sinuate.

Pronotum 1.07 times as long as wide; essentially as in *knulli* except surface of posterior areas more nearly rugose, with several small, isolated granules behind summit. Vestiture of short, slender scales and hair on posterior half.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; outline and disc essentially as in *knulli* except interstrial punctures on anterior half replaced by rounded granules, greatly reduced to almost obsolete on posterior half. Declivity about as in *knulli* except interstriae 3 indistinctly elevated, with its granules more isolated, not as coarse. Vestiture of minute strial hair and interstrial rows of erect scales, each scale smaller, more widely spaced, and more slender than in *knulli*; scales spaced within a row by about three times length of a scale, scales on declivity up to twice as long as on disc, of equal thickness, those on interstriae 1 and 3 of about equal length.

DISTRIBUTION.— Arizona and New Mexico.

USA: **Arizona**: Oracle, 13-VII, Hubbard and Schwarz; Santa Rita Mts., H. F. Wickham. **New Mexico**: Antelope Wells, 21-VIII-63, light trap, B. C. Campbell.

NOTES.— The holotype and two males compared to it were used in preparing the above treatment.

### 3. *Micracisella mimetica* Wood

*Micracisella mimetica* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):15 (Holotype, male; 5 km N Suchixtepec on Highway 175, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *knulli* Blackman by the larger size, by the frontal granules, by the shorter, broader elytral scales, and by the smaller denticles on the elevated declivital interstriae 3.

MALE.— Length 2.3–2.4 mm, 2.9 times as long as wide; color dark reddish brown.

Frons moderately convex except rather abruptly, strongly, transversely impressed on lower fourth; surface rugose-reticulate in marginal areas, more finely, rather obscurely rugose-reticulate in central area; upper two-thirds with about 30 small, high, isolated granules, two near center much larger; vestiture of uniformly distributed, short, coarse setae of moderate abundance. Eye oval, shallowly emarginate; twice as long as wide. Antennal club 1.0 times as long as wide; suture 1 reaching middle of club.

Pronotum 1.1 times as long as wide; outline and asperities as in *knulli*; anterior margin armed by six teeth, lateral pair much smaller; posterior areas rugose-reticulate, dull, with small, low, shining granules of moderate abundance. Vestiture on disc of recumbent scales, each scale about four times as long as wide; a few bristles in asperate area.

Elytra 1.9 times as long as wide; outline as in *knulli*; disc as *knulli* except surface irregular, with numerous transverse lines or wrinkles. Declivity as in *knulli* except interstriae 1 and 9 slightly more strongly convex but with denticles on summit much smaller. Vestiture recumbent, of interstrial scales except declivital interstriae 2, 4, and 8 glabrous; scales evidently slightly confused on odd-numbered interstriae, uniseriate on even-numbered interstriae; each scale two to three times as long as wide.

FEMALE.— Similar to male in all respects; distinguished externally only by terminal terga of abdomen.

DISTRIBUTION.— Oaxaca.

MEXICO: **Oaxaca**: 5 km N Suchixtepec on Highway 175, 4-VI-71, 9500 ft, mistletoe on oak, D. E. Bright.

NOTES.— The above treatment was based on the type series of five specimens.

### 4.—*Micracisella knulli* (Blackman)

Fig. 147

*Micracis knulli* Blackman, 1943, Proc. U.S. Nat. Mus. 93(3165):348 (Holotype, female; Huachuca Mts., Arizona; U.S. Nat. Mus., 56402)

DIAGNOSIS.— This is the only species in the genus with declivital interstriae 3 distinctly elevated and tuberculate; other distinguishing characters were mentioned in the above key.

FEMALE.— Length 2.0–2.5 mm, 3.2 times as long as wide; color dark brown.

Frons rather strongly, transversely impressed on middle third, convex above, epistomal area elevated; surface reticulate-granulate; lateral areas with abundant, coarse, subplumose setae of moderate length,

glabrous on median fourth. Eye slightly more than twice as long as wide. Antennal club with sutures 1 and 2 strongly arcuate, 1 reaching middle of club.

Pronotum 1.2 times as long as wide; widest on basal half, sides feebly arcuate, almost parallel on more than basal half, rather narrowly rounded in front; anterior margin armed by four teeth (rarely more); summit slightly in front of middle, low; anterior area rather coarsely asperate; posterior area shining, smooth, with fine, isolated, moderately abundant, granulate punctures. Vestiture of moderately abundant, mixed coarse and fine, moderately long setae.

Elytra 2.0 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal three-fourths, narrowly submucronate behind; striae not impressed, punctures rather fine, moderately deep; interstriae almost smooth, one and one-half times as wide as striae, punctures fine, uniseriate, indistinctly granulate. Declivity steep, convex, apex acuminate, not divaricate; strial punctures smaller, deep; interstriae 1 feebly elevated, 2 flat, 3 moderately elevated, 7 and 9 not elevated, 1, 3, and 9 each with a row of moderately coarse tubercles. Vestiture of rows of minute, fine, strial hair, and rows of interstrial scales; each scale on disc about six times as long as wide, slightly longer than distance between rows or between scales within a row, on declivity two to four times longer than on disc and usually pointed.

MALE.— Similar to female except transverse impression on frons absent, frontal pubescence more generally distributed but sparse in median area.

DISTRIBUTION.— S Arizona to Michoacán and Hidalgo.

USA: **Arizona**: Ash Canyon, 7-VI-69, 1800 m, No. 84, Miller Canyon, 22-VII-58, 7-VI-69, 1800 m, No. 85, all from Huachuca Mts. in *Quercus*, S. L. Wood; Miller Canyon, 1-VII-07, H. A. Kaeber; Santa Rita Mts., 29-VII-68, *Salix*, D. E. Bright. MEXICO: **Michoacán**: 9 km E Volcán Parícutin, 19-VI-65, 2500 m, No. 87, *Quercus*, S. L. Wood. **Hidalgo**: 17 km NE Jacala, 22-VI-53, 1700 m, *Quercus*, S. L. Wood.

HOST.— *Quercus* spp., *Salix* sp.

NOTES.— The above treatment was based on my 2 topotypic homotypes and on 129 other specimens.

### 5. *Micracisella ocellata* Wood

*Micracisella ocellata* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):16 (Holotype, male; 5 km N Suchixtepec on Highway 175, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *nitidula* Wood by the very deeply impressed declivital striae and by the moderately large punctures on the discal striae, each of which has a small, elevated, central point giving the appearance of an eye.

MALE.— Length 1.9–2.3 mm, 3.5 times as long as wide; color dark reddish brown, pronotum usually darker.

Frons broadly convex, a slight, transverse impression immediately above epistoma; surface finely rugose-reticulate, a few fine punctures in lateral areas, a few small granules in median area of upper half; vestiture of very short, stout subplumose setae laterally and on upper half, a few longer setae along epistoma. Eye feebly emarginate; twice as long as wide. Antennal club as in allied species.

Pronotum 1.18 times as long as wide; essentially as *nitidula* except scales on disc distinctly wider.

Elytra 2.4 times as long as wide; outline about as in *nitidula*; striae not impressed, punctures large, distinctly impressed, each with a small, central, elevated granule giving appearance of an eye; interstriae as wide as striae, shining, almost smooth, punctures fine, uniseriate, rather close. Declivity rather steep, convex, with apex slightly produced; striae deeply impressed, punctures small, obscure; interstriae 1, 2, and 3 equally convex, almost half as high as wide, each bearing a row of low, rounded nodules on its lateral half, granules more obscure and smaller on 3; surface on lower half somewhat rugose-reticulate. Vestiture of rows of fine, short, strial hair, and interstrial rows of recumbent scales; each scale on disc eight or more times as long as wide, about four times as long as wide on declivity.

FEMALE.— Similar in all respects to male; presumably those specimens with a few more setae on scape are females.

DISTRIBUTION.— Oaxaca.

MEXICO: **Oaxaca**: 20.5 km N Oaxaca, 31-V-71, 9000 ft, *Arbutus*, D. E. Bright; 24 and 59 km S Valle Nacional, 24-V-71, 4000 and 8500 ft, *Arbutus*, D. E. Bright; 5 km N Suchixtepec on Highway 175, 4-VI-71, 9500 ft, *Arbutus*, D. E. Bright.

HOST.— *Arbutus* sp.

NOTES.— The above treatment was based on the type series of 57 specimens.

### 6. *Micracisella nitidula* Wood

*Micracisella nitidula* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):37 (Holotype, female; 10 km NE Teziutlán, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the closely allied *scitula* Wood by characters summarized in the above key.

FEMALE.— Length 1.7–2.2 mm, 3.1 times as long as wide; color black.

Frons convex, less strongly on lower half, epistomal margin weakly elevated, surface very finely reticulate-granulate, reduced to minute points on small median area near epistoma; vestiture consisting of rather sparse, conspicuous, subplumose setae of moderate length to vertex. Scape twice as long as pedicel, bearing a small tuft of hair.

Pronotum 1.1 times as long as wide; widest just behind middle, sides rather strongly arcuate, weakly constricted on anterior third, rather narrowly rounded in front; anterior margin armed by six small teeth of equal size; summit near middle, rather broad; posterior area minutely reticulate-granulate, with a few minute, almost flat, granules toward summit; vestiture rather stout, moderately abundant, rather long.

Elytra 2.0 times as long as wide, 2.0 times as long as pronotum; sides almost straight and parallel on basal three-fourths, narrowly acuminate behind; striae not impressed, punctures small, shallow; interstriae twice as wide as striae, somewhat irregular, punctures very fine, uniseriate. Declivity convex, rather steep; strial punctures slightly deeper than on disc; interstrial punctures replaced by fine granules; apex subacuminate, mucro not developed, not at all divaricate. Vestiture consisting of very fine, moderately long strial hair and rows of erect interstrial scales, slightly longer on declivity; each scale on declivity slightly longer than distance between rows, similarly spaced within each row, each about six times as long as wide.

MALE.— Similar to female except frons slightly more convex; scape not expanded, sparsely pubescent; strial punctures on declivity more distinct, lower ones minutely granulate.

DISTRIBUTION.— Michoacán and Puebla to Chiapas.

MEXICO: **Chiapas**: 40 km SE Teopisca, 18-V-69, *Arbutus*, D. E. Bright; 11 km E San Cristóbal, 26-V-69, *Arbutus*, D. E. Bright. **Michoacán**: 26 km E Morelia, 14-VI-65, *Arbutus*, S. L. Wood. **Oaxaca**: 116 km S Oaxaca on Highway 113, 11-V-71, 2300 m, *Arbutus*, D. E. Bright; 5 km N Suchixtepec, 4-VI-71, 3100 m, *Arbutus*, D. E. Bright. **Puebla**: 25 km W Texmelucan, 13-VI-67, 2900 m, No. 28, *Arbutus*, S. L. Wood; 10 km NE Teziutlán, 2-VII-67, 1600 m, No. 142, *Rubus*, S. L. Wood.

HOSTS.— *Rubus* sp., *Arbutus* sp.

NOTES.— The above treatment was based on the holotype and 57 other specimens.

### 7. *Micracisella scitula* Wood

*Micracisella scitula* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):37 (Holotype, male; 14 km E Huatusco, Veracruz, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the allied *nitidula* Wood by characters summarized in the above key.

MALE.— Length 1.6 mm, 3.0 times as long as wide; color reddish brown.

Frons rather strongly convex, with a narrow, transverse impression just above epistomal margin; surface rather coarsely reticulate except almost smooth on small median area on lower half, a few very small granules scattered on upper half; vestiture sparse, very short in convex area, longer below.

Pronotum 1.2 times as long as wide; widest near middle, sides very feebly arcuate, almost parallel on more than basal half, rather narrowly rounded in front; anterior margin armed by four small teeth, median pair slightly larger; summit broad, near middle; posterior area coarsely reticulate, a few shining points evidently represent obsolete punctures; vestiture reduced to a few very stout bristles in marginal areas.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on slightly more than basal two-thirds, rather broadly rounded behind except subacuminate at suture; striae not impressed, punctures small, distinct, anterior margins of some of them very feebly elevated; interstriae shining, subrugulose, punctures two-thirds as large as those of striae, shallow, some obscure. Declivity convex, rather steep; strial punctures somewhat obscure; interstrial punctures on upper half replaced by rounded

granules; subreticulate toward suture near apex. Vestiture largely abraded on disc of type, evidently shorter than on declivity; on declivity consisting of rows of erect, interstrial scales, each scale almost as long as distance between rows, more widely spaced within each row except on 1, broad, averaging about twice as long as wide. Apex acuminate, mucro short; not at all divaricate.

DISTRIBUTION.— Veracruz.

MEXICO: **Veracruz**: 14 km E Huatusco, 7-VII-67, 1300 m, No. 173, *Quercus*, S. L. Wood.

NOTES.— The above treatment was based on the unique male holotype.

### 8. *Micracisella hondurensis* Wood

*Micracisella hondurensis* Wood, 1956, Canadian Ent. 88:233 (Holotype, female; Olanchito, Yoro, Honduras; Wood Coll.)

DIAGNOSIS.— Except as noted in the above key and in the description below, this species is very similar to *nanula* (LeConte).

FEMALE.— Length 1.4–1.8 mm, 3.2 times as long as wide; color dark brown, pronotum usually darker.

Head as in *nanula* except frontal impression less extensive, shallow, median carina very short, visible only immediately above epistomal margin. Pronotum as in *nanula* except granules in posterior area slightly larger and more generally distributed. Elytra as in *nanula* except strial punctures on disc very shallow, smaller, almost obsolete, on declivity strial punctures larger, very shallow; interstrial punctures smaller than those of striae, usually devoid of granules; interstrial scales slightly wider.

MALE.— As male of *nanula* except frons more strongly convex; granules on pronotal disc very slightly larger; elytral disc with surface smoother, strial punctures much larger, very shallow, distinct; declivital surface smoother, punctures larger, deeper, interstrial scales wider, each about three times as long as wide.

DISTRIBUTION.— Chiapas to Honduras.

MEXICO: **Chiapas**: El Rincón, 13-V-69, M. Campbell; 8 km S San Carlos, 6-III-53, R. C. Bechtel, E. I. Schlinger. HONDURAS: Olanchito, Yoro, 19-V-, 21-VI, 7, 30-VII-49, at light, E. C. Becker; Zamorano, Morazán, 18-IV-64, 700 m, No. 511, unidentified shrub, S. L. Wood.

NOTES.— The above treatment was based on the type series of 21 specimens and on 2 other specimens.

### 9. *Micracisella nanula* (LeConte)

*Micracis nanula* LeConte, 1876, Proc. Amer. Philos. Soc. 15:368 (Holotype, female; Haulover, Florida; Mus. Comp. Zool., 1022)

DIAGNOSIS.— This species is very closely related to *hondurensis* Wood and to *opacicollis* (LeConte). Refer to the key and to the treatment of those species for distinguishing characters.

FEMALE.— Length 1.5–1.7 mm, 3.2 times as long as wide; color very dark brown to almost black, elytra usually lighter.

Frons narrowly, subconcavely impressed on lower half, convex above; surface finely reticulate-granulate except almost smooth on median third of lower half, a fine, median carina from epistoma to deepest point in concavity; vestiture of short, stout setae to upper level of eyes. Eye very large, coarsely faceted, separated above by 1.1 times width of an eye, separated below by twice diameter of a facet. Antennal scape short, bearing a sparse tuft of long hair; club as described for genus.

Pronotum 1.15 times as long as wide; sides almost straight and parallel on basal half, rather narrowly rounded in front; anterior margin armed by four teeth (rarely up to six); summit slightly in front of middle, low; anterior area rather finely asperate; posterior area finely reticulate-granulate, dull, with small, isolated, shining granules to base. Vestiture of mixed fine and stout, short, moderately abundant setae.

Elytra 2.0 times as long as wide, 1.8 times as long as pronotum; sides straight and parallel on basal three-fourths, obtusely submucronate behind; striae not impressed, punctures small, moderately deep, spaced by more than diameter of a puncture; interstriae shining, somewhat irregular, more than twice as wide as striae, punctures minute, shallow, obscure. Declivity steep, convex, apex submucronate; surface reticulate-granulate on lower half; strial punctures deeper, perhaps very slightly larger than on disc; interstrial punctures finely granulate. Vestiture of rows of very fine, short, recumbent, strial hair, and rows of erect, interstrial scales; each scale four to six times as long as wide, about as long as distance between scales between rows and within a row, uniseriate on all declivital interstriae.

MALE.— Similar to female except frons convex to small flattened area immediately above epistoma, median carina very short, near epistoma; tuft of setae on scape smaller; interstrial granules on declivity smaller, often absent on interstriae 2; interstrial scales shorter, each about three to four times as long as wide.

DISTRIBUTION.— South Carolina and Florida to Texas.

USA: **Florida**: Apalchola, Big Pine Key, Biscayne, Gainesville, Hanover, Homestead, Key Largo, Key Vaca, Key West, Marathon, Miami, Missouri Key, Snead, Sugar Loaf Key. **Georgia**: Savannah, St. Catherine Island. **Louisiana**: Baton Rouge, Covington. **Mississippi**: Corinth, Natchez, Trimcane Swamp. **South Carolina**: Charleston, Jacksonboro. **Texas**: Rockport.

HOSTS.— *Acras sapota, Conocarpus erecta, Dipholia salicifolia, Mimosa* sp., *Pithecellobium guadaloupense, Prosopis* sp., *Quercus* sp., *Rhizophora mangle, Vitis* sp.

NOTES.— The above treatment was based on the holotype and on 81 other specimens.

### 10. *Micracisella opacithorax* Schedl

*Micracisella opacithorax* Schedl, 1940, An. Esc. Nac. Cienc. Biol., Mexico 1:340 (Syntypes, female; Matamoros and Mante, Tamaulipas, and Cardel, Veracruz, Mexico; Schedl Coll.

DIAGNOSIS.— This species is distinguished from *nanula* (LeConte) as indicated below.

FEMALE.— Length 1.6–1.9 mm, 3.0 times as long as wide; color very dark brown, elytra often lighter.

Frons as in *nanula* except median line usually more conspicuously impressed; setae on epistoma, frons, and scape conspicuously longer and more abundant. Elytral declivity with scales as in *nanula* except very slightly longer, much wider, each about two to three times as long as wide.

MALE.— Similar to female except sexual differences as in *nanula*.

DISTRIBUTION.— S Texas to Veracruz.

USA: **Texas**: Brownsville, 26-III-51, *Prosopis*, S. L. Wood; Kingsville, Cornell Univ. Lot 912, C. T. Reid; San Diego, 24-V-95, mesquite. MEXICO: **Tamaulipas**: Jiménez, 15-VI-53, *Mimosa*, S. L. Wood; Matamoros, 21-VII-30, at light, S. Flores; Mante, 9-VIII-30, 26-X-30, A. Dampf, and 13-III-44. **Veracruz**: Cardel, 3-VIII-32, at light, R. Ruiz Soto.

HOSTS.— *Mimosa* and *Prosopis*.

NOTES.— The above treatment was based on 3 syntypes and on 36 other specimens.

### 11. *Micracisella opacicollis* (LeConte)

Figs. 148–149

*Micracis opacicollis* LeConte, 1878, Proc. Amer. Philos. Soc. 17:625 (Holotype, female, Detroit, Michigan; Mus. Comp. Zool., 1297)

*Micracis asperulus* LeConte, 1878, Proc. Amer. Philos. Soc. 17:626 (Lectotype, female; Detroit, Michigan; Mus. Comp. Zool., 1298, present designation); Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Bull. 25:196. *Synonymy*

DIAGNOSIS.— This species is distinguished from *nanula* (LeConte) by the absence of interstrial granules on the declivity, by the closer, confused, interstrial scales on the declivity, particularly on interstriae 3, and by the broader interstrial scales. Further investigation could reduce this form to no more than a geographical race of *nanula*.

FEMALE.— Length 1.6–1.9 mm, 3.2 times as long as wide; color very dark brown to black.

Frons as in *nanula* except impressed area slightly stronger and more extensive, median carina very feebly indicated; lateral and upper areas more coarsely granulate.

Pronotum as in *nanula* except granules in posterior area smaller, reduced posteriorly, usually obsolete near base. Stout setae more nearly scalelike.

Elytra as in *nanula* except strial punctures very slightly larger; declivital reticulation greatly reduced; interstrial punctures on declivity as large as those of striae, feebly granulate only near apex and in extreme lateral areas, punctures on 1 and 3 confused; interstrial scales shorter and stouter, each two to three times as long as wide, usually more dense and confused on 1 and 3.

MALE.— Similar to female except frontal carina almost obsolete; declivital scales in uniseriate rows except a supplemental sutural row present, no indication of granules in apical portion of lateral areas.

DISTRIBUTION.— Minnesota and Massachusetts to Kansas and North Carolina.

USA: **District of Columbia**: Washington. **Kansas**: "Kansas Knaus." **Massachusetts**: Framingham, Sherborn. **Michigan**: Detroit. **Minnesota**: Ramsey Co. **Missouri**: Scott Co., St. Louis. **New Jersey**: Camden, Gloucester Co., Westville. **New York**: Greenwood Lake, Ithaca, Westbury. **North Carolina**: Boardman, Tryon. **Ohio**: Oak Hill. **Pennsylvania**: Hummelstown, Mont Alto. **Virginia**: Afton. **West Virginia**: Monongalia.

HOSTS.— *Carya* sp., *Castanea dentata, Quercus alba, Q. falcata.*

NOTES.— The above treatment was based on the holotype of *opacicollis*, on the

syntypes of *asperulus*, and on 186 other specimens. The holotype of *opacicollis* and the syntypes of *asperulus* are females, not males as reported by LeConte. Because a type has not been selected from the 4 syntypes of *asperulus*, I here designate the first specimen now bearing the type label and number 1298 as the lectotype of *asperulus* LeConte.

### 12. *Micracisella striata* Wood

*Micracisella striata* Wood, 1956, Canadian Ent. 88:231 (Holotype, female; Olanchito, Yoro, Honduras; Wood Coll.)

DIAGNOSIS.— This distinctive species has coarse, deep, strial punctures, with the interstriae narrower than the striae, and convex in both sexes.

FEMALE.— Length 1.2–1.5 mm, 3.0 times as long as wide; color yellowish brown.

Frons rather strongly convex, a slight, narrow impression just above epistoma; surface reticulate-granulate, finely below, more coarsely above, except almost smooth near center; vestiture confined to a few short, stout setae near margins of eyes. Antennal scape ornamented by a small tuft of hair; suture 1 not attaining middle of club.

Pronotum 1.1 times as long as wide; about as in *nanula* except anterior margin armed by two teeth, posterior area minutely rugulose, with a few rounded granules extending to base. Vestiture of a few small, stout setae.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal three-fourths, acuminate behind, costal margins notched just before apex; striae not impressed, punctures coarse, deep; interstriae shining, irregular, slightly narrower than striae, punctures fine, uniseriate, their anterior margins slightly elevated. Declivity steep, convex, apex extended; strial punctures reduced, very small toward apex; interstrial punctures slightly larger than on disc. Vestiture of rows of minute, fine, strial hair, and rows of erect, interstrial scales; each scale about three times as long as wide, slightly shorter than distance between rows or between scales within a row.

MALE.— Similar to female except tuft of hair on scape smaller; interstrial punctures on posterior half of disc more nearly granulate.

DISTRIBUTION.— Oaxaca to Honduras.

MEXICO: Oaxaca: 11 km N Matías Romero, 24-VI-67, 150 m, No. 95, liana, S. L. Wood; 29 km N Matías Romero, 29-VI-67, 150 m, No. 121, *Serjania*, S. L. Wood. HONDURAS: Olanchito, 19-V, 21-VI, 22-VII, 8-IX-49, at light, E. C. Becker; La Ceiba, 18-V, 17,28-VI-49, at light, E. C. Becker.

HOSTS.— *Serjania* sp., and other small vines (lianas).

NOTES.— The above treatment was based on the type series of 19 specimens and on 36 other specimens.

### 13. *Micracisella serjaniae* Wood

*Micracisella serjaniae* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):25 (Holotype, female; Zamorano, Morazán, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *striata* Wood by the much smaller strial punctures, by the less nearly granulate discal interstriae, by the distinctly, uniseriately granulate declivital interstriae, by the absence of a preapical emargination on the costal margin, and by a distinct sutural emargination.

FEMALE.— Length 1.2–1.3 mm, 3.0 times as long as wide; color very dark reddish brown, pronotum lighter.

Frons, antenna, and pronotum as in *striata*, except segment 1 of antennal club distinctly shorter.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; outline as in *striata* except apex wider and suturally emarginate; striae not impressed, punctures moderately small; interstriae shining, somewhat irregular, one and one-half times as wide as striae, punctures fine, uniseriate, not at all granulate. Declivity steep, convex, produced apically; strial punctures deeper than on disc; interstrial punctures granulate. Vestiture as in *striata* except interstrial scales very slightly larger; each scale about two to three times as long as wide.

MALE.— Similar to female except tuft of hair on scape much smaller; discal interstriae evidently less irregular.

DISTRIBUTION.— Honduras.

HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 547, *Serjania racemosa*, S. L. Wood.

NOTES.— The above treatment was based on the type series of 85 specimens.

### 14. *Micracisella monadis* Wood

*Micracisella monadis* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):36 (Holotype, female; Volcán Colima, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the allied *vescula* Wood and *similis* Wood by characters summarized in the above key.

FEMALE.— Length 1.5–1.7 mm, 2.9 times as long as wide; color dark brown.

Frons planoconvex from epistoma to well above eyes, epistomal margin slightly elevated toward center; surface very minutely, longitudinally etched, approaching reticulation laterally; glabrous. Scape more than three times as long as pedicel, broad, bearing a large tuft of hair.

Pronotum 1.1 times as long as wide; widest at middle, sides weakly arcuate on posterior two-thirds, weakly constricted on anterior third before rather narrowly rounded anterior margin; anterior margin armed by two basally contiguous, small teeth; summit at middle, broad; posterior areas coarsely reticulate, with a few minute granules near and behind summit; a few scales on marginal areas.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on more than basal two-thirds, narrowly rounded behind; striae not impressed, punctures very small, distinct; interstriae marked by lines, shining, three times as wide as striae, punctures fine, obscure. Declivity convex, rather steep; strial punctures larger, deeper, very obscure; interstrial punctures replaced by small rounded granules. Apex of elytra subacuminate. Vestiture consisting of very short, fine, strial hair and rows of longer, erect, interstrial scales; each scale slightly shorter than distance between rows, similarly spaced within rows, each scale about four times as long as wide, gradually, strongly narrowed toward their bases.

MALE.— Similar to female except frons convex, a narrow, transverse impression just above epistoma, surface finely rugose-reticulate, a few short, stout setae in lateral areas; tuft of hair on scape smaller; scape more slender; teeth on anterior margin of pronotum larger; declivital scales very slightly wider.

DISTRIBUTION.— Jalisco.

MEXICO: **Jalisco**: Volcán Colima, 23-VI-65, 2500 m, No. 105, mistletoe, S. L. Wood.

HOST.— *Struthanthus venetus*.

NOTES.— The above treatment was based on the type series of nine specimens.

### 15. *Micracisella similis* Wood

*Micracisella similis* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):38 (Holotype, female; Volcán Ceboruco, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the allied *monadis* Wood and *vescula* Wood by characters summarized in the above key.

FEMALE.— Length 1.4–1.5 mm, 3.0 times as long as wide; color black, summit of pronotum reddish brown.

Frons planoconvex, flattened toward center, gradually ascending to epistomal margin on lower fourth; surface minutely reticulate-granulate, smoother medially toward epistoma; vestiture moderately long and abundant toward lateral areas, subplumose. Scape twice as long as pedicel, bearing a small tuft of long hair.

Pronotum 1.16 times as long as wide; widest at middle, sides on basal half straight, almost parallel, rather narrowly rounded in front; anterior margin armed by two moderately large, basally contiguous teeth; summit at middle, broad; posterior areas minutely reticulate-granulate, with a few, fine scattered granules; vestiture short, scalelike.

Elytra 1.9 times as long as wide, 1.7 times as long as pronotum; outline as in *nitidula*; striae not impressed, punctures small, shallow; interstriae marked by lines, shining, slightly less than twice as wide as striae, uniseriate punctures very fine. Declivity convex, rather steep; strial punctures somewhat reduced; interstrial punctures replaced by fine granules on upper half, almost obsolete below; general surface granulose toward sutural apex; apex acuminate, sutural apex shallowly emarginate. Vestiture consisting of minute, fine, strial hair and uniseriate rows of longer, erect, interstrial scales; each scale slightly shorter than distance between rows, similarly spaced within each row, each scale on declivity about three times as long as wide.

MALE.— Similar to female except frons more nearly convex, frontal vestiture somewhat shorter; reduction of interstrial tubercles on lower half of declivity less pronounced.

DISTRIBUTION.— Nayarit.

MEXICO: **Nayarit**: Volcán Ceboruco, 5-VII-65, 1200 m, No. 189, *Serjania*, S. L. Wood.

NOTES.— The above treatment was based on the type series of nine specimens.

### 16. *Micracisella vescula* Wood

*Micracisella vescula* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):38 (Holotype, female; 2 km N Cerro Gordo, Veracruz, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *similis* Wood by the coarser strial punctures, by the absence of interstrial granules on the declivity, and by the large, broader, interstrial scales.

FEMALE.— Length 1.3–1.4 mm, 3.0 times as long as wide; color dark brown, summit of pronotum reddish brown.

Frons as in *similis* but less strongly flattened. Scape twice as long as pedicel, bearing a tuft of long hair.

Pronotum 1.17 times as long as wide; outline as in *similis*; anterior margin armed by two moderately large subcontiguous teeth; posterior area minutely reticulate-granulate, with obscure, subgranulate punctures; vestiture of rather abundant, short scales, each twice as long as wide.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; outline as in *nitidula*; striae not impressed, punctures rather fine, not always clearly defined; interstriae irregular, almost subrugose, as wide as striae, uniseriate punctures fine. Declivity convex, rather steep; strial punctures deeper than on disc, interstrial punctures equal in size to those of striae; apex acuminate, shallowly emarginate at sutural apex. Vestiture consisting of very fine, short, strial hair and interstrial rows of erect, uniseriate scales, each scale about as long as distance between rows, similarly spaced within each row, each about three times as long as wide; a supplemental row of smaller, sutural scales on declivity.

MALE.— Similar to female except frons more strongly convex, frontal vestiture shorter; tuft of hair on scape much smaller; teeth on anterior margin of pronotum slightly larger.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: 2 km N Cerro Gordo, 6-VII-67, 1000 m, No. 166, *Serjania*, S. L. Wood.

NOTES.— The above treatment was based on the holotype and allotype; no other specimens are known.

### 17. *Micracisella squamatula* Wood

*Micracisella squamatula* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):38 (Holotype, female; 10 km S Huajuapan, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nigra* Wood and the two preceding species by the much more widely spaced teeth on the anterior margin of the pronotum, by the scalelike, small, strial setae in addition to those of the interstriae, and by the more strongly divaricate elytra at the sutural apex.

FEMALE.— Length 1.3–1.5 mm, 3.0 times as long as wide; color black, summit of pronotum reddish brown, vestiture white.

Frons convex above, becoming flattened below, then ascending slightly to epistomal margin; surface reticulate-granulate above, becoming almost smooth in central area below except for a few fine points; vestiture rather abundant and long in large dorsolateral areas. Scape about twice as long and slightly wider than pedicel, bearing a small tuft of long hair.

Pronotum 1.1 times as long as wide; widest at middle, sides on posterior half almost straight and parallel on basal half, feebly constricted on anterior third, rather narrowly rounded in front; anterior margin armed by two moderately large, rather widely separated teeth; summit at middle, rather broad; posterior area finely reticulate-granulate, with a few minute granules; vestiture consisting of short, broad scales.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; outline as in *nitidula*; striae not impressed, punctures small, somewhat indistinct; interstriae irregularly marked by fine points and lines, one and one-half times as wide as striae, punctures fine, uniseriate. Declivity convex, rather steep; strial punctures evidently slightly deeper; interstrial punctures replaced by small rounded granules; sutural apex emarginate. Vestiture consisting of rows of small strial scales, each slightly longer than diameter of a strial puncture, about four times as long as wide, and rows of longer interstrial scales; each interstrial scale one and one-half times as long as strial scales and about equal in length to distance between rows of interstrial scales, each about three times as long as wide.

MALE.— Similar to female except frons more strongly convex on upper two-thirds, smooth area much smaller and subreticulate; tuft of hair on scape reduced.

DISTRIBUTION.— Puebla to Oaxaca.

MEXICO: Oaxaca: 10 km S Huajuapan, 16-VI-67, 2000 m, No. 45, *Serjania* sp., S. L. Wood. Puebla: 6 km S Atlixco, 14-VI-67, 2300 m, No. 32, *Serjania*, S. L. Wood.

HOST.— *Serjania* sp.

NOTES.— The above treatment was based on the type series of 11 specimens and on 24 other specimens.

### 18. *Micracisella nigra* Wood

*Micracisella nigra* Wood, 1956, Canadian Ent. 88:232 (Holotype, female; La Ceiba, Atlántida, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *serjaniae* Wood by the black color, by the reduced granulation on the pronotal disc, by the very shallow strial punctures, and by the reticulate-granulate surface on the elytral declivity.

FEMALE.— Length 1.3–1.5 mm, 2.8 times as long as wide; color black.

Frons, antenna, and pronotum as in *serjaniae*, except teeth on anterior margin of pronotum distinctly separated, and pronotal disc almost devoid of granules and pubescence.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal three-fourths, obtusely produced behind, not emarginate at suture; striae not impressed, punctures small, very shallow; interstriae shining, irregular, twice as wide as striae, punctures mostly obsolete. Declivity steep, convex, produced toward apex; surface reticulate-granulate; strial punctures moderately deep, not clearly defined; interstriae uniseriately, regularly, rather coarsely granulate. Vestiture largely confined to declivity, consisting of rows of very fine strial hair and interstrial rows of erect scales; each scale three to four times as long as wide, each slightly shorter than distance between rows or between scales in a row.

MALE.— Similar to female except tuft of setae on scape much reduced.

DISTRIBUTION.— Honduras to Colombia.

HONDURAS: La Ceiba, Atlántida, 15, 29-V, 7, 28-VI-49, at light, E. C. Becker; Olanchito, Yoro, 8-IX-49, at light, E. C. Becker. COLOMBIA: Finca El Bosque near Caicedonia, Valle de Cauca, 10-VII-59, guamo verde, J. Restrepo.

NOTES.— The above treatment was based on the type series of 12 specimens from Honduras and 5 other specimens from Colombia. The Colombia specimens are slightly larger, 1.5–1.6 mm, and the strial punctures are slightly impressed on the disc but smaller and less strongly impressed on the declivity. In view of the very slight differences, without other supporting data, only one species was recognized here.

### 19. *Micracisella nigrella* Wood

*Micracisella nigrella* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):37 (Holotype, female; Volcán de Agua, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nigra* Wood by the coarser sculpture of strial punctures and declivital granules, by the larger, coarser, more abundant interstrial scales, and by the different arrangement of marginal teeth on the pronotum.

FEMALE.— Length 1.5–1.8 mm, 3.0 times as long as wide; color almost black, summit of pronotum reddish brown.

Frons convex on upper half, transversely impressed on lower half, an indistinct median impression toward center; vestiture sparse, of very short, fine, subplumose setae. Scape twice as long as pedicel, bearing a moderately large tuft of long hair.

Pronotum 1.14 times as long as wide; widest just behind middle, sides weakly arcuate on more than basal half, rather narrowly rounded in front, anterior margin armed by two rather large teeth; summit at middle, rather broad; posterior area minutely reticulate-granulate, with moderately abundant, isolated, very fine granules; vestiture of rather short, broad scales.

Elytra 1.9 times as long as wide, 1.7 times as long as pronotum; outline as in *nitidula*; striae not impressed, punctures fine, distinct, shallow, interstriae with fine lines, twice as wide as striae, punctures very fine, half as large as those of striae. Declivity convex, rather steep; interstrial punctures about as large as those of striae; apex acuminate, sutural apex distinctly, shallowly emarginate. Vestiture consisting of rows of erect interstrial scales; each scale very slightly shorter

than distance between rows, similarly spaced within rows, each about two and one-half to three times as long as wide; a supplemental sutural row of smaller scales on declivity.

MALE.— Similar to female except frons slightly more convex; scape without tuft of hair; elytral scales very slightly larger.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán de Agua, Esquintla, 19-V-64, 1000 m, No. 603, shrub, S. L. Wood.

HOST.— A shrub, possibly *Rhus* sp.

NOTES.— The above treatment was based on the type series of 83 specimens.

### 20. *Micracisella divaricata* Wood

*Micracisella divaricata* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):39 (Holotype, female; 2 km N Cerro Gordo, Veracruz, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nigrella* Wood and other representatives of the genus by the deep, broad emargination at the sutural apex of the elytra.

FEMALE.— Length 1.5–1.6 mm, 2.8 times as long as wide; color black, central area of pronotum reddish brown.

Frons planoconvex from epistoma to upper level of eyes; surface coarsely reticulate above and laterally becoming smooth toward center, punctures fine, moderately abundant; vestiture consisting of moderately long, stout, subplumose setae moderately abundant in lateral areas and above. Scape twice as long as pedicel, bearing a small tuft of long hair.

Pronotum 1.1 times as long as wide; widest on basal half, sides almost straight and parallel then arcuately rounded to constriction on anterior third, narrowly rounded in front; anterior margin armed by two rather large, basally contiguous teeth; summit rather indefinite, at middle; small asperities continue to just behind summit, isolated granules continue to base; surface of posterior area coarsely reticulate; vestiture of small, short scales.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on more than basal two-thirds, then narrowly rounded to blunt apex; striae not impressed, punctures very small; interstriae shining, marked by lines, twice as wide as striae, uniseriate punctures fine, somewhat obscure. Declivity convex, rather steep; strial punctures largely obsolete; interstrial punctures replaced by rounded granules; apex divaricate, emargination as wide as width of antennal club and half as deep. Vestiture consisting of very minute, very fine strial hair and rows of longer, suberect, interstrial scales, each scale slightly shorter than distance between rows, similarly spaced within rows except closer on 1, each scale about four times as long as wide.

MALE.— Similar to female except frons more strongly convex, setae more evenly distributed; elytral scales wider, about three times as long as wide.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: 2 km N Cerro Gordo, 6-VII-67, 1000 m, No. 166, *Serjania*, S. L. Wood.

NOTES.— The above treatment was based on the type series of three specimens.

## GENUS *HYLOCURUS* EICHHOFF

*Hylocurus* Eichhoff, 1872, Berliner Ent. Zeit. 15:133 (Type-species: *Hylocurus elegans* Eichhoff, monobasic)

*Micracisoides* Blackman, 1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:19 (*Type-species: Micracis rudis* LeConte, present designation); Blackman, 1922, New York St. Coll. For., Syracuse, Tech. Pub. 16:144. *Synonymy*

DIAGNOSIS.— This genus is closely allied to *Phloeocleptus* Wood and to *Micracis* LeConte. From *Phlococleptus* it is distinguished by the bisinuate to very strongly procurved antennal sutures, by the presence of tubercles on the posterior face of the protibiae, and by the xylophagous habit. The antennae and prothoracic tibia distinguish it from *Micracis*.

DESCRIPTION.— Length 1.3–3.2 mm, 2.3–2.9 times as long as wide; color reddish brown to black.

Frons usually sexually dimorphic, excavated to convex, commonly ornamented by carinae, tubercles, or hair in either sex. Eye small, short, entire; finely granulate. Antennal scape rather short, slender, rarely ornamented by hair (females of four species); funicle 6-segmented; club moderately large, two bisinuate to strongly procurved sutures clearly marked by setae. Pronotum about as long as wide, summit distinct, at middle; anterior area finely asperate, anterior margin usually rather strongly serrate in male, in female finely serrate or unarmed; posterior area weakly to strongly reticulate, with

isolated granules, rarely punctured. Scutellum large. Elytra striate, interstriae uniseriately punctured; declivity usually sexually dimorphic, simply to elaborately sculptured. Vestiture of hairlike and/or scalelike setae. Anterior tibiae rather slender, wider apically; distal margin oblique, armed by several teeth; outer margin sinuate, unarmed; posterior face armed by several denticles or rugae.

DISTRIBUTION.— The United States to Argentina; two phloeophagous African species of doubtful relationship have also been assigned to this genus; 51 American species have been placed in *Hylocurus*.

BIOLOGY.— The species are xylophagous and they breed in unthrifty, injured, recently cut, or totally dead branches, limbs, and boles ranging from about 2 to 20 cm in diameter. The male extends the entrance tunnel well into the xylem tissues, where an elongate nuptial chamber is formed. Normally he is joined by two females, each of which constructs two egg galleries as in *Micracis*. Larval mines tend to follow the grain of the wood. Young adults apparently may remain in the brood host long after they mature; in at least one case (*incomptus*), an apparent second generation was produced without emerging.

NOTES.— Blackman (1920) described *Micracisoides* as a subgenus of *Micracis* and later (1922) considered it a synonym of *Hylocurus*. He (1922) implied, but did not clearly state, that *rudis* LeConte was the species on which his concept of the group was based. In view of the ambiguity, I here designate *Micracis rudis* LeConte as the type-species of *Micracisoides* Blackman.

## Key to the Species of *Hylocurus*

1. Male elytral interstriae each with a series of two or more granules or tubercles at declivital base, none of them particularly more prominent than others, these not formed into a circumdeclivital ring; female frons variable, often pubescent, sometimes bearing an elevation, or deeply excavated ..... 2

— Male elytral interstriae each with one prominent tubercle at posterior end of disc, these forming a conspicuous circumdeclivital ring; supplemental tubercles may also occur on declivity; female frons shallowly concave to convex, almost always with conspicuous pubescence ..... 20

2(1). Both sexes with frons very deeply excavated and variously ornamented by minutely pilose or spongy areas, E United States ..... 3

— Frons flattened or convex, devoid of spongy areas ..... 6

3(2). Frontal cavity bearing spongy areas on lateral walls, median area not at all elevated or bearing unusual prominences ..... 4

— Frontal concavity, at least in female, partly or completely divided by a median elevation, or median area bearing a pair of blunt horns ..... 5

4a(3). Frons moderately excavated, center of each half of excavation occupied by a small circular, convex, spongy area; female declivity with a small protuberance on interstriae 1 near middle (similar to but smaller than in *harnedi*); Louisiana, Mississippi; *Carya* (Pecan); 1.8–2.0 mm ..... 1. ***binodatus*** **Wood**

— Frons more deeply excavated, spongy areas larger; declivity without protuberance on interstriae 1 ..... 4b

4b(4a). Subcircular spongy areas largely flat, lower area sometimes protruding conspicuously; concavity very large, conspicuously wider than long, its ventrolateral angles occupied by spongy areas; Michigan and Pennsylvania to Kentucky and Georgia; 1.9–2.1 mm ..... 2. ***rudis*** **(LeConte)**

— Spongy areas almost as high as wide, protruding into cavity from lateral areas; frontal concavity about as long as wide, its ventrolateral angles free of spongy areas; Illinois and Maryland to Alabama; 1.8–2.0 mm ..... 3. ***torosus*** **Wood**

5(3). Spongy areas on median half of concavity, formed as a pair of basally separate median horns in male, in female fused medially and borne on a median elevation, elevation not reaching lower (orad) margin of concavity; Mississippi; *Carya*; 1.7–2.0 mm ..... 4. ***bicornus*** **(Blackman)**

— Frontal concavity completely divided by a median partition, spongy areas absent; Kentucky; 2.0 mm ..... 5. ***biconcavus*** **Blackman**

6(2). Elytral declivity with one large tooth or blunt process on or derived from interstriae 1, when process remote from suture striae 1 and 2 obsolete on lower two-thirds of declivity, other declivital granules small; eastern United States ..... 7

— Declivital interstriae 1 either unarmed or, if armed, its denticles smaller than on one or more other interstriae; declivital striae 1 and 2 never radically displaced ..... 8

7(6). Female declivity armed by a pair of pointed, hornlike processes, each about as high as wide, located immediately above middle of declivity, a shallow sulcus between their bases; male declivity armed at suture just below upper margin by a large, slender, fingerlike blunt spine, about three or four times as long as wide; Mississippi; *Carya*; 1.8–2.2 mm (see also 1. ***binodatus*** **Wood**) ..... 6. ***harnedi*** **Blackman**

— Both sexes with a blunt process immediately below middle of declivity, in line with interstriae 3, each bluntly pointed, wider than high, slightly larger and wider in male; Pennsylvania to North Carolina; *Carya*; 1.8–2.0 mm ..... 7. ***spadix*** **Blackman**

8(6). Frons in both sexes with a conspicuous, transverse, carinate elevation; declivital interstriae weakly elevated, serrations limited to about one tubercle; striae 1 and 2 obsolete on lower half of declivity ..... 9

— Transverse elevation rare on male frons, female frons flattened and strongly pubescent (an irregular elevation in *effeminatus*); declivital interstriae 9 acutely elevated and/or serrate; declivital striae clearly punctured to apex (confused in *dilutus*) ..... 11

9(8). Transverse frontal elevation equal in length to half width of frons; interstrial granules on male disc small, about two or three rather low tubercles on interstriae 3; elytra not sexually dimorphic; Chiapas to Guatemala; decaying limb; 2.1–2.5 mm ..... 8. ***incomptus*** **Wood**

— Transverse frontal elevation little more than a compressed tubercle, its length equal to considerably less than one-fifth width of frons; interstrial nodules on posterior third of male disc moderate to very coarse, continuing down declivity on 3 and lateral interstriae, about 10 nodules of equal size on interstriae 3; female interstriae finely granulate near and on declivity ..... 10

10(9). Larger; elytral nodules less developed, declivity with a coarse tubercle on interstriae 1, 3, and 9; Florida; 2.2–2.4 mm ..... 9. ***flaglerensis*** **Blackman**

— Smaller; elytral nodules in male strongly developed, declivity without tubercles conspicuously larger than nodules; Jalisco and San Luis Potosí to Costa Rica; bamboo; 1.6–2.2 mm ..... 10. ***nodulus*** **Wood**

11(8). Declivital interstriae 9 joins costal margin and continues to apex; male declivital interstriae near base each with several nodules; mature color reddish brown ..... 12

— Declivital interstriae 9 separated from costal margin by a rather wide groove; granules or nodules at base of male declivity usually smaller and less numerous ..... 13

12(11). Larger; male declivital interstriae 1–8 near base with several nodules extending to posterior area of disc; discal interstriae with transverse, irregular lines; strial punctures on declivity very small; declivital setae hairlike; Guatemala to Panama; *Inga*; 2.7–3.2 mm ..... 11. ***simplex*** **Blandford**

— Smaller; declivital nodules fewer, larger, not extending to disc, obsolete or with only one nodule on interstriae 2 and 4; discal interstriae almost smooth; strial punctures on declivity larger; interstrial bristles on declivity broad; Veracruz; 1.8 mm ..... 12. ***egenus*** **Eichhoff**

13(11). Strial punctures on lower half of declivity reduced in size and strongly confused; elytral tubercles small in both sexes; color reddish brown; Jalisco to Michoacán; 2.1–2.5 mm ..... 13. ***dilutus*** **Wood**

— Striae 1 and 2 with punctures on lower half moderately large, impressed, in rows ..... 14

14(13). Tubercles on declivital interstriae 3 continuing to junction with 9, tubercles normally also on 9 to this junction ..... 15

— Tubercles on declivital interstriae 3 obsolete below junction with 5, tubercles also absent on posterior part of 9; mature color black ..... 16

15(14). Larger; color reddish brown; interstrial nodules at base of male declivity very large, coarse tubercles continue to apices of interstriae 1 and 3; female frons with short, dense pile over large area; San Luis Potosí; *Robinia*; 2.3–2.6 mm ..... 14. ***ruber*** **Wood**

— Smaller; very dark reddish brown to black; granules at base of declivity very small, granules on interstriae 1 small; female frons pubescent on small area; setae rather long; Washington to Baja California; *Salix*, etc.; 1.4–1.8 mm ..... 15. ***hirtellus*** **(LeConte)**

16(14). Pronotal disc partly smooth and shining; elytral setae slender; female frons flattened and profusely pubescent over large area; Arizona to Michoacán; *Quercus*; 2.2–2.5 mm ..... 17. ***femineus*** **Wood**

— Pronotal disc strongly reticulate, dull; interstrial setae at base of declivity stout in female, scalelike in male (except slender in both sexes of *longipennis*) ..... 17

17(16). Interstriae 2 impressed on declivity, 2, 4, and 6 devoid of tubercles; tubercles on interstriae subacutely pointed; male frons with a transverse subcarinate elevation, more nearly tuberculate in female; Oaxaca; 1.7–2.1 mm (see also 16. ***longipennis*** **Wood,** Durango, 2.5 mm) ..... 18. ***effeminatus*** **Wood**

— Interstriae 2 on declivity not impressed, bearing fine tubercles to middle of declivity; interstrial nodules on posterior fourth of disc and upper fourth of declivity larger, broadly rounded, on interstriae 3–8; frons transversely impressed near epistoma, devoid of a transverse elevation ..... 18

18(17). Male declivital interstriae 9 devoid of tubercles; tubercles on all declivital interstriae smaller, lower, and more widely spaced; discal interstriae smooth, with few transverse lines; pronotal disc shining, rather weakly rugose-reticulate; Texas; 2.2 mm ..... 19. ***schwarzi*** **Blackman**

— Male declivital interstriae 9 as coarsely tuberculate as 8; tubercles on all declivital interstriae coarse, almost as high as wide; discal interstriae with numerous strongly impressed irregular lines; pronotal disc strongly rugose-reticulate ..... 19

19(18). Elytral declivity strongly reticulate, dull; discal striae near declivity strongly impressed, tubercles comparatively low; declivital interstriae 2 distinctly tuberculate to middle of declivity; pronotal disc with shallow punctures; "Mexico"; 2.4–2.7 mm ..... 20. ***errans*** **Blandford**

— Elytral declivity smooth, shining; discal striae near declivity rather weakly impressed, tubercles coarse, higher than wide; declivital interstriae 2 unarmed except near base; pronotal disc almost devoid of punctures; Oaxaca; 2.1–2.7 mm . ..... 21. ***rivalis*** **Wood**

20(1). Male declivital interstriae 9 strongly elevated, terminating abruptly or produced into a conspicuous spine without crossing broad, deep notch or groove at striae 9–10, elytral apex longer, acute; female scape very sparsely if at all pubescent; female frontal pubescent area never divided along median line ..... 21

— Male declivital interstriae 9 acutely, strongly elevated and joining costal margin, a slight notch between costal margin and 9 in one species but striae 9–10 obsolete before notch; female scape bearing a conspicuous tuft of long hair (except *elegans* in which frontal pubescent area divided along median line); tropical species ..... 29

21(20). Apices of blunt spines in circumdeclivital ring on male declivital interstriae 1 to 4 equal, or at least their apices forming a straight line (3 out of line in some *parkinsoniae*) ..... 22

— Apices of spines in male circumdeclivital ring distinctly longer on interstriae 1, 3, and 5 than on 2, 4, and 6; punctures intermixed with granules on pronotal disc ..... 27

22(21). Apices of interstrial spine 5 (and occasionally 3) in male circumdeclivital ring extending beyond (posterior to) 1 to 4, posterior face of spines vertical, rarely projecting; female frons planoconvex, finely punctured, pubescence rather abundant but not dense; California to Texas; *Cercidium*, *Condalia*, etc.; 1.7–2.3 mm ..... 22. ***parkinsoniae*** **Blackman**

— Apex of male circumdeclivital spine 5 in line with others ..... 23

23(22). Male declivital face with at least one tubercle below circumdeclivital ring on interstriae 1, 3, 5, 7, and occasionally on others; female frons shallowly concave ..... 24

— Male declivital face with tubercles below circumdeclivital ring only on interstriae 1 and 3; female frons flat to convex ..... 26

24(23). Denticles on declivital interstriae 3 extending lower, final pointed granule in line with 9, slight elevation extending between apices of 3 and 9, this elevation armed by granules in female; circumdeclivital tubercles in male well developed; strial punctures on posterior half of male disc very large, very deep; female frons distinctly convex, with an indistinct, central, transverse callus and moderately abundant vestiture; black; Guatemala; 2.6–2.9 mm ..... ..... 23. ***cancellatus*** **Blandford**

— Declivital denticles on interstriae 3 ending higher on declivity, final pointed granule at junction of interstriae 3 and 7 usually on a weak elevation connecting these interstriae; male circumdeclivital tubercles less well developed, punctures on posterior half of disc much smaller, not as deep ..... 25

25(24). Tubercles in male circumdeclivital ring poorly developed, two or more tubercles below this ring on interstriae 5 and 7, punctures on striae 1 and 2 almost as large as those in lateral areas; male frons flattened, female frons planoconcave, both pubescent on broad area three-fourths as wide as distance between eyes; Texas to Maryland and Florida; *Celtis*; 1.8–2.3 mm ..... ..... 24. ***langstoni*** **(Blackman)**

— Tubercles in male circumdeclivital ring well developed, projecting slightly, interstriae 5 and 7 never with more than one tubercle each below circumdeclivital ring, punctures on lower half of striae 1 and 2 small, very coarse on all striae near base of declivity; female frons shallowly concave and pubescent on median two-thirds; Tamaulipas to San Luis Potosí, 1.8–2.2 mm ..... 25. ***medius*** **Wood**

26(23). Strial punctures on face of male declivity near apex almost as large as those near circumdeclivital ring; three tubercles on male declivital interstriae 3 smaller than those on 1; female frons broadly flattened and pubescent on median two-thirds or more; Puebla; *Salix*; 2.5–2.9 mm ..... 26. ***microcornis*** **Wood**

— Punctures on face of male declivity on lower half of striae 1 and 2 about one-third as large as punctures near circumdeclivital ring; two tubercles on male declivital interstriae 3 larger than those on 1; female frons flattened and pubescent on median half; San Luis Potosí, 1.8–2.0 mm ..... 27. ***equidens*** **Wood**

27(21). Two or more spines on male circumdeclivital ring projecting more than twice basal width of spine; Honduras; *Ficus*; 2.2 mm ..... 28. ***disparilis*** **Wood**

— None of spines on male circumdeclivital ring projecting more than basal width of spine ..... 28

28(27). All spines in male circumdeclivital ring less well developed, long spines on upper half of declivity projecting no more than twice distance of short spines; large punctures on face of male declivity in definite rows, with distinguishable interstriae; Costa Rica; 1.7–2.5 mm ..... 29. ***alternus*** **Wood**

— All spines in male circumdeclivital ring more strongly developed, longest spines projecting four or more times distance of short spines; large punctures on male declivital face much larger, deeper, confused; Nayarit to Oaxaca; *Acacia*, *Inga*; 1.5–2.1 mm ..... 30. ***inaequalis*** **Wood**

29(20). Spines in circumdeclivital row of male blunt, rounded, symmetrical; female scape sparsely pubescent; female frons with pubescent area largely or completely divided into two parts; mature color almost black; Nayarit to Colombia; 1.3–1.8 mm ..... 31. ***elegans*** **Eichhoff**

— Spines in circumdeclivital ring of male sharply pointed on lateral side of each spine; female scape bearing a tuft of long hair; female frontal pubescence uniformly distributed; body color reddish brown ..... 30

30(29). Spines in male circumdeclivital ring projecting only slightly; male declivity more distinctly convex, strial rows easily discernible; female frons moderately concave, pubescence abundant; suture 1 on antennal club strongly procurved, extending beyond basal third; Nayarit, 1.9–2.2 mm (see also 35. ***punctatorugosus*** **Schedl**)— ..... 32. ***dissidens*** **Wood**

— Spines in male circumdeclivital ring projecting conspicuously, especially in lateral areas; male declivity more nearly flattened, strial rows seen with difficulty; female frons convex, pubescence rather sparse; suture 1 on antennal club weakly procurved; Costa Rica; 2.0–2.2 mm (see also 33. ***clarki*** **Wood**) ..... 34. ***aberrans*** **Wood**

### 1. *Hylocurus binodatus* Wood

*Hylocurus binodatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):17 (Holotype, female; Nicholson, Mississippi; U.S. Nat. Mus.)

DIAGNOSIS.— The frontal area of this species has a pair of raised spongy patches somewhat like the *rudis* group of species, but the elytral declivity is similar to *harnedi* Blackman.

FEMALE.— Length 1.8–2.0 mm, 2.7 times as long as wide; color very dark brown, almost black.

Frons with a large, transversely reniform concavity from midway between epistoma and upper level of eyes to vertex, widest point at upper level of eyes, occupying three-fourths of area between eyes; concavity rather abruptly impressed, moderately deep; central area of each half of concavity occupied by a protuberant, oval, spongy area, occupying about half of concave area; spongy areas rather narrowly separated from one another; general sculpture as in *rudis*; subglabrous.

Pronotum as in *rudis* except granules on disc smaller. Elytral disc as in *rudis*. Declivity as in *rudis* except tubercles distinctly larger; interstriae 1 with a moderately large protuberance at middle of declivity, slightly displaced from suture, almost as high as wide, similar to but smaller than female *harnedi*; interstriae 9 not more strongly elevated than in *rudis*. Vestiture as in *rudis*.

DISTRIBUTION.— Louisiana to Mississippi.

USA: **Louisiana**: Algiers, 18-IV-45, No. 45-8751, pecan, Rau. **Mississippi**: Nicholson, 15-I-45, No. 45-2357, under hickory bark, W. H. Anderson.

HOST.— *Carya* sp.

NOTES.— The above treatment was based on the type series of three specimens.

### 2. *Hylocurus rudis* (LeConte)

Figs. 148–149

*Micracis rudis* LeConte, 1876, Proc. Amer. Philos. Soc. 15:369 (Holotype, female?; Detroit, Michigan; Mus. Comp. Zool., 1020)

*Micracis biorbis* Blackman, 1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:22 (Holotype, male; Syracuse, New York; U.S. Nat. Mus., 58217); Wood, 1972, Great Basin Nat. 32:196. *Synonymy*

DIAGNOSIS.— This species is distinguished from *torosus* Wood by the larger frontal excavation, the spongy area ventrolateral in position, mostly flat, and distinctly larger.

FEMALE.— Length 1.9–2.1 mm, 2.7 times as long as wide; color very dark brown.

Frons deeply, broadly excavated, margins of concavity abrupt except median area below; surface minutely etched to rugulose; ventrolateral areas of concavity occupied by large, subcircular, minutely pilose areas (appearing spongy) of somewhat variable size and position, lower halves of these areas moderately protruding, upper halves almost flat, these areas separated below by a distance about equal to one-fourth width of concavity (variable in series); glabrous except for minute pile. Antennal club with two bisinuate sutures.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on slightly more than basal half, broadly rounded in front; serrations on anterior margin almost obsolete; summit poorly developed, in front of middle; asperities continue as granules to base; posterior area reticulate, with a few granules. Glabrous.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal three-fourths, a slight notch at end of elevated interstriae 9, subacutely acuminate and mucronate behind; striae weakly impressed, punctures rather coarse, deep; interstriae weakly convex, smooth, punctures fine, uniseriate, rather widely spaced. Declivity steep, convex, produced at apex; striae rather obscure, a slight impression below where 3 and 7 join; interstriae 9 rather strongly elevated, its apex declining gradually, all interstriae with several rounded granules; acuminate area tuberculate to its base. Vestiture of fine, moderately long hair, largely confined to declivity.

MALE.— Similar to female except frontal excavation slightly smaller, not as deep, spongy areas flatter; declivital granules slightly larger except smaller on interstriae 1 and 2.

DISTRIBUTION.— Michigan and Pennsylvania to Kansas and Georgia.

USA: **District of Columbia**: Washington. **Georgia**: Black's Mt., Clarksville. **Kansas**: Ottawa. **Kentucky**: Humble. **Maryland**: Jacksons, Plummers Island. **Michigan**: Detroit. **New Jersey**: Pequest. **Ohio**: Delaware Co., Franklin Co., Westerville. **Pennsylvania**: Blain, Harrisburg, Hummelstown, Pittsburgh, University Park. **Virginia**: "Va."

HOSTS.— *Carya* spp., *Fagus grandifolia*, *Quercus velutina*, *Ulmus americana*.

BIOLOGY.— Presumably as described for the genus.

NOTES.— The above treatment was based on the holotypes of *rudis* and *biorbis* and on 43 other specimens.

Apparently there is a great deal of variation in the size of the spongy areas on the frons in this rare species.

### 3. *Hylocurus torosus* Wood

Figs. 148–150

*Hylocurus torosus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):28 (Holotype, female; Florence, South Carolina; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *rudis* (LeConte) by characters of the frontal excavation and its protuberances as noted below.

FEMALE.— Length 2.0 mm, 2.7 times as long as wide; color very dark brown.

Frons deeply excavated on median two-thirds from just above epistomal margin to well above eyes, broadly oval in outline, its margins abrupt on all sides; surface etched as in *rudis*; lateral walls of concavity with a pair of large, protruding, subcircular areas, almost as high as wide, pile longer than in *rudis*.

Antenna, pronotum and elytra as in *rudis*.

DISTRIBUTION.— Illinois and Maryland to Alabama and South Carolina.

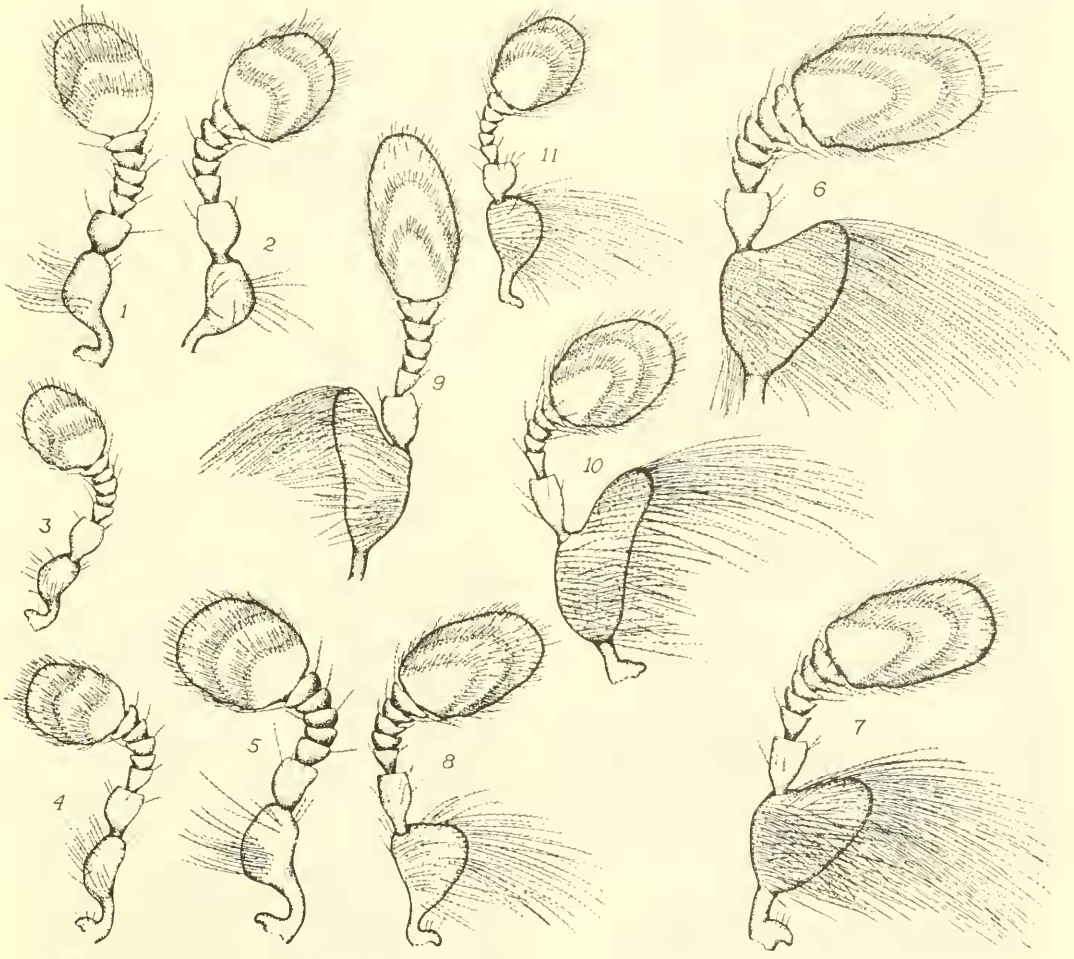



Fig. 148. Micracini spp., antennae: 1, *Hylocurus torosus*, female; 2, *Hylocurus rudis* (=*biorbis*), female; 3, *Hylocurus bicornus*, female; 4, *Hylocurus harnedi*, female; 5, *Hylocurus langstoni*, female; 6–7, *Micracis suturalis*, female, 8, same, male; 9–10, *Micracis swainei* (9 is an abnormally slender club), female; 11, *Micracisella opacicollis*, female. (After Blackman 1920:pl. I.)

USA: **Alabama**: Corona Mines, 18-IX-76, B. A. Hawkins. **Illinois**: Pine Hills Field Station, Union Co., 15-V-67. **Maryland**: Plummers Island, *Carya* and *Celtis*, A. D. Hopkins. **North Carolina**: Tryon, *Acer*, *Carya*, *Casanea dentata*, S. F. Fiske. **South Carolina**: Florence, 12-V-61, in flight, V. M. Kirk.

NOTES.— The above treatment was based on the holotype and on 10 other specimens.

### 4. *Hylocurus bicornus* (Blackman)
Figs. 148–149

*Micracis bicornus* Blackman, 1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:23 (Lectotype, female; Mendenhall, Mississippi; U.S. Nat. Mus., present designation.)

DIAGNOSIS.— This species is distinguished from *rudis* (LeConte) by the very different sculpture of the frons as noted below.

FEMALE.— Length 1.7–2.0 mm, 2.7 times as long as wide; color very dark brown.

Frons excavated about as in *rudis* except bilobed spongy areas borne on a strongly elevated median partition; spongy area about one-fourth as wide as frontal concavity.

Pronotum as in *rudis* except posterior area less distinctly reticulate. Elytra as in *rudis* except striae indistinctly impressed, punctures smaller, not as deep; declivity more finely sculptured, more nearly shining.

MALE.— Similar to female except frontal excavation not as deep, median partition absent, spongy areas borne on paired processes arising from median half of floor of concavity, basally, narrowly separated, each process higher than wide, its basal longitudinal axis about twice as great as its transverse axis.

DISTRIBUTION.— Mississippi.

USA: **Mississippi**: Mendenhall, 26, 30-XII-19, hickory, M. W. Blackman.

HOST.— *Carya* sp.

BIOLOGY.— Apparently as described for the genus.

NOTES.— The above treatment was based on the lectotype, on the lectoallotype, and on 20 other specimens. The female syntype in the U.S. National Museum, labeled as the holotype, is here designated as the lectotype of this species.

### 5. *Hylocurus biconcavus* Blackman
Fig. 147

*Hylocurus biconcavus* Blackman, 1943, Proc. U.S. Nat. Mus. 93:344. (Holotype, female?; Kentucky; U.S. Nat. Mus., 56397)

FEMALE.— Length 2.0 mm, 2.7 times as long as wide; color almost black. As in *bicornus* (Blackman) except large, deep, transversely oval frontal excavation completely divided by a narrow median partition; slightly spongy texture limited to summit of this partition.

DISTRIBUTION.— Kentucky.

USA: **Kentucky**: "Ky."

NOTES.— The above treatment was based on the holotype. Insufficient material is available to evaluate the status of this species.

### 6. *Hylocurus harnedi* (Blackman)
Figs. 148–149, 151

*Micracis harnedi* Blackman, 1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:24 (Lectotype, female; Mendenhall, Mississippi; U.S. Nat. Mus., present designation)

DIAGNOSIS.— This species and the allied *spadix* Blackman are remotely related to other known *Hylocurus*. In both species the elytral declivity is armed by only one pair of prominent, blunt elevations, these apparently derived from interstriae 1. In the *harnedi* male these processes are basally subcontiguous at the suture just below the base of the declivity, and in the female they are just above the middle of the declivity about in line with interstriae 2.

FEMALE.— Length 1.8–2.2 mm, 2.8 times as long as wide; color almost black.

Frons obscured in available specimens; evidently moderately convex and finely granulate, with sparse vestiture. Pronotum essentially as in *bicornus*.

Elytra 1.7 times as long as wide; sides almost straight and parallel on more than basal two-thirds, abruptly rounded, then strongly acuminate behind, with a pair of projecting declivital processes interrupting outline; striae feebly impressed toward declivity, punctures moderately coarse, deep; interstriae as wide as striae, weakly convex posteriorly, shining, with occasional transverse lines, punctures fine, often rather obscure, uniseriate, becoming finely granulate on posterior third. Declivity very steep, broadly convex; striae 1 and 2 apparently obsolete; a large, pointed elevation just above middle of declivity in line with interstriae 2, higher than wide; a shallow impression between

horns from base of declivity to base of acuminate elytral apex; interstriae lateral to horns bearing uniseriate, isolated, pointed granules; interstriae 9 rather strongly elevated, elevation terminated abruptly behind. Vestiture confined to declivital base, of sparse, stout, almost scalelike setae.

MALE.— Similar to female except sutural interstriae bearing a rather slender, blunt, fingerlike process near base of declivity, interstriae 3 convex and uniseriately granulate to middle of declivity, not bearing a pair of horns at this position; declivital interstriae 9 more strongly elevated.

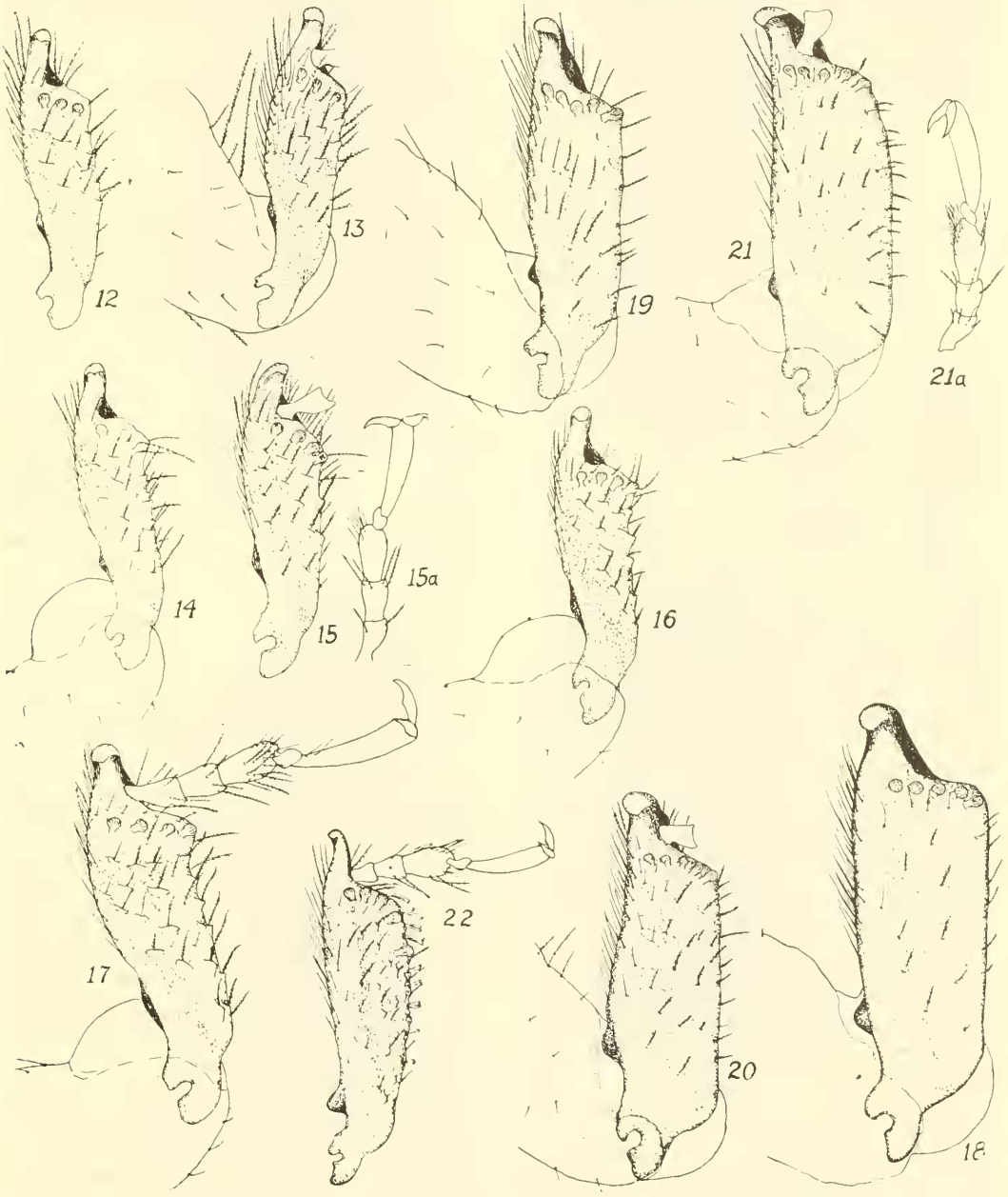



Fig. 149. Micracini spp., protibiae: 12, *Hylocurus torosus*, female; 13, *Hylocurus rudis*, female; 14, *Hylocurus bicornus*, female, 15, same, male; 16, *Hylocurus harnedi*, female; 17, *Hylocurus langstoni*, female; 18–19, *Micracis suturalis*, female; 20–21, *Micracis swainei*, female; 22, *Micracisella opacicollis*, female. (After Blackman 1920:pl. 11.)

DISTRIBUTION.— Mississippi.

USA: Mississippi: Mendenhall, 30-XII-19, *Carya*, M. W. Blackman.

BIOLOGY.— Specimens were removed from hickory branches. The gallery systems apparently were as described for the genus.

NOTES.— The above treatment was based on the lectotype, on the lectoallotype, and on three paratypes. The female syntype from Mendenhall, Mississippi, that was labeled "type" by Blackman is here designated as the lectotype of this species.

### 7. *Hylocurus spadix* Blackman

*Hylocurus spadix* Blackman, 1928, Bull. New York St. Coll. For., Syracuse Tech. Bull. 25:188 (Holotype, female; Tryon, North Carolina; U.S. Nat. Mus., 27131)

DIAGNOSIS.— This species is distinguished from *harnedi* Blackman by the pair of declivital spines below the middle of the declivity, located in the same position in both sexes (in line with interstriae 3).

MALE.— Length 1.8–2.0 mm, 2.8 times as long as wide; color almost black.

Frons and pronotum as in *harnedi*.

Elytra 1.6 times as long as wide; outline as in *harnedi*; striae feebly impressed at base, more strongly toward declivity, punctures rather coarse, deep; interstriae almost as wide as striae, smooth with a few transverse lines, punctures uniseriate, fine, rather coarse, uniseriate granules at declivital base. Declivity very steep, rather broadly convex; a pair of large, blunt, almost mammiform elevations at or just below middle of declivity in line with interstriae 3, almost as high as wide, basal width slightly greater than width of an interstriae; lateral areas with granules and interstriae 9 as in *harnedi*. Vestiture of sparse, stout setae at base of declivity.

FEMALE.— Similar to male except declivital granules much smaller, interstriae 9 less strongly elevated; mammiform declivital elevations with smaller basal width but equal in height.

DISTRIBUTION.— Pennsylvania to North Carolina.

USA: **North Carolina**: Tryon, Hopk. U.S. 3190B, hickory, W. F. Fiske. **Pennsylvania**: Linglestown, 2-VIII-13, hickory, A. D. Hopkins.

HOST.— *Carya*.

BIOLOGY.— Presumably as in *harnedi*.

NOTES.— The above treatment was based on the holotype, allotype, two paratypes, and on one other specimen.

### 8. *Hylocurus incomptus* Wood

*Hylocurus incomptus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):44 (Holotype, male; Volcán de Agua, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nodulus* Wood by characters summarized in the above key.

MALE.— Length 2.1–2.5 mm, 2.6 times as long as wide; color black.

Frons moderately convex, epistomal margin slightly elevated; a conspicuous, transverse carina occupying median half at upper level of eyes; surface coarsely reticulate, sparse punctures minute; vestiture inconspicuous except on epistomal margin. Eye smaller than in related species.

Pronotum 1.2 times as long as wide; widest at base, sides almost straight, converging slightly anteriorly on posterior two-thirds, broadly rounded in front; anterior margin subserrate; sculpture as in *femineus* Wood, with tubercles behind summit finer, becoming obsolete at base; vestiture inconspicuous, hairlike.

Elytra 1.5 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on basal two-thirds, rather abruptly rounded behind, median fourth extending into a rather well-developed mucro; striae not impressed, punctures fine, shallow but distinct; interstriae about three times as wide as striae, marked by irregular lines, almost flat, punctures minute, widely separated, becoming finely granulate on posterior fourth. Declivity convex, very steep; strial punctures obscure; interstriae 3 weakly, 9 moderately elevated, 1 feebly raised and terminating apically in mucro; all interstriae with a row of tubercles on upper third, minute on 2, rather coarse on 3, and last tubercle on 9, those on 3 extend to middle, on 1 two or three minute granules scattered on lower half. Vestiture hairlike, consisting of rows of short strial and slightly longer interstrial setae on declivity.

FEMALE.— Similar to male except evidently very slightly more finely sculptured; declivital vestiture longer and more abundant.

DISTRIBUTION.— Chiapas to Guatemala.
MEXICO: **Chiapas**: 13 km NE San Cristóbal, 15-V-69, *Quercus*, D. E. Bright. GUATEMALA: Volcán de Agua, Esquintla, 19-V-64, 1000 m, No. 616, S. L. Wood.

BIOLOGY.— The original series was taken from an old, decaying, fallen limb, 20 cm in diameter, of an unidentified tree. The

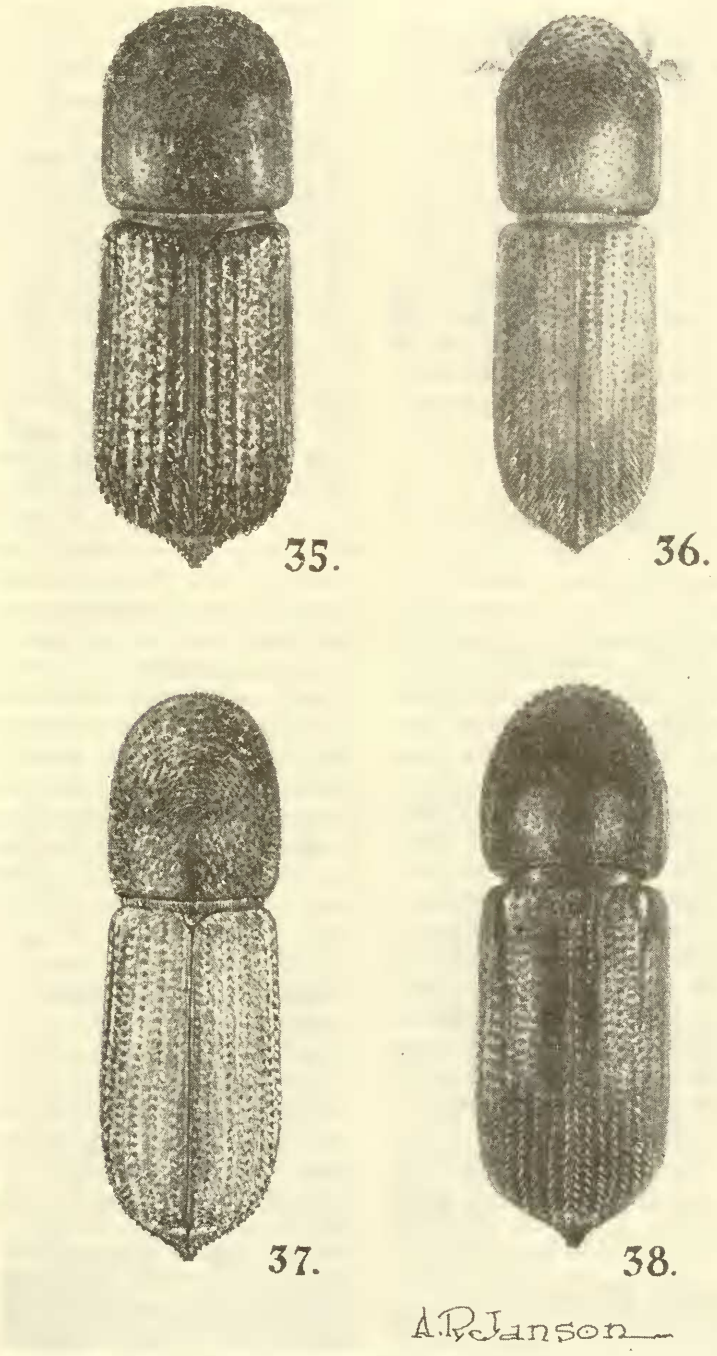



Fig. 150. Micracini, dorsal aspect: 35, *Hylocurus torosus*; 36, *Micracis swainei*, female; 37, *Micracis suturalis*, female, 38, same, male. (After Blackman 1922, pl. VII.)

galleries were such that it appeared more than one generation had been completed within this one limb; there were no exit holes or indications that the mature beetles were making tunnels in the direction toward the surface of the limb.

NOTES.— The above treatment was based on the type series of 69 specimens and on one other specimen.

### 9. *Hylocurus flaglerensis* Blackman
Fig. 147

*Hylocurus flaglerensis* Blackman, 1943, Proc. U.S. Nat. Mus. 93:345 (Holotype, female; Flagler Co., Florida; U.S. Nat. Mus., 56400)

DIAGNOSIS.— This species is somewhat intermediate between *incomptus* Wood and *nodulus* Wood, but it is distinguished by the larger size, by the larger upper declivital tubercles, and by other characters mentioned below.

MALE.— Length 2.2–2.4 mm, 2.5 times as long as wide; color almost black.

Frons as in *nodulus*; pronotum as in *incomptus* except posterior area feebly reticulate, almost shining, granules narrower.

Elytral outline as in *incomptus*; striae not impressed, punctures rather coarse, deep; interstriae very slightly wider than striae, uniseriate punctures rather coarse, their anterior sides elevated to form fine nodules that become distinctly larger toward declivity, largest about half as high as wide. Declivity convex, moderately steep, apex acuminate; arrangement of tubercles basically as in *incomptus*, interstriae 1 armed by a moderately large tooth just below base of declivity, 3 bearing a rather coarse, blunt tooth near middle of declivity, two or more smaller tubercles may occur dorsad of this major one, one small tubercle at or near apex of 5 and 7, tubercle at junction of 3 and 9 proportionately smaller than in *incomptus*. Vestiture of rather long, coarse hair of moderate length.

DISTRIBUTION.— Florida.

USA: **Florida**: Marion Co., 31-I-30, fruit fly trap, R. B. Mathews.

NOTES.— The above treatment was based on the holotype and paratype.

### 10. *Hylocurus nodulus* Wood
Fig. 152

*Hylocurus nodulus* Wood, 1956, Canadian Ent. 88:141 (Holotype, male; Pujal, San Luis Potosí, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is in the *robustus* Schedl group of species, but it is very distinct. It is distinguished from North American forms by characters included in the above key.

MALE.— Length 1.6–2.2 mm, 2.5 times as long as wide; color almost black.

Frons convex, a moderately deep, rather narrow, transverse impression at level of antennal insertion; surface somewhat granulate-punctate, a conspicuous, rather coarse, transversely compressed median granule at upper level of eyes. Antennal club subcircular, with sutures 1 and 2 weakly procurved.

Pronotum 1.1 times as long as wide; sides very feebly arcuate, subparallel on basal half, rather narrowly rounded in front; anterior margin armed by two coarse, closely set teeth; posterior surface obscurely reticulate, with rather numerous isolated granules toward summit. Vestiture of sparse, coarse hair.

Elytra 1.4 times as long as wide, 1.3 times as long as pronotum; outline about as in *rudis*; striae not impressed, punctures small, distinct at base, becoming larger, malformed toward declivity; interstriae smooth, with distinct punctures on basal third, 1 and 2 with large, rounded nodules on middle third, higher and more acutely rounded behind on all interstriae. Declivity confined to posterior third; steep, convex, produced at apex; strial punctures very small, not always clearly formed; interstriae 1 elevated toward apex, 3 weakly, broadly raised on middle third, 1 and 2 unarmed, others with tubercles on upper two-thirds, lower one or two tubercles on 3 larger, 9 rather weakly elevated, not tuberculate. Vestiture largely confined to declivity; of coarse, blunt, moderately long interstrial bristles.

FEMALE.— Similar to male except frontal impression not as deep; teeth on anterior margin of pronotum smaller; all nodules and granules on elytra rather small; vestiture of slender, pointed bristles.

DISTRIBUTION.— Jalisco and San Luis Potosí to Costa Rica.

MEXICO: **Jalisco**: Guadalajara, 26-VII-42, bamboo (Nogales interception No. 55381). **San Luis Potosí**: Pujal, 20-VI-53, bamboo, S. L. Wood. HONDURAS: La Lima, Cortez, 5-V-64, 200 m, bamboo, S. L. Wood. COSTA RICA: Santa Ana, San José, 1-VIII-63, No. 94, bamboo, S. L. Wood; San José, San José, 12-IX-63, No. 161, 22-X-63, No. 239, *Bambusa vulgaris*, S. L. Wood.

HOSTS.— Bamboo.

BIOLOGY.— Essentially as described for the genus.

NOTES.— The above treatment was based on 15 paratypes and on 33 other specimens.

### 11. *Hylocurus simplex* Blandford

Fig. 152

*Hylocurus simplex* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):222 (Holotype, male; El Tumbador, San Marcos, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species has several equal, uniseriate interstrial tubercles at the base of the declivity, and interstriae 9 joins the costal margin.

MALE.— Length 2.7–3.2 mm, 2.7 times as long as wide; color reddish brown.

Frons rather strongly convex, abruptly, transversely impressed on lower third; surface brightly shining, smooth, with large, deep, close punctures uniformly distributed from impression to vertex; glabrous. Antennal club subcircular; two weakly procurved sutures.

Pronotum 1.1 times as long as wide; widest at base, sides almost straight, converging slightly on basal half, rather narrowly rounded in front; anterior margin irregularly serrate; posterior area subreticulate, with isolated granules extending to base. Glabrous.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; outline about as in *rudis*; striae distinctly impressed, punctures moderately small, very close, deep; interstriae smooth, shining, a few transverse lines, punctures small, almost uniseriate; each interstriae with two coarse, rounded nodules at base of declivity except 3 and 5 with more. Declivity steep, convex, produced at apex; striae not impressed, punctures small, rather shallow; interstriae smooth, shining, 1 with a few small granules on lower half, 3 with four to eight rather large, rounded nodules on upper two-thirds, 5 and 7 each with five nodules at base, 2, 4, 6, and 8 smooth except at extreme base, 9 subacutely, rather strongly elevated and joining costal margin; a few granules on or near apex. Glabrous except for a few hairlike setae near base of declivity.

FEMALE.— Similar to male except frons flattened on median half, transverse impression absent, flattened area finely punctured, with abundant, fine, hairlike setae of moderate length; anterior margin of pronotum unarmed; declivital interstrial tubercles slightly smaller, mostly pointed, larger and more abundant on 1, more abundant (10) on 3.

DISTRIBUTION.— Guatemala to Panama.

GUATEMALA: El Tumbador, San Marcos, G. C. Champion. PANAMA: Cerro Punta, 19-XII-63, No. 315, 11-I-64, No. 404, 1800 m, *Inga*, S. L. Wood.

HOST.— *Inga* sp.

BIOLOGY.— As described for the genus. Specimens were taken from dying limbs and boles up to 15 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 15 other specimens. The holotype is a male, not a female as stated by Blandford.

### 12. *Hylocurus egenus* Blandford

*Hylocurus egenus* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):222 (Holotype, male; Motzorongo, Veracruz, Mexico; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *simplex* Blandford by the smaller size, by the elimination of nodules on declivital interstriae 2 and their reduction to one on 4, by the coarser declivital strial punctures, by the smoother discal interstriae, and by the scale-like interstrial setae on the declivity.

MALE.— Length 1.8 mm, 2.6 times as long as wide; color reddish brown.

Frons of type not clearly visible, evidently similar to *simplex*.

Pronotum 1.15 times as long as wide; as in *simplex* except basal areas more strongly reticulate, granules finer, less numerous.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; outline as in *simplex*; striae weakly impressed, punctures rather coarse, deep; interstriae as wide as striae near declivity, twice as wide as striae near base, smooth, shining, punctures fine, uniseriate, rather sparse, with no transverse lines. Declivity steep convex; about as in *simplex* except strial punctures larger, deeper, interstriae 2 without nodules, 4 with one, those on 1 and 3 sharply pointed; nodules not extending to disc. Vestiture confined to declivity where nodules, punctures, or tubercles occur, consisting of erect, flattened interstrial bristles, each as long as distance between

rows, each about six to eight times as long as wide.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: Motzorongo, Flohr.

NOTES.— The above treatment was based on the male holotype.

### 13. *Hylocurus dilutus* Wood

*Hylocurus dilutus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):29 (Holotype, male; Volcán Colima, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is allied to *simplex* Blandford and *ruber* Wood, but it is distinguished by the smaller average size, by the smaller interstrial tubercles in both sexes, and by the small, confused strial punctures on the declivity.

MALE.— Length 2.1–2.5 mm, 2.6 times as long as wide; color rather dark reddish brown.

Frons convex, transversely impressed on lower third; surface obscurely reticulate-granulate, convex area with rather numerous, very large, low, shining granules over more than central half; vestiture fine, sparse, inconspicuous except more abundant along epistoma. Antennal club broadly oval; sutures 1 and 2 strongly procurved, 1 almost reaching middle.

Pronotum 1.1 times as long as wide; as in *simplex* except sides weakly arcuate; anterior margin armed by eight coarse serrations; posterior area more strongly reticulate, with isolated granules slightly smaller.

Elytra 1.5 times as long as wide, 1.4 times as long as pronotum; outline as in *simplex*; striae not impressed, punctures moderately large, rather deeply, not sharply impressed; interstriae almost smooth, with a few obscure, transverse lines, evidently narrower than striae, punctures not clearly defined; each interstriae near declivity with about two low, poorly formed granules. Declivity steep, convex, produced at apex; strial punctures small, deep, confused on lower two-thirds; interstriae 1 and 3 weakly elevated, 1 with very small granules on upper two-thirds, 3 with small granules on upper third, 9 rather strongly elevated on basal half, its summit subserrate, a rather broad impression between 9 and costal margin. Subglabrous; very sparse, short, fine hair on some specimens.

FEMALE.— Similar to male except frons flattened on at least median half, transvrse impression absent, surface reticulate, dull, with rather abundant, small, deep punctures and fine, short, abundant hair; serrations on anterior margin of pronotum smaller, irregular; strial punctures on disc smaller, not as deep, sharply defined; tubercles on declivity evidently slightly smaller.

DISTRIBUTION.— Jalisco to Michoacán.

MEXICO: **Jalisco**: Volcán Colima, 23-VI-65, 2500 m, No. 102; S. L. Wood. **Michoacán**: Zirimicuaro, 2-XI-80, 1350 m, T. H. Atkinson.

BIOLOGY.— As described for the genus. Specimens were taken from a branch of a leguminous tree.

NOTES.— The above treatment was based on the type series of 14 specimens.

### 14. *Hylocurus ruber* Wood

*Hylocurus ruber* Wood, 1956, Canadian Ent. 88:142 (Holotype, male; 32 km NE Ciudad del Maíz, San Luis Potosí, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species resembles *simplex* Blandford, although the relationship may be rather remote; it is distinguished by characters summarized in the above key.

MALE.— Length 2.3–2.6 mm, 2.5 times as long as wide; color dark reddish brown.

Frons broadly convex, a shallow, transverse impression just above epistoma; surface obscurely reticulate, deeply, rather coarsely punctured except rather coarsely granulate at center; vestiture of coarse, short, rather abundant setae uniformly distributed. Antennal club elongate-oval; sutures 1 and 2 moderately procurved.

Pronotum 1.1 times as long as wide; essentially as in *simplex* except posterior area with fine granules extending almost to base with moderately large, shallow punctures intermixed.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; outline about as in *rudis*; striae moderately impressed toward declivity, punctures rather small and shallow at base, coarse and very deep toward declivity; interstriae as narrow or narrower than striae, smooth, shining, convex, fine punctures widely spaced, replaced by nodules at base of declivity on all interstriae. Declivity steep, convex, produced at apex; surface

smooth, shining, all striae rather coarsely punctured in rows; interstriae 1, 3, and 9 moderately elevated, 2, 4, 5, 6, and 8 each with one or two large, rounded nodules at base, 1 with moderately small, pointed denticles to apex, 3 with large pointed denticles to junction with 9, 7 with five nodules, 9 with a series of contiguous nodules to junction with 5. Vestiture largely confined to declivital area, of long, slender, interstrial scales; absent from central face of declivity except on 1 and 3.

FEMALE.— Similar to male except frons flattened, with dense, uniformly short pubescence over broad area; anterior margin of pronotum more finely, less regularly serrate; strial punctures on disc slightly smaller, interstrial nodules much smaller.

DISTRIBUTION.— San Luis Potosí.

MEXICO: San Luis Potosí: Los Abritos (32 km NE Ciudad del Maís), 18-VI-53, *Robinia*, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on four paratypes.

### 15. *Hylocurus hirtellus* (LeConte)

Fig. 147

*Micracis hirtellus* LeConte, 1876, Proc. Amer. Philos. Soc. 15:369 (Holotype, female; Southern California; Mus. Comp. Zool., 1021)

*Hylocurus crinitus* Blackman, 1943, Proc. U.S. Nat. Mus. 93:347 (Holotype, male; Orange, California; U.S. Nat. Mus., 56401); Bright, 1966, Pan Pacific Ent. 42:304. *Synonymy*

DIAGNOSIS.— Except for the antenna, protibia, and elytral denticles, this species might easily be confused with *Micracis* species. Within *Hylocurus* it might be confused with *femineus* Wood or *effeminatus* Wood, except that the sparse tubercles on interstriae 3 continue to the junction with interstriae 9.

MALE.— Length 1.4–1.8 mm, 2.9 times as long as wide; very dark brown to almost black.

Frons broadly convex, a distinct transverse callus near middle, a slight, transverse impression just above epistoma; epistomal area shining, upper area rather coarsely granulate-punctate; vestiture rather sparse, moderately coarse, long. Antennal club oval; sutures 1 and 2 moderately, asymmetrically procurved.

Pronotum 1.1 times as long as wide; widest just behind middle, sides moderately arcuate on basal two-thirds, rather narrowly rounded in front; anterior margin somewhat irregularly armed by six to eight coarse teeth; posterior area reticulate, with rather abundant, close, small, isolated, shining granules. Vestiture of rather abundant, fine, long hair.

Elytra 1.9 times as long as wide, 1.7 times as long as pronotum; outline as in *rudis*; striae very feebly impressed, punctures coarse, rather deep; interstriae shining, almost as wide as striae, anterior margins of punctures raised on basal half, distinctly, finely granulate toward declivity. Declivity steep, convex, apex acutely produced; strial punctures smaller than on disc, distinct; interstriae 1 and 3 very feebly elevated, 9 moderately elevated, 1 finely, 3 more coarsely, irregularly tuberculate, tubercles on 3 attain junction with 9; interstriae 5, 7, and 8 each with about two to four small tubercles near base, others with occasional small granules. Vestiture of rows of fine, rather abundant, strial and interstrial hair, that of interstriae much longer.

FEMALE.— Similar to male except frons flattened, with a dense patch of fine, long, yellow hair on central half on upper two-thirds; anterior margin of pronotum almost unarmed; discal interstriae not as irregular; declivital tubercles somewhat more abundant; vestiture evidently finer, slightly shorter.

DISTRIBUTION.— Washington to Baja California.

USA: **California**: Alameda Co., Arcata, Berkeley, Contra Costa Co., Eureka, Fieldbrook, Los Angeles, Mill Valley, Mt. St. Helena, Mt. Tamalpais, Monterey Co., North Hollywood, Oakland, Orange, Palo Alto, Pasadena, Riverside Co., Santa Ana, Scotia, Solano Co., Ventura Co. **Oregon**: Portland. **Washington**: Hobart in King Co. MEXICO: **Baja California**: Santa Domingo.

HOSTS.— *Alnus* sp., *Arbutus menziesii*, *Ceanothus* sp., *Populus* sp., *Rhus* sp., *Salix* spp. Bright (1973:64) adds *Myrica*, *Quercus*, *Rhamnus*, *Umbellularia*.

BIOLOGY.— Essentially as described for the genus.

NOTES.— The above treatment was based on the holotypes of *hirtellus* and *crinitus* and on 142 other specimens.

### 16. *Hylocurus longipennis* Wood

*Hylocurus longipennis* Wood, 1979, Great Basin Nat. 39:141 (Holotype, male; 5 km W El Salto, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the slender body form and by other characters cited below. Although it is more closely allied to *hirtellus* (LeConte) than to other known species, the relationship is not close.

MALE.— Length 2.5 mm (females 2.8–3.0 mm), 3.1 times as long as wide; color very dark brown.

Frons with a strong, transverse carina on more than median half midway between level of antennal insertion and upper margin of eyes; surface concealed by pronotum above carina, smooth, shining, with small punctures at sides and below. Antenna about as in *hirtellus* except club slightly longer, wider, with sutures slightly more strongly procurved.

Pronotum 1.2 times as long as wide; about as in *hirtellus* except disc longer, more strongly reticulate, with subcrenulate tubercles almost twice as large.

Elytra 2.0 times as long as wide, 1.7 times as long as pronotum; sides straight and parallel on basal four-fifths, rather abruptly, serrately tapered to strong, apical mucro; striae not impressed, punctures rather coarse, deep, spaced by diameter of a puncture; interstriae slightly narrower than striae, smooth, shining, punctures small, close, their anterior margins slightly elevated, more strongly so near declivity. Declivity very steep, convex; about as in *hirtellus* except smoother, more brightly shining, tubercles at base slightly larger, broader, interstriae 3 without tubercles below junction with 7, 9 higher and without tubercles on its posterior half; costal margin near apex finely serrate. Vestiture much as in *hirtellus* except interstrial setae at base of declivity longer, coarser, strial setae much shorter.

FEMALE.— Similar to male except frons without a carina, an indefinite callus in its place, upper surface with indefinite punctures and fine, sparse granules, vestiture rather sparse; tubercles at base of declivity finer.

DISTRIBUTION.— Durango.

MEXICO: **Durango**: El Salto, 7-VI-65, 2500 m, No. 41, *Quercus* branch, S. L. Wood.

NOTES.— The above treatment was based on the type series of four specimens.

### 17. *Hylocurus femineus* Wood

*Hylocurus femineus* Wood, 1959, Great Basin Nat. 19:59 (Holotype, male; Miller Canyon, Huachuca Mts., Arizona; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the allied *effeminatus* Wood by the larger size, by the smoother, shining pronotal disc, by the finer elytral setae, and by the more nearly flattened female frons, which is more densely, more extensively pubescent.

MALE.— Length 2.2–2.5 mm, 2.3 times as long as wide; color almost black.

Frons convex above, a conspicuous transverse carina at upper level of eyes on median half, rather strongly, transversely impressed below carina; surface densely, rather coarsely punctured above, finely punctured and transversely etched below; vestiture sparse, fine, limited to lateral areas of impression. Antennal club subcircular; sutures 1 and 2 rather weakly procurved.

Pronotum 1.05 times as long as wide; essentially as in *simplex* except posterior area largely shining (reticulate in Michoacán series), with isolated granules to base, most granules with a shallow puncture on anterior margin, granules larger toward summit. Vestiture of fine, sparse hair.

Elytra 1.4 times as long as wide, 1.3 times as long as pronotum; outline about as in *simplex*; striae very feebly impressed, punctures rather small, deep, some of them connected by longitudinal lines; interstriae wider than striae, smooth, with occasional transverse lines, punctures small, uniseriate. Declivity very steep, broadly convex, produced at apex; strial punctures slightly smaller than on disc, in rows; interstriae 1 with a few minute granules, 2, 4, 5, and 6 with one or two tubercles at base, 3 and 8 with tubercles reaching middle of declivity, 9 rather strongly elevated, subserrate, with one or two fine granules between apex of elevation and terminal mucro. Vestiture of moderately coarse hair at base of declivity, few setae on declivital face.

FEMALE.— Similar to male except frons flattened, carina absent, broadly, rather densely pubescent; anterior margin of pronotum finely serrate; elytral disc smoother;

major tubercles on declivital interstriae 1 and 3 slightly larger, others smaller, 9 less strongly elevated; vestiture finer, more generally distributed.

DISTRIBUTION.— S Arizona to Michoacán.

USA: Arizona: Miller Canyon, Huachuca Mts., 22-VIII-58, S. L. Wood. MEXICO: Michoacán: Patzcuaro-Ario de Rosales km 32, 31-X-80, S-129, *Quercus*, T. H. Atkinson.

BIOLOGY.— As described for the genus. The host was thought to be a small, uprooted *Aesculus* sp., but native representatives of this genus are unknown at the type locality.

NOTES.— The above treatment was based on the type series of six specimens.

### 18. *Hylocurus effeminatus* Wood
Fig. 145

*Hylocurus effeminatus* Wood, 1956, Canadian Ent. 88:143 (Holotype, male; 8 km NW Totolapan, Oaxaca, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from the allied *femineus* Wood by the smaller size, by the dull, reticulate pronotal disc, by the coarser elytral setae, and by the transverse, female frontal callus.

MALE.— Length 1.7–2.1 mm, 2.5 times as long as wide; color almost black.

Frons as in *femineus* except vestiture more conspicuous. Antennal club oval; sutures 1 and 2 feebly arcuate.

Pronotum 1.1 times as long as wide; as in *femineus* except sides almost straight and parallel on basal half, and discal area reticulate, dull, without punctures.

Elytra 1.4 times as long as wide, 1.3 times as long as pronotum; outline as in *femineus*; striae very feebly impressed, punctures rather small, deep; interstriae as wide as striae, smooth, devoid of lines, punctures small, widely spaced. Declivity steep, convex, acuminate at apex; striae and tubercles essentially as in *femineus* except tubercles average smaller in size and very slightly more numerous. Vestiture largely confined to declivital base, consisting of interstrial scales; each scale about four to six times as long as wide.

FEMALE.— Similar to male except frontal carina poorly developed, represented by a transverse callus bearing several coarse granules, vestiture sparse, limited to central area; anterior margin of pronotum less coarsely serrate; declivital tubercles averaging slightly larger; elytral vestiture much more slender and more widely distributed.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 6 km N Totolapan, 3-VII-53, 20-VI-67, 1100 m, Nos. 61, 63, S. L. Wood; 30 km SE Cameron, 21-VI-67, leguminous tree, S. L. Wood.

HOST.— Leguminous trees.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on 8 paratypes and on 64 other specimens.

### 19. *Hylocurus schwarzi* Blackman

*Hylocurus schwarzi* Blackman, 1928, Bull. New York St. Coll. For., Syracuse, Tech. Pub. 25:189 (Holotype, male; Victoria, Texas; U.S. Nat. Mus., 27132)

DIAGNOSIS.— This species is very similar to *effeminatus* Wood, but it is distinguished by characters included in the following description.

MALE.— Length 2.2 mm, 2.4 times as long as wide; color almost black.

Frons convex, weakly, transversely impressed above epistoma and in median area; entirely devoid of transverse carinate elevation; surface reticulate-granulate with low, subaciculate rugae in lateral areas; vestiture sparse, inconspicuous.

Pronotum 1.03 times as long as wide; as in *effeminatus* but slightly more shining.

Elytra 1.4 times as long as wide; outline about as in *effeminatus* but stouter; strial punctures deeper, transversely larger than *effeminatus*; interstriae weakly convex, on posterior fourth of disc each with row of rounded nodules larger and more broadly rounded than in *effeminatus*. Declivity about as in *effeminatus* except interstriae 2 not impressed, bearing a row of very small tubercles to middle, 3–8 all armed by similar, larger, rounded tubercles, those on 3 and 7 continuing almost to middle of declivity, others end on upper fourth. Vestiture as in *effeminatus* except scales narrower at their apices than at bases, each about six to eight times as long as wide.

DISTRIBUTION.— S Texas.

USA: Texas: Victoria, 27-III, E. A. Schwarz.

NOTES.— The above treatment was based on the holotype and on one paratype.

### 20. *Hylocurus errans* Blandford

*Hylocurus errans* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):224 (Lectotype, male; "Mexican"

tobacco refuse, but probably from Brazil; British Mus. Nat. Hist., present designation)

This species was found at Paris in "Mexican" tobacco refuse. Virtually all of the Blandford species named from that material that have now been identified in the American fauna, are from Brazil, not Mexico. Until this species can be identified in the Central American or in the Mexican fauna, it should be regarded as a Brazilian species.

The first specimen in the syntypic Blandford series has been labeled "Type," although it has never been so designated. I here designate this male as the lectotype of *errans* Blandford.

### 21. *Hylocurus rivalis* Wood

*Hylocurus rivalis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):16 (Holotype, male; 5 km or 3 miles N Suchixtepec, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *schwarzi* Blackman by the serrate male declivital interstriae 9, with the nodules on all interstriae higher and slightly closer, by the numerous, strong, irregularly transverse, interstrial lines, and by the more strongly rugose-reticulate pronotal disc. It is probably more closely related to *effeminatus* Wood.

MALE.— Length 2.1–2.7 mm, 2.8 times as long as wide; color very dark reddish brown, some specimens almost black.

Frons as in *effeminatus*, including transverse elevation. Antennal club distinctly larger than in *effeminatus*. Pronotum as in *effeminatus*.

Elytra 1.8 times as long as wide; outline similar to *effeminatus*; striae not impressed, punctures moderately large, deep; interstriae slightly wider than striae, shining, with numerous, irregular, coarse, transverse lines giving interstriae a subcrenulate appearance, some of low, transverse ridges continuing across striae; moderately high, rounded nodules near declivity on all interstriae. Declivity steep, convex, contours about as in *schwarzi*; striae 1 and 2 continuing to base of mucro; base of each interstriae with three to five rounded nodules, largest as high as wide, 1, 3, and 7 with small, pointed tubercles to middle of declivity, tubercles on 2 and 4 extending to upper third, those on 5, 6, and 8 ending on upper fourth, 9 moderately elevated about as in *schwarzi* but with small nodules to apex of elevation. Vestiture more abundant than in *schwarzi*, of rows of minute strial hair, and rows of delicate, coarse, pointed bristles of same texture as *schwarzi*; bristles longest near base of declivity, each of longest bristles longer than distance between rows, more closely spaced within a row.

FEMALE.— Similar to male except frons devoid of transverse elevation; transverse lines and subcrenulate ridges on elytral disc poorly developed; interstrial nodules much less than half as high, extending almost to middle of disc; declivital tubercles smaller; vestiture finer.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 5 km or 3 miles N Suchixtepec on Highway 175, 4-VI-71, 3000 m, *Pinus*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 54 specimens.

### 22. *Hylocurus parkinsoniae* Blackman

*Hylocurus parkinsoniae* Blackman, 1922, New York St. Coll. For., Syracuse, Tech. Pub. 22(5):142 (Holotype, male; Ray, Arizona; U.S. Nat. Mus., 26629)

DIAGNOSIS.— This species is somewhat intermediate between the group of species having the male circumdeclivital interstrial spines all of equal length and the group having them alternate between long and short spines. In this species spine 5 (and occasionally 3) is slightly longer than the others.

MALE.— Length 1.7–2.3 mm, 2.5 times as long as wide; color dark brown to almost black.

Frons convex above, abruptly, moderately, transversely impressed on lower third; surface of upper area coarsely, very closely punctured, lower area with fine punctures and some transverse striations; vestiture fine, sparse, largely confined to impressed area. Antennal club subcircular; sutures 1 and 2 moderately procurved.

Pronotum 1.1 times as long as wide; as in *effeminatus* except posterior area subshining, granules decreasing in size posteriorly, some of them with shallow punctures on their anterior sides.

Elytra 1.4 times as long as wide, 1.3 times as long as pronotum; sides straight, diverging very slightly to declivital base, then abruptly converging, a conspicuous notch at apex of

elevated interstriae 9, with broad, subacute, produced apex mucronate; striae weakly impressed, punctures moderately large, deep; interstriae shining, convex, as wide as striae, punctures rather fine, uniseriate, rather close, each ending precipitously at base of declivity in a large, blunt tubercle. Declivity very steep, subtruncate, face broadly convex, with a circumdeclivital ring of large tubercles, produced at apex; strial punctures clearly impressed, in rows, those near base coarse, becoming finer toward apex; tubercles or blunt spines 1 to 8 in circumdeclivital ring of equal length, not projecting, except 5 longer (sometimes 3 also), 3, 5, and 7 usually with a supplemental tubercle immediately below spine and on 3 and 5 sometimes joined to it, 9 strongly elevated and ending abruptly well before apex; interstriae 3 with two coarse tubercles on middle third, 1 with a dozen or more fine, pointed tubercles; surface subshining. Vestiture confined to declivital base and tubercles on face; consisting of coarse bristles.

FEMALE.— Similar to male except frons flattened, very finely punctured, with rather abundant, coarse, moderately long, subplumose setae on central two-thirds; anterior margin of pronotum less coarsely serrate; tubercles on pronotal disc larger, punctures almost obsolete; circumdeclivital spines replaced by a series of small granules; declivity more convex, strial punctures of equal size, interstriae 9 less strongly elevated; vestiture finer, more generally distributed.

DISTRIBUTION.— California to Texas.

USA: **Arizona**: Fort Yuma, Mesa, Ray, Sabino Canyon, Santa Catalina Mts. **California**: Mecca, Palo Verde. **Texas**: Brownsville, Columbus, Davis Mts., Hidalgo Co., Southmost, Victoria.

HOSTS.— *Celtis laevigata*, *Cercidium microphyllum*, *C. floridum*, *Condalia obtusifolia*, *Mimosa* sp., and *Quercus* sp.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotype and on 172 other specimens.

### 23. *Hylocurus cancellatus* Blandford

*Hylocurus cancellatus* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):221 (Lectotype, male; Quiché Mts., Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished from *medius* Wood by the larger size, by the black color, by the much coarser deeper strial punctures on the male disc, by the steeper declivity, by the different arrangement of minor tubercles on the declivital face, and by other characters.

MALE.— Length 2.6–2.9 mm, 2.5 times as long as wide; color very dark brown to black.

Frons convex, rather strongly, transversely impressed below carina; a conspicuously elevated, transverse carina slightly below upper level of eyes occupying median half; surface shining rather coarsely granulate-punctate above carina, lower area smooth, shining, impunctate on median half, finely punctured laterally; vestiture fine, sparse, inconspicuous except along epistoma. Antennal club with sutures more strongly procurved than in allied species.

Pronotum 1.3 times as long as wide; essentially as in *microcornis* Wood.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal three-fourths, slightly wider at base of declivity, abruptly narrowed at base of declivity, acutely mucronate behind; striae weakly impressed, punctures very deep, rather small at base, gradually increasing in size toward declivity, those near declivity at least three times larger than those at base; interstriae shining, three times as wide as striae at base, half as wide near declivity, punctures small, sparse, obscure; declivital margin abrupt, margin armed by a circumdeclivital ring of equal, nonprojecting, coarse, blunt tubercles. Declivity steep, moderately convex; striae distinctly marked by rows of punctures to near apex, punctures moderately coarse near base, becoming very fine below; interstriae 1 with a row of fine tubercles from base to apex, 2 unarmed, 3 armed by one tubercle just below basal margin and four to five tubercles on lower two-thirds, lowest one in line with 9 and with a weak elevation extending to 9, 6 and 7 each with two tubercles, 9 rather strongly elevated, ending rather abruptly near but separate from costal margin. Vestiture confined to declivity, of sparse, moderately coarse, rather long hair.

FEMALE.— Similar to male except frontal carina much more poorly developed; frontal vestiture above carina moderately abundant; strial punctures on posterior area of disc only

twice as large as those at base, not as deep as in male; circumdeclivital ring of tubercles not evident, each interstriae with about three small uniseriate tubercles at base of declivity; declivital face as in male except tubercles extend from apex of interstriae 3 to 9.

DISTRIBUTION.— Guatemala.

GUATEMALA: Quiché Mts., 5-9700 ft, G. C. Champion.

NOTES.— The above treatment was based on four of Blandford's syntypes. The male syntype on the first pin in the Blandford series is here designated as the lectotype of *cancellatus* Blandford.

### 24. *Hylocurus langstoni* (Blackman)

Figs. 148–149, 151

*Micracis langstoni* Blackman, 1920, Mississippi Agric. Expt. Sta. Tech. Bull. 9:26 (Lectotype, female; Agricultural College, Mississippi; U.S. Nat. Mus., 24734, present designation)

DIAGNOSIS.— This species is distinguished from the allied *medius* Wood by the smaller interstrial tubercles in the male circumdeclivital ring, with two or more tubercles below the ring on interstriae 5 and 7, by the rather coarse, uniform strial punctures on the declivity, and by the less strongly impressed, more broadly pubescent female frons, the male frons similar to that of the female.

MALE.— Length 1.8–2.3 mm, 2.6 times as long as wide; color very dark brown.

Frons broadly flattened, rather finely punctured, with abundant, erect, coarse, subplumose, moderately long setae. Antennal club subcircular; sutures 1 and 2 weakly procurved.

Pronotum 1.1 times as long as wide; as in *effeminatus* except basal area with shallow punctures at anterior margin of granules.

Elytra 1.5 times as long as wide, 1.4 times as long as pronotum; outline about as in *effeminatus*; disc as in *parkinsoniae* except interstriae feebly convex, punctures rather widely separated, tubercles in circumdeclivital ring much smaller. Declivity very steep, broadly convex, apex produced; strial tubercles coarse, deep, in rows, only slightly larger toward base; interstriae 1 with fine, irregular granules to apex, 3 with about four larger, pointed tubercles to middle of declivity, 5 and 7 each with two tubercles below circumdeclivital ring, 9 strongly elevated, ending abruptly at posterior end. Vestiture largely confined to declivital base and at tubercles on declivital face; consisting of stout bristles.

FEMALE.— Similar to male except frons slightly impressed; anterior margin of pronotum minutely serrate; circumdeclivital ring of tubercles absent, other tubercles smaller; vestiture more generally distributed, finer.

DISTRIBUTION.— Texas to Maryland and Florida.

USA: **Florida**: Lake Co. **Maryland**: Brunswick, Plummer's Island. **Mississippi**: Agricultural College. **South Carolina**: St. Catherine Island. **Texas**: Beeville, Brownsville, Columbus, Gillespie, Karnes City. **Virginia**: Lovettsville, Rocky Point in Franklin Co.

HOST.— *Celtis pallida*, C. sp., *Ulmus* sp.

BIOLOGY.— As described for the genus.

NOTES.— Blackman based this species on a long series of syntypes. He selected a female from this series and labeled it as the type and placed it in the type collection at the U.S. National Museum without validating his action. I here designate that female as the lectotype of *langstoni* Blackman. The above treatment was based on the lectotype and on 71 other specimens.

### 25. *Hylocurus medius* Wood

Fig. 145

*Hylocurus medius* Wood, 1956, Canadian Ent. 88:144 (Holotype, male; 8 km W Antiguo Morelos, Tamaulipas, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from the allied *langstoni* (Blackman) by the much larger tubercles in the male circumdeclivital ring, by the absence of male frontal vestiture, and by other characters mentioned in the above key.

MALE.— Length 1.8–2.2 mm, 2.4 times as long as wide; color very dark brown.

Frons convex, a transverse, granulate callus just below upper level of eyes; surface finely subrugose, finely, shallowly, closely punctured; vestiture of sparse, stout, setae of moderate length. Antennal club subcircular; sutures 1 and 2 poorly formed, moderately procurved.

Pronotum as in *effeminatus*.

Elytra 1.4 times as long as wide, 1.3 times as pronotum; outline as in *parkinsoniae*; disc as in *parkinsoniae* except some strial punctures connected by longitudinal lines, a few transverse lines cross interstriae; circum-

declivital spines as in *parkinsoniae* except all of equal length. Declivity as in *parkinsoniae* except submarginal tubercles on interstriae 3, 5, 7, and occasionally on others distinctly below circumdeclivital ring. Vestiture shorter, more nearly scalelike than in *parkinsoniae*.

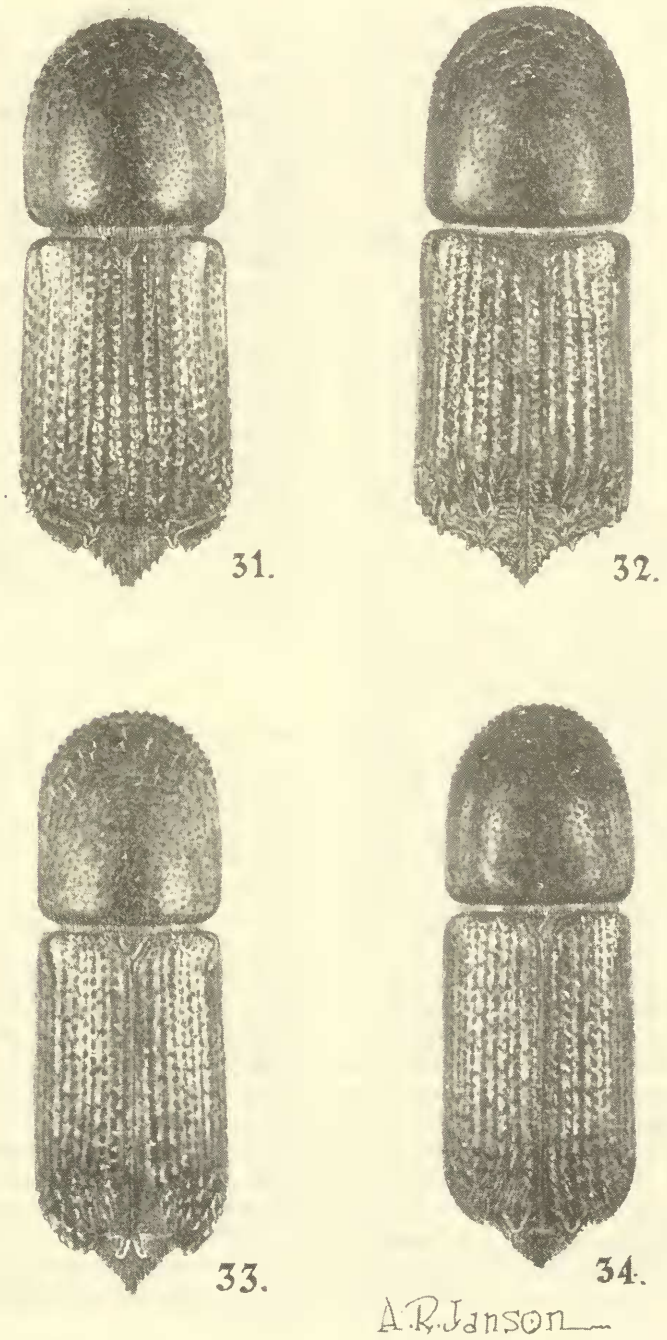



Fig. 151. *Hylocurus*, dorsal aspect: 31, *langstoni*, male, 32, same, female; 33, *harnedi*, male, 34, same, female. (After Blackman 1922:pl. VI.)

FEMALE.— Similar to male except frons very shallowly concave, with a dense patch of rather long, coarse, subplumose setae on central two-thirds; anterior margin of pronotum minutely serrate; circumdeclivital ring of tubercles absent; strial punctures on declivity of equal size, tubercles smaller, vestiture finer and more generally distributed.

DISTRIBUTION.— Tamaulipas to San Luis Potosí.

MEXICO: San Luis Potosí: Pujal, 20-VI-53, S. L. Wood. Tamaulipas: 8 km W Antiguo Morelos, 20-VI-53, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on 16 paratypes.

### 26. *Hylocurus microcornis* Wood

*Hylocurus microcornis* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):45 (Holotype, male; 26 km E Texmelucan, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the allied *equidens* Wood by characters summarized in the above key.

MALE.— Length 2.5–2.9 mm, 2.7 times as long as wide; color black.

Frons weakly convex, ascending slightly toward epistoma; surface very closely, subgranulately punctured, with a transverse carina occupying median third at level immediately below upper level of eyes. Antennal club very slightly longer than distance equal to width of eye, 1.7 times as long as wide.

Pronotum 1.06 times as long as wide; widest on basal third, sides weakly arcuate and converging slightly to anterior third, then rather narrowly rounded in front; anterior margin armed by eight teeth; anterior slope asperate, posterior area closely tuberculate, interstriae rather coarsely reticulate; vestiture inconspicuous, hairlike.

Elytra 1.9 times as long as wide, 2.0 times as long as pronotum; striae slightly impressed on posterior third, punctures deep, small at base, increasing in size toward declivity; interstriae as wide as striae, weakly convex except near declivity, terminating abruptly at margin of declivity in a blunt, nonprojecting spine, punctures rather fine, uniseriate. Declivity abrupt, somewhat convex within ring of subequal marginal tubercles (except those on 1 smaller); costal margin near apex subserrate; strial punctures impressed, in rows; interstriae shining, 1 bearing nine small pointed tubercles, 3 with three small granules, lateral interstriae unarmed, mucro well developed, reticulate. Vestiture confined to declivity, consisting of minute strial hair and rather long, slender bristles.

FEMALE.— Similar to male except frons above more nearly flattened, slightly more protuberant below, ornamented on median two-thirds by a conspicuous tuft of rather long, yellow hair from near epistoma to vertex, median area immediately above epistoma smooth and shining, remaining area rather finely reticulate-granulate, punctures obscure, carina absent; anterior margin of pronotum unarmed; tubercles on declivital margin absent; declivital striae as on disc, interstriae except 2 armed by fine tubercles, those on 1, 3, 7, and 9 extending to middle of declivity, others ending on upper fourth; elytral vestiture finer, shorter, extending to disc.

DISTRIBUTION.— Puebla.

MEXICO: Puebla: 26 km E Texmelucan, 13-VI-67, 2900 m, No. 29, *Salix*, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treament was based on the type series of eight specimens.

### 27. *Hylocurus equidens* Wood

Fig. 145

*Hylocurus equidens* Wood, 1956, Canadian Ent. 88:144 (Holotype, male; Los Abritos, 32 km NE Ciudad del Maíz, San Luis Potosí, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— Refer to the above key to distinguish this species from the closely allied *microcornis* Wood.

MALE.— Length 1.8–2.0 mm, 2.5 times as long as wide; color very dark brown.

Frons, antenna, and pronotum as in *parkinsoniae* except pronotal disc reticulate, with isolated granules to base, punctures absent.

Elytral disc as in *parkinsoniae* exceot blunt circumdeclivital spines slightly larger, all spines of equal length; declivity steeper. Declivity as in *parkinsoniae* except less convex, strial punctures near base larger, submarginal tubercles entirely absent except on interstriae 1 and 3; these tubercles as in *parkinsoniae* except interstriae 3 weakly elevated near center, two tubercles slightly larger; setae much coarser.

FEMALE.— Frons, pronotum, and elytra as in female *medius*.

DISTRIBUTION.— San Luis Potosí.

MEXICO: San Luis Potosí: Los Abritos, 32 km NE Ciudad del Maís, 18-VI-53, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on 12 paratypes.

### 28. *Hylocurus disparilis* Wood

*Hylocurus disparilis* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):29 (Holotype, male; Zamorano, Morazán, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *inaequalis* Wood by the exaggerated development of the male circumdeclivital spines.

MALE.— Length 2.2 mm, 2.5 times as long as wide; color very dark brown.

Frons, antenna, pronotum, and elytral disc as in *inaequalis* Wood except circumdeclivital spines longer, particularly on alternate odd-numbered interstriae, spines 1 and 9 conspicuously longer than others; elytral apex much more slender than in allied species. Declivital face with punctures on lower two-thirds of striae 1 and 2 very small, in rows, all other punctures coarse, deep, confused, becoming much larger toward base; interstriae 3 not elevated, armed by two blunt tubercles.

DISTRIBUTION.— Honduras.

HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 558, *Ficus glabrata*, S. L. Wood.

BIOLOGY.— The unique type was taken from a new tunnel in the wood of a small, broken, fig branch.

### 29. *Hylocurus alternus* Wood

*Hylocurus alternus* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):43 (Holotype, male; 21 km SE Liberia, Guanacaste, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the rather closely related *inaequalis* Wood, by the less strongly developed spines in the circumdeclivital row of the male, and by the distinct rows of strial punctures in lateral areas on the male declivity; and by the less abundant vestiture on the female frons.

MALE.— Length 1.7–2.5 mm, 2.5 times as long as wide; color very dark brown, almost black.

Frons convex and granulate above, transversely impressed and punctured below a transverse carina formed at upper level of eyes by four basally confluent tubercles; vestiture inconspicuous.

Pronotum 1.1 times as long as wide; widest near base, sides feebly arcuate and converging very slightly on basal two-thirds, then rather broadly rounded in front; anterior margin armed by about 12 coarse serrations; summit in front of middle; posterior area subshining, rather finely punctured, posterior margin of each puncture subasperate, more coarsely sculptured toward summit. Vestiture consisting of short, inconspicuous hair.

Elytra 1.4 times as long as wide, 1.2 times as long as pronotum; sides almost straight and parallel to declivital base; profile of posterior margin interrupted by projection of spines on interstriae 9 and 3 and by sutural apex; striae not impressed, punctures large, deeply impressed; interstriae narrower than striae, irregularly, sparsely punctured, each ending posteriorly at declivital margin in a tubercle or spine. Declivity abrupt, very steep; upper and lateral margins armed by a row of tubercles, those on interstriae 2, 4, and 6 distinctly shorter, all tubercles abruptly declivous behind, 9 longer and projecting; declivital face convex, coarsely punctured, with two rather coarse tubercles on interstriae 3 and about four smaller ones on middle third of 1; apex narrowly acuminate. Vestiture consisting of short, stout, bristles.

FEMALE.— Similar to male except frontal carina absent, frons more finely sculptured; anterior margin of pronotum finely serrate; elytra not abruptly declivous, without a marginal row of tubercles on declivity; each interstriae bearing about three to five small tubercles on upper or lateral half of declivity.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 21 km or 13 miles SE Liberia, Guanacaste, 10-VI-66, 50 m, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 41 specimens.

### 30. *Hylocurus inaequalis* Wood

Fig. 145

*Hylocurus inaequalis* Wood, 1956, Canadian Ent. 88:146 (Holotype, male; 9 km S Tehuantepec, Oaxaca, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from the allied *alternus* Wood by the characters summarized in the above key and in the diagnosis of *alternus*.

MALE.— Length 1.5–2.1 mm, 2.5 times as long as wide; color very dark brown.

Frons with a subcarinate, irregular, transverse row of granules just below upper level of eyes, broadly convex above, transversely impressed below; surface very finely rugose and minutely, rather obscurely punctured above, more finely sculptured below; vestiture moderately abundant. Antenna as in allied species. Pronotum as in *alternus*.

Elytral disc and declivity as in *alternus* except odd-numbered spines in circumdeclivital ring projecting about four times or more as far as even-numbered spines and more than twice as far as in *alternus*, and punctures in lateral areas of declivital face considerably larger, confused, general relief more exaggerated, tubercles on interstriae 3 higher, vestiture similar.

FEMALE.— As in female *alternus* except frons shallowly concave on median third of lower half, more finely sculptured, more closely pubescent.

DISTRIBUTION.— Nayarit to Oaxaca.

MEXICO: **Colima**: 3 km W, No. 136, and 24 km W Armeria, No. 151, 50 m, thorness shrub, S. L. Wood; 53 km S Colima, 27-VI-65, 700 m, No. 123, shrub, S. L. Wood. **Nayarit**: 8 km S Rosamorada, 14-VII-65, 100 m, No. 248, *Inga paterno*, S. L Wood. **Oaxaca**: 9 km S Tehuantepec, 8-VII-52, *Acacia*, S. L. Wood.

HOSTS.— *Acacia* sp., *Inga paterno*, etc.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on 26 paratypes and on 97 other specimens.

### 31. *Hylocurus elegans* Eichhoff
Fig. 152

*Hylocurus elegans* Eichhoff, 1872, Berliner Ent. Zeitschr. 15:134 (Holotype, male; Teapa, Tabasco, Mexico; Brussels Mus.)

*Hylocurus minor* Wood, 1961, Great Basin Nat. 21:4 (Holotype, female; Finca Alto Bonito, Caicedonia, Valle de Cauca, Colombia; Wood Coll.); Wood, 1972, Great Basin Nat. 32:195. *Synonymy*

DIAGNOSIS.— This species superficially resembles *microcornis* Wood and its allies, but it is distinguished in the male by the absence of an abrupt notch at the posterior end of elevated interstriae 9; instead interstriae 9 joins the costal margin. In the female the frontal pubescence is limited to the upper half of the facial area and is almost completely divided along the median line into two parts.

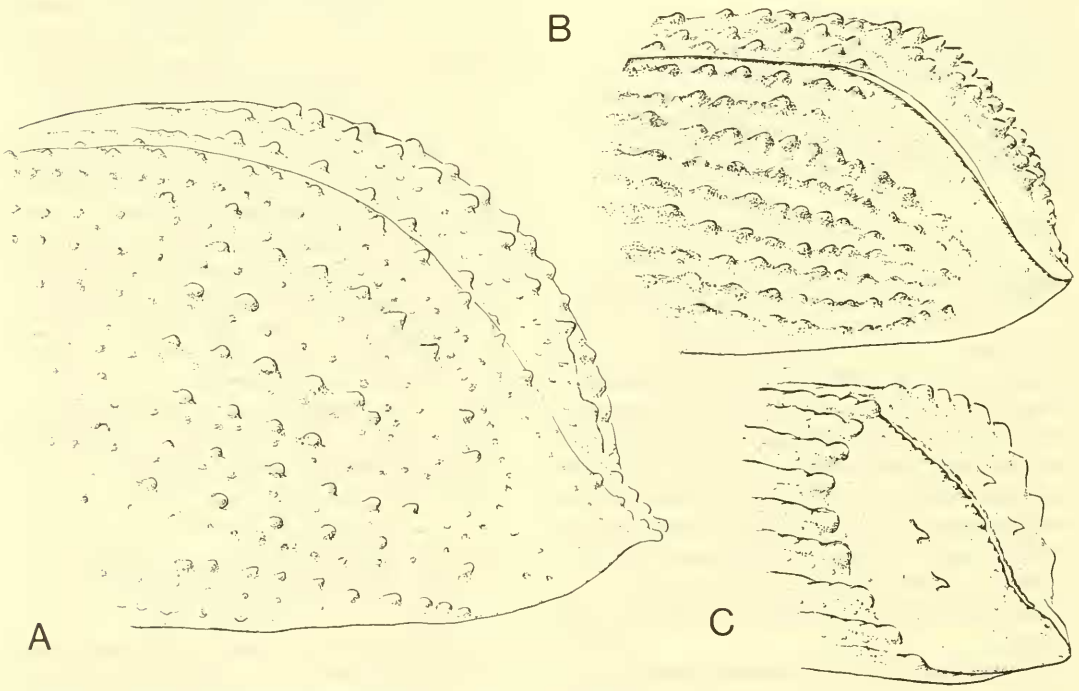



Fig. 152. *Hylocurus* spp., males: A, *simplex*; B, *nodulus*; C, *elegans*.

MALE.— Length 1.3–1.8 mm, 2.7 times as long as wide; color very dark brown.

Frons as in *alternus* Wood except transverse carina continuous, rather well developed. Pronotum as in *alternus* except punctures absent.

Elytra 1.4 times as long as wide; sides almost straight and parallel on more than basal three-fourths, then abruptly rounded to subacute, rather strongly produced apex; striae feebly impressed toward declivity, punctures moderately coarse, deep; interstriae slightly narrower than striae, weakly convex, punctures moderately convex, rather widely spaced, their anterior margins slightly elevated, interstriae all ending in a circumdeclivital ring of large, rounded nodules of equal length and size at abrupt base of declivity. Declivity very steep, broadly, weakly convex, produced at apex; surface shining; strial punctures larger and in rows toward base, smaller and confused on lower half; a few small, obscure granules on interstriae 1, two small teeth on 3, 9 rather strongly elevated, joining costal margin and continuing to apex as a continuous ridge (allotype of *minor* with a slight notch at end of interstriae 9 rarely seen in Mexican material). Vestiture largely confined to declivital area, consisting of interstrial scales; each scale about four times as long as wide.

FEMALE.— Similar to male except frons very shallowly, rather narrowly concave below upper level of eyes, convex above, upper area bearing a pair of dense patches of erect, coarse, rather long, yellow, subplumose setae on median half, patches often connected at upper extremities; anterior margin of pronotum unarmed; elytral disc more conservatively sculptured, circumdeclivital nodules absent; declivity more strongly convex, basal area with several interstrial tubercles, two tubercles on interstriae 3 near middle of declivity larger, interstriae 9 ending abruptly, not joining costal margin; declivital scales more slender, longer.

DISTRIBUTION.— Nayarit to Colombia.

MEXICO: Colima: 3 km W Armeria, 28-VI-65, 70 m, No. 136, tree branch; 24 km W Armeria, 30-VI-65, 30 m, No. 151, shrub; 6 km S Cihuatlán, 30-VI-65, 70 m, No. 158, tree branch; all by S. L. Wood. Nayarit: Los Corchos, 10-VII-65, 7 m, No. 211, *Inga*, and 11-VII-65, 10 m, No. 218, *Acacia*, S. L. Wood. HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 546, *Acacia pennatula*, S. L. Wood. COSTA RICA: Dominical, 9-VII-63, 3 m, No. 296, shrubby vine (liana), S. L. Wood. COLOMBIA: Finca Alta Bonito, Caicedonia, Valle de Cuaca, 30-IV-59, vine, J. Restrepo; Finca El Bosque, Caicedonia, Valle de Cauca, VI-59, *Coffea*, J. H. Losso.

HOSTS.— *Acacia* spp., *Inga* sp., *Coffea arabica*, etc.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 12 specimens and on 219 other specimens.

### 32. *Hylocurus dissidens* Wood

*Hylocurus dissidens* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):30 (Holotype, male; Laguna Santa María, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *aberrans* Wood by the slightly smaller spines in the male circumdeclivital ring, by the more strongly convex male declivital face, by the more abundant pubescence on the female frons, and by the more strongly procurved suture on the antennal club.

MALE.— Length 1.9–2.2 mm, 2.7 times as long as wide; color dark reddish brown.

Frons as in *aberrans*. Antennal club with sutures moderately procurved. Pronotum as in *aberrans* except granules in discal area slightly larger, punctures not indicated.

Elytra 1.6 times as long as wide; widest at base of declivity, sides straight on more than basal three-fourths, abruptly, serrately rounded behind, obtusely produced at apex; striae not impressed except near declivital margin, punctures moderately coarse, deep; interstriae almost as wide as striae, smooth, punctures small, sparse; each interstriae ending at margin of declivity in a coarse nodule of equal length, 3–9 acutely pointed on their lateral margins and projecting slightly. Declivity abrupt, very steep, broadly convex, produced behind; strial punctures in rows, those near base of declivity larger, interstriae minutely granulate, 1 slightly elevated to apex and bearing about five small granules on middle third, 3 rather weakly elevated on upper two-thirds, with four closely set, acutely pointed teeth on middle third; interstriae 9 acutely elevated, joining costal margin, but with a very small notch at its apex as it joins costal margin. Glabrous except for a few minute, hairlike setae at declivital margin.

FEMALE.— Similar to male except frons shallowly concave on central half, upper

two-thirds of concavity with dense, erect, coarse, subplumose setae, surface minutely reticulate-granulate, devoid of larger granules; anterior margin of pronotum more finely serrate; strial punctures slightly smaller; circumdeclivital ring of nodules absent, declivity more strongly convex; declivital face similar, more finely sculptured, all interstriae with a few minute granules near base, 9 rather weakly elevated, ending remote from costal margin; vestiture rather widely distributed, sparse, coarse, moderately long.

DISTRIBUTION.— Nayarit.

MEXICO: Nayarit: Laguna Santa María, 6-VII-65, 1000 m, No. 197, S. L. Wood.

BIOLOGY.— As described for the genus. The host was a large, square-stemmed, thorny, shrubby vine (liana).

NOTES.— The above treatment was based on the type series of 21 specimens.

### 33. *Hylocurus clarki* Wood

*Hylocurus clarki* Wood, 1979, Great Basin Nat. 39:141 (Holotype, male; between Sicabé and San Miguel Ixtahuacán, San Marcos, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *aberrans* Wood by the more coarsely tuberculate pronotal disc, by the smaller discal strial punctures, and by the very different male elytral declivity.

MALE.— Length 2.3–2.5 mm, 2.4 times as long as wide; color dark reddish brown.

Head about as in *aberrans*.

Pronotum as in *aberrans* except disc much more strongly reticulate, rounded tubercles conspicuously larger.

Elytra similar to *aberrans* except strial punctures smaller, interstriae slightly wider than striae and marked by more numerous transverse lines, declivity with spines in circumdeclivital ring blunt, conspicuously more strongly projecting, particularly on upper half, degree of projection about equal to width of spine, punctures on declivital face confused, vestiture on circumdeclivital ring conspicuously longer, more slender, setae on declivital face short, of stout hair.

DISTRIBUTION.— Guatemala.

GUATEMALA: Between Sicabé and San Miguel Ixtahuacán, San Marcos, 24-II-72, *Pinus tenuifolia*, E. W. Clark.

NOTES.— The above treatment was based on the type series of two males.

### 34. *Hylocurus aberrans* Wood

*Hylocurus aberrans* Wood, 1969, Brigham Young Univ. Sci. Bull., Biol. Ser. 10(2):44 (Holotype, male; Dominical, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the closely allied *dissidens* Wood by characters summarized in the above key.

MALE.— Length 2.0–2.2 mm, 2.6 times as long as wide; color dark reddish brown.

Frons broadly convex, with a slight transverse impression just above epistomal margin; surface finely, regularly granulate. Antennal club with two procurved sutures, 1 extending two-fifths of club length from base, 2 extending four-fifths from base.

Pronotum 1.2 times as long as wide; widest on basal half, sides feebly arcuate, rather broadly rounded in front; anterior margin armed by 16 or more serrations; summit in front of middle; posterior area reticulate, with small, subgranulate punctures of moderate abundance. Vestiture consisting of short, erect scales with a few bristles in asperate area.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel to base of declivity, then slightly wider at middle of declivity; posterior outline interrupted by declivital spines on interstriae 7, 8, and 9 and by short, broad, sutural apex; striae slightly impressed, punctures deep, coarse, much smaller toward base; interstriae about half as wide as striae, punctures on 1 moderately large, others mostly minute. Declivity abrupt, very steep, almost entirely margined by a row of tubercles or spines; tubercles at base of declivity on interstriae 1 and 2 not pointed, abruptly declivous behind, those on 2 to 8 produced into increasingly large and pointed toothlike spines, 9 similar but lower and extending nearer elytral apex than normal for this genus; apex not strongly produced, its margin subserrate, small dentations about half as high as apex of elevation on interstriae 9; central area coarsely punctured, interstriae 3 slightly elevated near center and bearing three small teeth, 1 on lower third gradually elevated to apex and finely serrate. Vestiture consisting of a few stout bristles or scales at margin and on interstriae 1 and 3.

FEMALE.— Similar to male except frons less strongly convex, finely punctured, ornamented by stout, short, rather sparse setae; scape flattened and bearing a tuft of long, coarse setae; anterior margin of pronotum almost unarmed; elytra more finely sculptured, declivity convex, without marginal ring of tubercles, striae regularly punctured, odd-numbered interstriae bearing several rounded granules; rows of broad scales on upper half of all declivital interstriae.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Dominical, Puntarenas, 9-XII-63, 3 m, S. L. Wood.

BIOLOGY.— Presumably as described for the genus; the tunnel was not fully developed.

NOTES.— The above treatment was based on the holotype and allotype.

### *Hylocurus retusipennis* Blandford

*Hylocurus retusipennis* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):223 (Holotype, male; "Mexican" tobacco refuse intercepted at Paris; British Mus. Nat. Hist.)

It has been assumed since its description that *retusipennis* Blandford was a Mexican species. The type is identical to a series of males from southern Brazil (Santa Catarina) that have been in my collection under the name *Hylocurus bidentatus* Schedl, as determined by Schedl. The suspected synonymy has not been confirmed.

### 35. *Hylocurus punctatorugosus* (Schedl)

*Micracis punctatorugosus* Schedl, 1948, Rev. de Ent. 19:575 (Holotype, female; Huetamo, Michoacán, Mexico; Schedl Coll.)

DIAGNOSIS.— The antennal scape and certain other features superficially resemble certain species of *Micracis*; however, the frons, protibia, elytral declivity, and other features clearly indicate an affinity to *aberrans* Wood and to the South American *singularis* Wood, *dimorphus* (Schedl), and allied species. It is the only Central American species in this section of the genus with a triangularly expanded, elaborately pubescent antennal scape.

FEMALE.— Length 2.4 mm, 3.0 times as long as wide; color rather dark reddish brown.

Frons flat on slightly more than median half from level of antennal insertion to well above eyes, epistoma rather strongly ascending to margin; flattened area smooth, brightly shining, impunctate, its lateral margins with a rather dense row of very fine, moderately long hair from epistoma to upper level of eyes (upper areas concealed by pronotum). Scape narrowly triangular, one-fourth of its length projecting beyond insertion of pedicel; ornamented by a tuft of long hair arising from anterior margin from base to level of insertion of pedicel, a separate tuft arising from apex of extended portion; longest setae more than three times length of scape. Antennal club about 1.5 times as long as wide, very similar to some *Micracis*.

Pronotum 1.3 times as long as wide; sides straight and parallel on more than basal half; summit at middle; anterior slope asperate as in allied species, anterior margin rather narrowly rounded, armed by six serrations; posterior areas almost smooth, shining, punctures rather coarse, moderately deep. Vestiture hairlike.

Elytra 1.9 times as long as wide, 1.5 times as long as pronotum; outline as in female *aberrans*; disc about as in *aberrans* except strial punctures slightly smaller. Declivity convex, rather steep, mucro rather poorly developed; surface smooth, shining; striae slightly impressed, punctures about as on disc; alternate interstriae each armed by a row of fine, pointed tubercles, 9 subcostate, unarmed, and joining costal margin; rugose-reticulate at mucro. Vestiture of fine, short strial hair and rows of fine, erect interstrial bristles on disc and declivity, each as long as distance between rows.

DISTRIBUTION.— Michoacán.

MEXICO: Michoacán: Huetamo, 328 m.

NOTES.— The above treatment was based on the holotype.

### *Hylocurus beckeri* Hedquist

*Hylocurus beckeri* Hedquist, 1954, Ent. Tidskr. 75:8 (Holotype, female; Chimaltenango, Guatemala; Naturhistoriska Riksmuseet, Stockholm)

DIAGNOSIS.— This species was based on three females, two of which are virtually unrecognizable; the holotype also is in rather poor condition. The slender form suggests a relationship to the *elegans* species group, but the granulate, nonpubescent frons and the fine, hairlike declivital vestiture cannot be

associated with any species presently before me.

FEMALE.— Length 2.0 mm, 2.75 times as long as wide; color very dark brown.

Frons convex, much as in female *effeminatus* Wood except rounded granules more numerous and more widely distributed, vestiture finer, less abundant.

Pronotum 1.1 times as long as wide; very similar to *bicornis* (Blackman) except discal area more strongly rugose, tubercles more nearly circular in outline. Elytra as in male *bicornis* except interstriae 1 with several fine tubercles of equal size, vestiture shorter, finer, two tubercles on interstriae 3 slightly larger.

DISTRIBUTION.— Guatemala.

GUATEMALA: Chimaltenango, Chimaltenango, 1951, 1250 m, *Pinus*, G. Becker.

NOTES.— The above treatment was based on the type series of three female specimens.

## *Hylocurus spinifex* Blandford

*Hylocurus spinifex* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):225 (Lectotype, male; "Mexican" tobacco refuse, but probably from Brazil; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This aberrant species, named from specimens found at Paris in "Mexican" tobacco refuse, almost certainly does not belong to the Mexican fauna. It probably came from Brazil. There is some doubt that it belongs to *Hylocurus*, although it shares several characters with that genus. It is unique in having the antennal insertion on the frons, with the insertions separated by slightly more than half the distance between the eyes. The scape is unusually long, the club apparently of the *Hylocurus* type, but it can be seen only at an extreme angle on the type. The anterior margin of the pronotum is serrate, the pronotal disc is deeply punctured, the declivity is as illustrated by Blandford except the apex is emarginate, not mucronate, and the emargination is filled by the peculiar apex of sternum 5; the tibiae are unusually small.

The first syntype in the Blandford series, a male, has been labeled "Type," although it has never been so designated. I here designate this male as the lectotype of *spinifex* Blandford.

## Tribe CACTOPININI

Cactopinae Chamberlin, 1939, The bark and timber beetles of North America, p. 243 (Type-genus: *Cactopinus* Schwarz, 1899)

Anatomical features.— The frons is sexually dimorphic, with the male impressed and armed by a pair of (usually confluent) hornlike spines of large to enormous size, the female is convex and unarmed, the posterodorsal area of the head is slightly produced caudad, the eye is small and entire, the antennal funicle is 5-segmented, the club is almost conical to rather strongly flattened, the pronotum is asperate, its summit is at or near the posterior margin, the procoxae are contiguous, and the elytral sculpture is somewhat unique and almost always coated by a film of host origin.

Biological features.— All species are monogamous, and those species in hosts other than cactus are phloeophagous. Those in cactus breed in dry tissue immediately below the epidermis, or (*hubbardi* Schwarz) in scar tissue in deep wounds. The parental galleries consist of an irregular cave, often with indefinite, broad egg galleries. The eggs are deposited individually in niches. Larval mines may be individual or lost in a criss-crossing maze. Successive generations have been bred in the same piece of dry cactus for four years. Symbiotic relationships with fungi have not been reported.

Taxonomy.— This unique tribe is restricted to the Mexican plateau region. Its nearest relationships appear to be with Micracini, but that connection is remote. They are exceedingly rare.

### Genus *CACTOPINUS* Schwarz

*Cactopinus* Schwarz, 1899, Psyche 8 (Suppl. 1):11 (Type-species: *Cactopinus hubbardi* Schwarz, monobasic)

*Cactopinorus* Bright, 1967, Canadian Ent. 99:918 (Type-species: *Cactopinus cactophthorus* Wood, original designation); Wood, 1969, Coleopterists Bull. 23:42. *Synonymy*

Diagnosis.— This unique genus is remotely related, at best, to other known genera of Scolytidae. The paired epistomal male horns, the distinctive antenna, pronotum, and elytra are unmatched in the family.

Description.— Length 1.2–2.3 mm, 2.0–2.6 times as long as wide; color very dark brown to black, often covered by an incrustation; vestiture hairlike except for epistomal brush.

Frons profoundly dimorphic; male with a pair of separate or contiguous epistomal hornlike spines varying from short to half length of body, frontal area moderately to profoundly excavated; female frons simple, unarmed, convex to shallowly concave, vestiture usually sparse. Eye moderately small, finely faceted, anterior margin entire or broadly sinuate. Antennal scape moderately short, slender; funicle 5-segmented; club very small and slender to rather large and broad, two sutures straight to strongly procurved, indicated by rows of setae. Pronotum with summit well behind middle, projecting behind posterior margin in some species; anterior slope armed by narrow asperities. Scutellum small, laterally compressed, much longer than wide, somewhat depressed. Elytra striate, conservatively to coarsely sculptured; declivity abrupt, usually somewhat bisulcate. Anterior coxae contiguous.

Distribution.— S California and S Utah to Oaxaca; 14 species are known.

Biology.— These monogamous species breed in certain species of giant cacti, *Yucca*, *Bursera*, *Pinus*, and *Rhus*. They excavate an elongate, cave-type tunnel having large, irregulary formed egg niches along its margins. Little effort is made by the beetles to remove frass from their tunnels, thereby making it necessary for them to wallow in the frass. Presumably the male horns were developed

as tactile organs to facilitate excavation of the tunnel or location of his mate. Larval tunnels mine surrounding tissues; ordinarily they are rather long and winding. Apparently it is common for several successive generations to be completed in a piece of host material without adult emergence between generations.

Key to the Species of *Cactopinus*
(Adapted from Wood 1968:43–45)

1. Body stout, 2.0 times as long as wide; male epistomal horns widely separated, space between them at least as wide as one horn; antennal club large, circular, sutures procurved; strial punctures coarse and very deep ..... 2

— Body more slender, more than 2.2 times as long as wide; male epistomal horns contiguous at least on basal half; antennal club small and oval to large and circular, sutures either straight or procurved; strial punctures smaller, usually not as deep ..... 3

2(1). Male frons shallowly concave, its upper margin rounded; male horns very short, their height usually not greater than their basal width; lateral convexities on elytral declivity moderate, with striae 2 clearly marked before summit; interstrial nodules on disc continue to base of elytra; Oaxaca; giant cactus; 1.5–1.9 mm ..... 1. ***microcornis*** **Wood**

— Male frons broadly, deeply concave, its upper margin abrupt; male horns each three or more times longer than its basal width; lateral convexities of elytral declivity abruptly, strongly elevated, striae 2 obsolete toward summit of lateral elevation; interstrial nodules largely obsolete on basal half of disc; Jalisco; giant cactus; 1.3–1.6 mm ..... 2. ***mexicanus*** **Wood**

3(1). A majority of pronotal asperities on anterior half, including anterior fourth; posteromedian area of pronotum weakly conical, usually not projecting behind posterior margin; pronotal asperities irregular in size, mostly fine, close, abundant; male frons deeply, broadly concave (except excavated but transversely flat to feebly concave in *cactophthorus*) ..... 4

— A majority of pronotal asperities on posterior half, anterior fourth usually unarmed; posteromedian area of pronotum strongly projecting over scutellum; pronotal asperities coarse, isolated, comparatively sparse; male frons transversely flat or convex ..... 10

4(3). Pronotal asperities more widely distributed, supplemented in lateral areas by rounded granules extending to lateral margins; posteromedian margin of pronotum narrowly elevated into a small cone projecting very slightly above scutellum; body never covered by an incrustation ..... 5

— Pronotal asperities more narrowly distributed on posterior half, lateral areas devoid of granules; posteromedian area not narrowly elevated or produced into a cone; body usually largely covered by an incrustation ..... 9

5(4). Antennal club rather small, distinctly longer than wide, sutures straight; male frons more narrowly excavated, upper half not wider than distance between eyes (except *cactophthorus*); usually smaller, 1.2–1.9 mm ..... 6

— Antennal club rather large, about as wide as long, sutures rather strongly, subangulately procurved; upper half of male frontal excavation distinctly wider than distance between eyes; usually larger, 1.3–2.3 mm ..... 8

6(5). Male frons strongly excavated but transversely almost flat, anterior margin of eye touching excavation when viewed from lateral aspect; frontal horn of male longer than median length of frontal excavation; strial punctures slightly smaller, not as deep; interstriae slightly wider, punctures fine, somewhat confused; Puebla; giant cactus; 1.2–1.4 mm ..... 3. ***cactophthorus*** **Wood**

— Male frons more narrowly concave, anterior margin of eye not reaching excavation when viewed from lateral aspect; frontal horn of male much shorter than length of frontal excavation; strial punctures slightly larger, deeper; interstriae narrower, punctures somewhat coarser, usually uniseriate ..... 7

7(6). Discal interstriae uniseriately punctured to margin of declivity; Oaxaca; giant cactus; 1.6–1.9 mm ..... 4. ***niger*** **Wood**

— Discal interstriae uniseriately, closely, rather coarsely granulate on slightly less than posterior half; Oaxaca; giant cactus; 1.3–1.6 mm ..... 5. ***granulifer*** **Wood**

8(5). Frons devoid of a median carina, sometimes feebly, obtusely raised in male; sutures of antennal club strongly, obtusely bisinuate; elytral punctures and pronotal asperities slightly larger, posteromedian marginal cone on pronotum rather well developed; Puebla to Oaxaca; giant cactus; 1.4–1.7 mm ..... 6. ***nasutus*** **Wood**

— Upper half of frons bearing an acutely elevated median carina in both sexes; sutures of antennal club angulate, 1 acute (more pronounced in male); elytral punctures and pronotal asperities slightly smaller, posteromedian marginal cone on pronotum poorly developed; Hidalgo; giant cactus; 1.5–1.8 mm ..... 7. ***carinatus*** **Wood**

9(4). Strial punctures fine, shallow, interstrial punctures minute, confused; declivity rather gradual, more narrowly sulcate above, elytral apex narrowly rounded behind; lateral convexities of declivity entirely devoid of granules or teeth; San Luis Potosí to Hidalgo; *Yucca* leaves; 1.3–1.5 mm ..... 8. ***depressus*** **Bright**

— Strial punctures rather coarse, deep; interstriae 1, 3, and 5 uniseriately granulate to base; elytra broadly rounded behind; declivity steep, rather broadly excavated, lateral convexities each armed by about three to five coarse teeth; Jalisco to Oaxaca; *Bursera*, etc.; 1.4–1.7 mm ..... 9. ***spinatus*** **Wood**

10(3). Elytral declivity shallowly sulcate, lateral convexities armed by minute granules; elytra rather narrowly rounded behind; male horn shorter than half length of pronotum; body slender, more than 2.5 times as long as wide ..... 11

— Elytral declivity rather deeply sulcate, lateral convexities armed by small to very large denticles; elytra very broadly rounded behind; male horn usually longer than half length of pronotum ..... 12

11(10). Elytral declivity not sulcate except for feeble impression on interstriae 1, interstriae 1–3 not granulate; Utah to Baja California; *Pinus*; 1.3–1.5 mm ..... 10. ***koebelei*** **Blackman**

— Elytral declivity shallowly sulcate, interstriae 1–3 uniseriately, coarsely granulate; S California; *Rhus diversalobata*, *R. trilobata*; 1.3–1.8 mm ..... 11. ***rhois*** **Blackman**

12(10). Body slender, 2.6 times as long as wide; sulcus extending anterior to declivital base between sutural striae; lateral convexities of declivity armed by fine, rounded granules; setae on sides of elytra very long, coarse; S California to S Nevada; *Pinus*; 1.6–2.0 mm ..... 12. ***pini*** **Blackman**

— Body stout, 2.4 times as long as wide; sulcus not extending anterior to declivital base; lateral convexities of declivity armed by pointed denticles ..... 13

13(12). Declivital interstriae 3 armed by small, pointed denticles; declivital sulcus deeper, narrower; antennal club larger, at least three times as wide as last funicular segment, 1.1 times as long as wide; S Arizona; *Carnegia gigantea*; 1.6–2.3 mm ..... 13. ***hubbardi*** **Schwarz**

— Declivital interstriae 3 armed by a row of about three to eight long, slender teeth; declivital impression almost flat; antennal club small, not more than twice as wide as last funicular segment, 1.3 times as long as wide; S California to Baja California; *Bursera*; 1.6–2.1 mm ..... 14. ***desertus*** **Bright**

### 1. *Cactopinus microcornis* Wood
Fig. 153

*Cactopinus microcornis* Wood, 1969, Coleopt. Bull. 23:45 (Holotype, male; 10 km S Huajuapan, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *mexicanus* Wood by characters summarized in the above key.

MALE.— Length 1.5–1.9 mm, 2.0 times as long as wide; color black.

Frons rather narrowly concave on median half, about two-thirds of concave area above upper level of eyes, lower area halfway between epistomal margin and upper level of eyes armed by a pair of hornlike tubercles, distance between tubercles and height of each tubercle about equal to its basal width; surface subreticulate, with rather sparse fine punctures; vertex rather coarsely rugose-reticulate, vestiture rather sparse, hairlike, abundant, and coarse on epistomal margin. Antennal club circular in outline, sutures moderately bisinuate.

Pronotum 0.89 times as long as wide; widest a third of length from base, posterior two-thirds of sides very strongly arcuate, narrowly rounded in front; basal margin slightly produced behind in median area; summit on basal fourth; asperities begin on median third just behind anterior margin and extend to pointed posteromedian extremity projecting above scutellum, closely set but not high, asperate area rather abruptly subinflated on posterior half; lateral areas almost smooth, with isolated, setiferous, rounded granules of moderate size; vestiture hairlike, rather sparse, of moderate length.

Elytra 1.2 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on more than basal two-thirds, broadly subemarginate behind; sutural striae feebly, others not at all impressed, punctures coarse, deep, close; interstriae narrower than striae, uniseriately granulate to base, nodules increase in height posteriorly. Declivity short, very steep, strongly sulcate; striae 1 rather strongly impressed; interstriae 1 moderately elevated, areas lateral to striae 1 ascending to broad summit on 4, tubercles absent on 1 and 2, of moderate size on 3 and 4, coarse on 5 to 9. Vestiture consisting of interstrial rows of moderately long hair on 3, 5, 7, and lateral areas, setae on other interstriae minute if present.

FEMALE.— Similar to male except frontal concavity not as deep and extending further toward epistoma, tubercles entirely absent; elytral tubercles very slightly smaller.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 10 km, No. 44, and 32 km, No. 47, S Huajuapan, 16-VI-67, 2000 m, giant cactus, S. L. Wood.

BIOLOGY.— As described for the genus. When competing for space with *granulifer*, this species tended to occupy the summits of the cactus ridges.

NOTES.— The above treatment was based on the type series of 58 specimens.

### 2. *Cactopinus mexicanus* Wood
Fig. 153

*Cactopinus mexicanus* Wood, 1967, Great Basin Nat. 27:37 (Holotype, male; 21 km N Juchitlán, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the closely allied *microcornis* by the much longer epistomal horns and the more deeply concave frons of the male, by the much more strongly sulcate elytral declivity, and by the smaller elytral tubercles.

MALE.— Length 1.3–1.6 mm, 2.0 times as long as wide; color black.

Frons deeply, broadly excavated from vertex to epistomal area; epistoma armed by two widely spaced hornlike spines, each spine about four times as long as its basal width, separated from one another by basal width of a spine; excavated area glabrous, a few setae on spines, epistomal brush conspicuous. Eye, antenna, and pronotum as in *microcornis* except posterolateral areas of pronotum more coarsely granulate.

Elytra as in *microcornis* except interstrial granules largely obsolete on anterior half of disc, smaller in posterior areas; lateral convexities on declivity abruptly elevated and much higher, sulcus between them deep; striae 2 usually obsolete in vicinity of lateral convexities of declivity; sutural interstriae on declivity with low, rounded granules.

FEMALE.— Similar to male except frons flattened, transversely impressed just above epistoma, horns absent.

DISTRIBUTION.— Jalisco.

MEXICO: **Jalisco**: 21 km N Juchitlán, 2-VII-65, 1000 m, No. 176, giant cactus, S. L. Wood.

HOST.— Probably *Pachycereus pecten-aboriginum*.

BIOLOGY.— This species infested dry, yellowing tissues immediately below the epidermis of a large, dying arm of its host. The tunnels were so crowded their pattern could not be ascertained, but evidently they were similar to related species.

NOTES.— The above treatment was based on the type series of 114 specimens.

### 3. *Cactopinus cactophthorus* Wood
Fig. 154

*Cactopinus cactophthorus* Wood, 1957, Great Basin Nat. 17:105 (Holotype, male; 16 km SE Tehuitzingo, Puebla, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from the allied *niger* Wood and *granulifer* Wood by the very different frontal excavation in the male and larger epistomal horns, and by other characters mentioned in the above key.

MALE.— Length 1.2–1.4 mm, 2.3 times as long as wide; color black.

Frons very deeply excavated from vertex to epistoma, including lateral margins; excavated area almost flat to rather shallowly concave in transverse direction, very deeply concave on longitudinal axis; upper margin abrupt; surface minutely subrugose; epistomal horns fused except at tips, length about equal to length of frontal excavation (variable); tubercle at lateral margin near antennal insertion rather well developed. Antennal club rather small, 1.2 times as long as wide; sutures straight.

Pronotum 1.02 times as long as wide; widest just behind middle, sides moderately arcuate on slightly more than basal half, rather narrowly rounded in front; summit on basal fourth; asperities narrow, high, extending from base to anterior margin; lateral areas minutely granulose, devoid of granules. Vestiture of sparse hair.

Elytra 1.4 times as long as wide; sides almost straight and parallel on basal two-thirds, broadly rounded behind except lateral convexities of declivity project to give a subemarginate appearance; striae 1 feebly impressed, punctures coarse, deep; interstriae distinctly narrower than striae, minutely irregular, punctures small, uniseriate. Declivity very steep, rather broadly sulcate; strial punctures much smaller than on disc, rows except 1 not clearly discernible; interstriae 2 strongly impressed, 1 convex, slightly

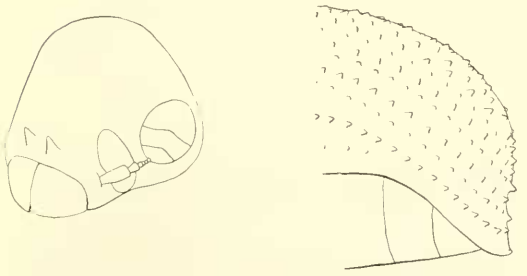


Fig. 153. *Cactopinus microcornis*, male head and elytral declivity. (After Wood 1969:46.)



Fig. 153 continued. *Cactopinus mexicanus*, male head and elytral declivity. (After Wood 1969:46.)

elevated, lateral areas strongly, rather abruptly elevated in central area, not on lower fourth; granules small, confused except on interstriae 3. Vestiture largely confined to sides, of moderately coarse, short, interstrial hair.

FEMALE.— Similar to male except frons moderately, transversely impressed on central half, its sides rounded, epistomal horns absent; lateral convexities on elytral declivity less strongly elevated, granules smaller.

DISTRIBUTION.— Puebla.

MEXICO: **Puebla**: 24 km SE Acatlán, 16-VI-67, No. 41, giant cactus, S. L. Wood; Tehuitzingo, 3-VII-53, giant cactus, S. L. Wood.

BIOLOGY.— As described for *mexicanus*. A small piece of exceedingly dry cactus was kept to preserve an example of the tunnels of this species. It was examined six weeks later and found to contain an active colony of this species, presumably derived from unhatched eggs or previously unnoticed larvae. Three flights of beetles were preserved from this colony, emerging at about one- to two-month intervals. The piece of cactus was almost reduced to powder by the beetles before it was fumigated.

NOTES.— The above treatment was based on 79 paratypes and on 19 other specimens.

### 4. *Cactopinus niger* Wood

*Cactopinus niger* Wood, 1969, Coleopt. Bull. 23:46 (Holotype, male; 32 km S Huajuapan, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *cactophthorus* Wood by characters summarized in the above key.

MALE.— Length 1.6–1.9 mm, 2.3 times as long as wide; color black.

Frons deeply, broadly concave from base of horns to vertex, upper margin acute; basally contiguous pair of horns arise just above epistoma, fused on their basal half, diverging distally, their total length slightly less than distance equal to longitudinal axis of frontal concavity; lateral margins armed by a pair of small tubercles just above antennal insertion; surface of concavity smooth to subreticulate, with a few minute punctures, area above concavity rugose-reticulate; vestiture of fine, short hair above horns, slightly longer on horns, much longer and somewhat reddish on epistomal margin. Antennal club rather small, oval, sutures straight.

Pronotum 1.0 times as long as wide; widest on basal third, sides moderately arcuate, distinctly constricted on anterior third, rather narrowly rounded in front; posterior margin produced behind in median area; asperate area beginning just behind anterior margin on median third, expanding laterally toward middle, then narrowed to median process at base, not inflated laterally, transition to asperate area gradual; lateral areas smooth, with isolated rounded granules, granules transcend gradually into asperities above; vestiture hairlike, longer anteriorly.

Elytra 1.26 times as long as wide, 1.34 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly subemarginate behind; striae 1 weakly, others not impressed, punctures coarse, close, deep; interstriae smooth but undulating, punctures uniseriate, moderately large, deep, their anterior margins slightly higher, a few weak granules toward declivity. Declivity short, steep, strongly, broadly sulcate; striae 1 strongly impressed on upper two-thirds; interstriae 1 slightly elevatd, lateral areas ascending to broad summit on 4, lower fourth of 2 flattened, 3–9 each bearing a uniseriate row of moderately large, high, rounded tubercles. Vestiture consisting of a few short, interstrial, hairlike setae on declivity and sides.

FEMALE.— Similar to male except frons feebly convex with a shallow impression on median third, horns entirely absent.

DISTRIBUTION.— Oaxaca.

MEXICO: **Oaxaca**: 32 km S Huajuapan, Oaxaca, 16-VI-67, 2000 m, No. 46, giant cactus, S. L. Wood.

BIOLOGY.— As described for the genus. The host species had a distinctive bluish color.

NOTE.— The above treatment was based on the type series of 82 specimens.

### 5. *Cactopinus granulifer* Wood

*Cactopinus granulifer* Wood, 1969, Coleopt. Bull. 23:48 (Holotype, male; 6 km S Huajuapan, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— As indicated by the characters summarized in the above key, this species is very closely related to *niger* Wood.

MALE.— Length 1.3–1.6 mm, 2.36 times as long as wide; color black.

Frons deeply, broadly concave from epistomal horn to vertex, upper margin abrupt,

subacute; epistomal horns similar to but smaller than in *niger*, about two-thirds as long as longitudinal axis of concavity; surfaces and vestiture as in *niger*. Antennal club rather small, subcircular in outline; suture 1 straight, 2 feebly bisinuate.

Pronotum 1.02 times as long as wide; as in *niger* except asperities begin well behind anterior margin and do not extend as far laterally, granules in lateral areas smaller and less abundant, intermixed with numerous, close, fine, deep punctures; vestiture hairlike, longer anteriorly.

Elytra 1.3 times as long as wide, 1.3 times as long as pronotum; outline essentially as in *niger*; striae 1 feebly, others not impressed, punctures coarse, deep, close, with interspaces between punctures uniseriately granulate, granules increasing in size posteriorly until almost as large as those of interstriae at declivital margin; interstriae narrower than striae, irregular, uniseriate granules increasing in size toward declivity. Declivity short, very steep, broadly, deeply sulcate; general sculpture as in *niger* except lateral convexities higher, granules higher, much more numerous (including those on striae), granules reduced on striae 1 and interstriae 1 on lower two-thirds. Vestiture consisting of uniseriate rows of erect interstrial hair of moderate length, except minute on declivity.

FEMALE.— Similar to male except frons weakly convex, with a slight transverse impression near upper level of eyes.

DISTRIBUTION.— Oaxaca.

MEXICO: **Oaxaca**: 6 km N Totolapan, 20-VI-67, 1200 m, No. 67; 6 km, No. 44, and 32 km, No. 47, S Huajuapan, 16-VI-67, 2000 m; all from giant cactus by S. L. Wood.

HOST.— Giant cactus.

BIOLOGY.— As described for the genus. When in competition for space with *microcornis*, this species tended to avoid the summits of ridges on the host.

NOTES.— The above treatment was based on the type series of 97 specimens.

### 6. *Cactopinus nasutus* Wood

*Cactopinus nasutus* Wood, 1969, Coleopt. Bull. 23:49 (Holotype, male; 16 km S Matamoros, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *cactophthorus* Wood by the broad antennal club, which has bisinuate sutures, and by other characters summarized in the above key.

MALE.— Length 1.4–1.7 mm, 2.2 times as long as wide; color black.

Frons extensively excavated from epistomal horns to well back on vertex, reaching inner margins of eyes and exceeding width of eyes above, upper margin acute; surface of excavation smooth, shining, a feebly median elevation on lower half; horns rather large, as long as longitudinal axis of excavation, their proximal half fused, diverging slightly apically, subapical tufts of hair well developed; a pair of small tubercles located on lateral margins just above antennal insertion; vestiture confined to horns and epistomal margin. Antennal club large, circular in outline, sutures very strongly bisinuate.

Pronotum 1.02 times as long as wide; outline as in *niger*; asperities attain anterior margin and blend laterally with rounded granules; a few, fine, punctures evident laterally; vestiture hairlike, longer anteriorly.

Elytra 1.3 times as long as wide, 1.3 times as long as pronotum; outline as in *niger*; striae 1 weakly, others not at all impressed, punctures coarse, deep, close; interstriae almost as wide as striae, shining, undulating slightly, punctures uniseriate, rather coarse, deep, close, not at all granulate. Declivity steep, broadly, rather shallowly sulcate; general sculpture as in niger, tubercles on interstriae 3–9 uniseriate, comparatively small, those on lower half of 1 and 2 obsolete. Vestiture consisting of uniseriate rows of interstrial hair; not evident in impressed area of declivity.

FEMALE.— Similar to male except frons weakly convex, flattened below, with a pair of low, subtuberculate, raised areas in position of male horns.

DISTRIBUTION.— Puebla to Oaxaca.

MEXICO: **Oaxaca**: 6 km N Totolapan, 20-VI-67, 1200 m, No. 67, giant cactus, S. L. Wood. **Puebla**: 16 km S Matamoros, 14-VI-67, 1700 m, No. 36, giant cactus, S. L. Wood.

HOST.— Giant cactus.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 81 specimens.

### 7. *Cactopinus carinatus* Wood

*Cactopinus carinatus* Wood, 1969, Coleopt. Bull. 23:50 (Holotype, male; 26 km N Ixmiquilpan, Hidalgo, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nasutus* Wood by characters summarized in the above key.

MALE.— Length 1.5–1.8 mm, 2.4 times as long as wide; color black.

Frons as in *nasutus* except excavation slightly less extensive above, and divided by a distinctly elevated, median carina; horns slightly smaller. Antennal club large, subcircular in outline, sutures very strongly bisinuate, 1 angulate. Pronotum and elytra as in *nasutus* except strial punctures smaller, interstrial punctures on disc minute, declivital granules of reduced size, and declivital sulcus narrower, lateral convexities more abruptly elevated.

FEMALE.— Similar to female of *nasutus* except frons with a median carina on upper half, transverse impression at upper level of eyes more pronounced, and subepistomal elevations somewhat more extensive.

DISTRIBUTION.— Hidalgo.

MEXICO: **Hidalgo**: 26 km N Ixmiquilpan, 10-VII-67, 1700 m, No. 190, giant cactus, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 48 specimens.

### 8. *Cactopinus depressus* Bright

*Cactopinus depressus* Bright, 1967, Canadian Ent. 99:921 (Holotype, male; 46 miles or 73 km N San Luis Potisí, San Luis Potosí, Mexico; Canadian Nat. Coll., 9391); Wood, 1969, Coleopt. Bull. 23:51 (female)

DIAGNOSIS.— This species is distinguished by the very small, shallow strial punctures, by the absence of interstrial granules, and by other characters mentioned in the key. Its relationship to other species is not close.

MALE.— Length 1.3–1.5 mm, 2.6 times as long as wide; color very dark brown to black.

Frons very deeply concave from vertex to epistoma, but somewhat less extensively than in most other species; fused epistomal horns slightly shorter than longitudinal axis of excavation; surface minutely granulate. Antennal club small, about 1.4 times as long as wide; two very obscure sutures indicated by rows of setae.

Pronotum 1.0 times as long as wide; widest just behind middle, sides weakly arcuate, subparallel on basal two-thirds, very broadly rounded in front, almost straight on median half of anterior margin; summit on basal fourth, narrow, high asperities on triangular elevated area, a few extending to anterior fourth; lateral areas almost smooth. Vestiture confined to marginal areas, of coarse hair, a few exceedingly long.

Elytra 1.6 times as long as wide; sides straight and parallel on more than basal two-thirds, obtusely subangulate behind, slightly produced; striae not impressed, punctures very small, shallow; interstriae about three times as wide as striae, smooth, shining, except entire surface usually covered by a thin, dull incrustation, punctures fine, shallow. Declivity moderately steep, deeply, rather narrowly sulcate, sulcus extending almost to middle of elytra; surface essentially as on disc; lateral convexities on upper half rather abrupt, moderately high. Vestiture largely confined to sides, of sparse, coarse, rather long, hairlike setae.

FEMALE.— Similar to male except frons irregularly convex, finely granulate; declivital sulcus very shallow.

DISTRIBUTION.— San Luis Potosí to Hidalgo.

MEXICO: **Hidalgo**: 26 km N Ixmiquilpan, 10-VII-67, 1900 m, No. 189, *Yucca*, S. L. Wood. **San Luis Potosí**: 73 km N San Luis Potosí, 2-IX-58, *Yucca*, E. Mockford.

HOST.— *Yucca* sp.

BIOLOGY.— This species infested the yellow, dying leaves of a very large, branching, living *Yucca* tree. The entrance tunnels were mostly on the lower surfaces. The transverse adult galleries were essentially as described for the genus; straight, longitudinal larval mines were made between fibers of the leaf and were rather long.

NOTES.— The above treatment was based on the holotype and 121 other specimens.

### 9. *Cactopinus spinatus* Wood
Fig. 154

*Cactopinus spinatus* Wood, 1957, Great Basin Nat. 17:106 (Holotype, male; 2 km SE Cameron, Oaxaca, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species has large declivital spines comparable to those of *desertus* Bright, but the pronotal asperities are much

more widely distributed, the pronotal summit is not at all conical, the declivital sulcus is much deeper and wider, and the declivity lateral to interstriae 3 is armed by several coarse tubercles.

MALE.— Length 1.4–1.7 mm, 2.5 times as long as wide; color black.

Frontal concavity essentially as in *cactophthorus* except surface rather coarsely punctured; fused epistomal horns longer than longitudinal axis of concavity; lateral angles above antennal insertion coarsely bituberculate, a smaller tubercle on epistomal margin near median line; vestiture of fine, short setae on acute upper margin of concavity, conspicuous on horns and epistomal margin.

Pronotum 1.0 times as long as wide; widest just behind middle, sides moderately arcuate, converging very slightly on basal two-thirds, broadly rounded in front; summit at base, not conical or projecting, asperate area somewhat elevated, rather sharply defined on a rather definite, narrow triangle from base to anterior margin; asperities narrow, high, less numerous on anterior fourth; lateral areas shining, with fine punctures and granules.

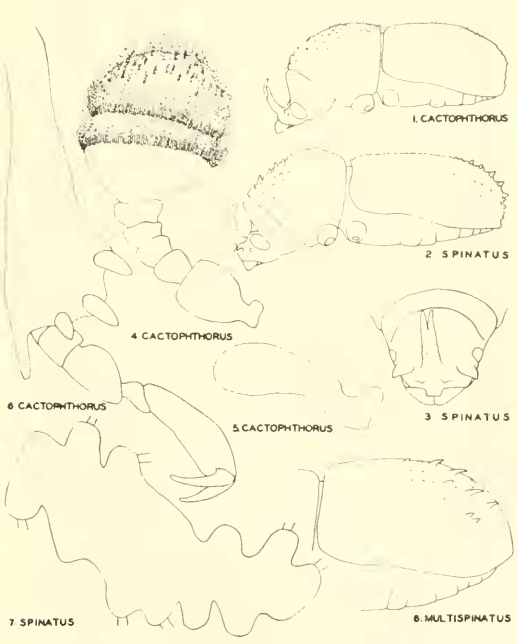



Fig. 154. *Cactopinus* and *Pseudothysanoes*: *C. cactophthorus*, 1, male, 4, antenna, 5, scape, 6, protibia; *C. spinatus*, 2, male, 3, male head, 7, parental gallery with egg niches; *P. multispinatus*, 8, lateral aspect of male elytra. (After Wood 1957:108.)

Vestiture of fine and coarse, short and very long, moderately abundant hair.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, posterior margin straight on median two-thirds; striae 1 moderately impressed toward declivity, punctures rather coarse, deep; interstriae about half as wide as striae, minutely granulate, somewhat convex, odd-numbered interstriae regularly granulate, granules slender, moderately high, other interstriae irregularly granulate. Declivity steep, rather broadly, deeply excavated; punctures in excavated area small, confused except on striae 1; interstriae 1 strongly depressed, rather weakly convex, with a row of very fine granules; excavated area rather narrow above, broad below, lateral elevations very high, median margins of their summits armed by a row of four to seven coarse, slender teeth, lateral margins of summits armed by similar smaller teeth; lateral areas with several smaller denticles, presumably on interstriae 3 to 9. Vestiture of strial and interstrial hair, short and fine to long and very coarse; rather abundant.

FEMALE.— Similar to male except frons very shallowly impressed, all tubercles represented but smaller, those in position of horns widely separated and each about as high as wide; declivital spines slightly larger.

DISTRIBUTION.— Jalisco to Oaxaca.

MEXICO: **Jalisco**: 1 km N Atenquique, 21-VI-65, 1000 m, No. 112, *Bursera*, S. L. Wood. **Oaxaca**: 2 km SE Cameron, 7-VII-53, 800 m, twigs of large tree; 57 km SE Cameron, 22-VI-67, No. 83, *Bursera*; 6 km N Totolapan, 20-VI-67, 1100 m, No. 62, *Bursera*; all by S. L. Wood.

HOSTS.— *Bursera* spp., etc.

BIOLOGY.— Specimens were taken from small dying branches on living trees of three species of *Bursera* and of one other tree genus. The galleries evidently were similar to those described for the genus. Resins from the tree and beetle activity from this and *Dendroterus* species greatly complicated observation.

NOTES.— The above treatment was based on 14 paratypes and on 79 other specimens.

### 10. *Cactopinus koebelei* Blackman

*Cactopinus koebelei* Blackman, 1938, Proc. Ent. Soc. Washington 40:156 (Holotype, male, Argus Mts., Inyo, California; U.S. Nat. Mus., 52796)

DIAGNOSIS.— This species is distinguished from *rhois* Blackman by the very shallowly impressed declivital sulcus, and by the absence of granules on declivital interstriae 1–3 (fine granules on upper half in some specimens).

MALE.— Length 1.3–1.5 mm, 2.5 times as long as wide; color black.

Frons presumably as in *rhois* (concealed in specimens at hand); lateral areas unarmed by tubercles; horns straight, fused, less than half as long as pronotum. Antennal club very small, 1.5 times as long as wide, sutures straight.

Pronotum 1.0 times as long as wide (projecting summit excluded); widest at middle, sides weakly arcuate and subparallel on basal two-thirds, broadly rounded in front; summit projecting rather strongly behind base above scutellum, asperate area abruptly, strongly elevated on narrow triangular area to anterior fourth, anterior fourth neither elevated nor asperate; lateral areas finely, closely, shallowly, irregularly punctured. Vestiture abraded in specimens at hand.

Elytra 1.5 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on more than basal two-thirds, narrowly rounded behind; striae impressed, punctures coarse, moderately deep; interstriae half as wide as striae, slightly irregular, punctures fine, obscure, uniseriate. Declivity steep, rather broadly convex with a slight sulcus; striae 1 impressed on upper half, lateral convexities on upper half moderately high, rounded; strial punctures slightly smaller than on declivity; interstriae 1 and 3 with irregular, obscure indications of very fine granules. Vestiture largely confined to lateral areas, of sparse short and sparse coarse, long hair.

FEMALE.— Similar to male except frons convex above eyes, a transverse impression on lower half, horns represented by a pair of widely spaced, large, blunt tubercles about as high as wide.

DISTRIBUTION.— Baja California to SW Utah.

USA: **California**: Argus Mts., V-91, A. Koebele; Lockwood Canyon, 13-V-13, *Pinus monophylla*, A. D. Hopkins; Mt. Hawkins, 13-VI-40, *P. lambertiana*, C. R. Bruck; Mt. Pinos, 30-VIII-41, *P. monophylla*, C. R. Bruck; Pith Creek, 13-V-13, *P. monophylla*, A. D. Hopkins; Valyermo, 1-I, 1-V-37, *P. monophylla*, A. T. McClay. **Utah**: Deep Creek Mts. near Calleo, Juab Co., 24-VII-57, *P. monophylla*, D. E. Bright. MEXICO: **Baja California**: Laguna Hanson, 27-VIII-58, E. L. Sleeper.

HOST.— *Pinus monophylla* and *P. lambertiana*.

BIOLOGY.— Presumably this species breeds in small twigs of pinyon pine.

NOTES.— The above treatment was based on the holotype and on 93 other specimens.

### 11. *Cactopinus rhois* Blackman
Fig. 96

*Cactopinus rhois* Blackman, 1938, Proc. Ent. Soc. Washington 40:154 (Holotype, male; Ventura Co., California; U.S. Nat. Mus. 52795)

DIAGNOSIS.— This species is distinguished from the allied *koebelei* Blackman by the more strongly sulcate elytral declivity, and by the presence of moderately coarse granules on declivital interstriae 1 to 3.

MALE.— Length 1.3–1.8 mm, 2.5 times as long as wide; color black.

Frons strongly excavated from epistoma to vertex, upper margin obtusely angulate; very shallowly concave at middle on transverse line; surface shining, rather coarsely, closely, shallowly punctured; horns equal to slightly less than half length of pronotum; lateral epistomal tubercles absent. Antennal club as in *koebelei*.

Pronotum as in *koebelei*.

Elytra 1.5 times as long as wide; outline about as in *rhois*; striae 1 moderately impressed, punctures rather coarse, moderately deep; interstriae shining, slightly more than half as wide as striae, punctures very fine, evidently supplemented by rather numerous, confused, impressed points almost as large as punctures. Declivity steep, rather broadly convex, with a moderately impressed sulcus; striae 1 strongly impressed; interstriae 1 depressed, convex, area lateral to striae 1 ascending rather abruptly to rounded summit; all interstriae with small, high, rather closely set granules. Vestiture of moderately abundant, fine, short and long, coarse hair.

FEMALE.— Frons as in *koebelei* except frontal tubercles smaller; otherwise as in male.

DISTRIBUTION.— S California.

USA: **California**: Montrose, 16-XII-34, *Rhus trilobata*, and 10-XII-33, *Rhus ovata*, C. R. Bruck; Henniger Flats, Mt. Wilson, 21-VI-40, *R. ovata*, C. R. Bruck; Coyote Creek in Ventura Co., 20-VI-40, *R. trilobata*, C. R. Bruck.

HOSTS.— *Rhus diversilobata, R. trilobata.*

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotype and on 266 other specimens.

### 12. *Cactopinus pini* Blackman

*Cactopinus pini* Blackman, 1938, Proc. Ent. Soc. Washington 40:153 (Holotype, male; Griffen, Kern, California; U.S. Nat. Mus., 52794)

DIAGNOSIS.— This species is distinguished from the closely allied *rhois* Blackman by the less strongly impressed male frons, by the longer male horns, by the steeper, more strongly sulcate elytral declivity, and by the absence of elytral granules particularly on the declivity.

MALE.— Length 1.6–2.0 mm, 2.6 times as long as wide; color black.

Frons as in *rhois* except flattened or weakly convex on a transverse line, surface more finely punctured; epistomal horns straight, longer, about half length of pronotum. Pronotum as in *rhois.*

Elytra 1.5 times as long as wide; sides almost straight and parallel on basal two-thirds, very broadly rounded behind; disc as in *rhois* except evidently impressed interstrial points reduced or absent (obscured by incrustation). Declivity steep, very strongly sulcate; sutural interstriae very strongly impressed above, impression expanding to interstriae 3 below; lateral areas abruptly, very strongly, broadly elevated; granules not evident. Vestiture of coarse, very long, rather sparse, interstrial hair, and more abundant, finer, short hair.

FEMALE.— Similar to male except frons not excavated, rather narrowly flattened, horns absent.

DISTRIBUTION.— S California and Nevada.

USA: California: Ventura Co., 13-XI-05 (or 17-XI-06?), Hopk. US 2775, Jeffrey pine, A. D. Hopkins; Frazier Mt., 6-IX-40, *Pinus monophylla,* C. R. Bruck; Mt. Pinos, 30-VIII-41, *P. monophylla,* C. R. Bruck. Nevada: Reno, Melrose Highway, 5-IV-74, *P. jeffreyii,* M. M. Furniss.

HOSTS.— *Pinus jeffreyii* and *P. monophylla.*

BIOLOGY.— Specimens were taken from shaded out branches of the host.

NOTES.— The above treatment was based on the holotype and on 73 other specimens.

### 13. *Cactopinus hubbardi* Schwarz

*Cactopinus hubbardi* Schwarz, 1899, Psyche 8(Suppl. I):11 (Lectotype, male; Tucson, Arizona; U.S. Nat. Mus., present designation); Blackman, 1938, Proc. Ent. Soc. Washington 40:152 (redescription)

DIAGNOSIS.— This species probably is more closely allied to *rhois* than to other known species, but it is distinguished by the stouter body form, by the steeper elytral declivity, by the smaller declivital granules, which are absent on interstriae 1 and 2, by the stouter pronotal asperities, and by the longer male epistomal horns.

MALE.— Length 1.6–2.3 mm, 2.2–2.4 times as long as wide; color very dark brown to black.

Frons as in *pini,* epistomal horns often much longer.

Pronotum 0.96 times as long as wide (protruding summit omitted); essentially as in *rhois* except asperities stouter and obsolete on anterior fourth.

Elytra 1.4 times as long as wide; sides almost straight and parallel on basal two-thirds, rather broadly subemarginate behind; striae 1 moderately impressed, strial punctures coarse, deep; interstriae slightly narrower than striae, weakly convex, almost smooth, punctures fine, uniseriate. Declivity very steep, rather deeply sulcate; sutural striae deeply impressed, impression wider below; lateral areas abruptly, rather strongly elevated; interstriae 2 armed by granules only at base, 3 and 4 tuberculate to their apices, lateral areas with occasional smaller granules. Vestiture of moderately long, coarse, rather abundant hair.

FEMALE.— Similar to male except frons convex above, very shallowly concave on narrow area below, epistomal horns absent.

DISTRIBUTION.— S Arizona.

USA: Arizona: Tucson, 31-XII-1896, *Cereus giganteus,* H. G. Hubbard and E. A. Schwarz; Sabino Canyon, Pima Co., 9-VIII-62, *Carnegiea gigantea,* S. L. Wood; Santa Catalina Mts., 17-IX-64, saguaro.

HOST.— *Carnegiea gigantea.*

BIOLOGY.— This species differs in habits from all other giant-cactus-inhabiting species. It breeds only in scar tissue formed in the living host on the inner walls of deep cavities, such as those made by woodpeckers. The tunnels are very shallow in the scar tissue.

NOTES.— The above treatment was based on the lectotype, about 240 paratypes, and on 14 other specimens. The male in the type collection at the U.S. National Museum has

been regarded as the type, but it has never been officially designated. It is here designated as the lectotype of this species.

### 14. *Cactopinus desertus* Bright
Fig. 96

*Cactopinus desertus* Bright, 1967, Canadian Ent. 99:923 (Holotype, male; 7 miles or 11 km S Ocotillo Wells, Anza-Borrego Desert Park, San Diego Co., California; California Acad. Sci.)

DIAGNOSIS.— The declivital armature of this species superficially resembles that of *spinatus* Wood, but the pronotal characters are as in *hubbardi* and its allies. The distinguishing characters were summarized in the above key.

MALE.— Length 1.6–2.1 mm, 2.4–2.5 times as long as wide; color black.

Frons as in *rhois*; epistomal horns straight, usually more than half as long as pronotum. Pronotum as in *rhois*, anterior fourth devoid of asperities.

Elytra 1.6 times as long as wide; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind, outline interrupted by projecting declivital spines; striae 1 moderately impressed, strial punctures coarse, deep; interstriae about half as wide as striae, somewhat convex, punctures fine. Declivity steep, rather broadly, deeply sulcate; striae 1 clearly indicated, 2 and 3 obsolete; lateral convexities high, armed by a row of six to nine large, spinelike teeth beginning at base on interstriae 2 but diverging to what probably is interstriae 3 (judged from tubercles on other species), alternate teeth often smaller. Vestiture of sparse short and very long, coarse hair.

FEMALE.— Similar to male except frons as in female *hubbardi*, epistomal brush especially well developed.

DISTRIBUTION.— S California to Baja California.

USA: **California**: 7 miles or 11 km S Ocotillo Wells, Anza-Borrego Desert State Park, 11-III-65, *Bursera microphylla*, C. W. O'Brien. MEXICO: **Baja California**: 50 km N La Paz, 27-III-74, *Bursera*, M. M. Furniss; 11 km SW Mission San Borja, 31-III-73, *Bursera*, J. Doyen; Santa Rosalia, 29-III-74, *Bursera*, M. M. Furniss.

HOST.— *Bursera microphylla*.

BIOLOGY.— As described for the genus. Specimens were taken from small branches, limbs, and bole; evidently several generations were produced in the same tree.

NOTES.— The above treatment was based on 2 male and 2 female paratypes and on 37 other specimens.

## Tribe IPINI

Ipini Bedel, 1888, Ann. Soc. Ent. France, hors serie 6:386 (Type-genus: *Ips* DeGeer, 1775)

Anatomical features.— The frons is usually sexually dimorphic, the eye is sinuate to shallowly emarginate, the antennal funicle is 5-segmented, the club is either obliquely truncate or the sutures on the posterior face are strongly displaced toward the apex, the pronotum is declivous and asperate on the anterior half, its lateral margins are rounded, the coxae are contiguous, and the declivity is usually strongly impressed or excavated, with the lateral margins armed by spinose denticles.

Biological features.— All are polygamous and phloeophagous. Eggs are deposited in niches. Larval mines are individual and rarely cross one another. Symbiotic fungi apparently are associated with them, but not in a mycetophagous sense. The northern genera are restricted to coniferous hosts, *Acanthotomicus* occurs in broadleaf trees.

Taxonomy.— Because only a minor fraction of the species groups found in Eurasia are represented in American *Pityogenes* and *Orthotomicus*, it is presumed that these genera originated in Eurasia and reached North America rather recently. The reverse situation is found in *Pityokteines* and *Ips*, where a North American origin is postulated; the ancestral stock from which both were derived presumably reached North America from Eurasia in an earlier migration. *Acanthotomicus* occurs in tropical America, Africa, and the Indo-Australian area; species groups common to both South America and Africa suggest a faunal exchange well after the basic generic features were fixed. The Ipini are a compact group, closely allied to the Dryocoetini, in which the generic limits may be obscure. The separation of *Ips* and *Orthotomicus* is particularly difficult and may not be justified.

### Genus *PITYOGENES* Bedel

*Pityogenes* Bedel, 1888, Ann. Soc. Ent. France, hors ser. 6:397 (Type-species: *Dermestes chalcographus* Linnaeus, original designation)

*Eggersia* Lebedev, 1926, Ent. Blätt. 22:121 (Type-species: not designated); Schedl, 1962, Centralbl. Forstw. 79:132. *Synonymy*

*Pityoceragenes* Balachowsky, 1949, Faune de France 50:244 (Type-species: *Bostrichus bidentatus* Herbst, original designation); Schedl, 1958, Tijdschr. Ent. 101:145. *Synonymy*

Diagnosis.— Within the tribe Ipini this genus is distinguished by the very short, obtuse intercoxal piece on the prosternum, and by the large spines on the elytral declivity. The females of all American species, except *meridianus* Blackman, have a large fossal excavation on the frons; this character does not occur in most European or Asian species.

Description.— Length 1.8–3.7 mm, 2.5–2.7 times as long as wide; light brown to almost black.

Frons sexually dimorphic, male convex, female with a large central fossa (except *meridianus*); vestiture hairlike, sparse, inconspicuous. Eye elongate-oval, weakly sinuate on anterior margin; finely granulate. Antennal scape elongate; funicle 5-segmented; club oval, two sutures on anterior face, 1 reaching basal half, posterior face with one suture well below apex. Pronotum slightly longer than wide; anterior slope asperate, punctured on posterior areas; anterior margin serrate. Scutellum well-developed, flat. Elytra with small, widely spaced strial and interstrial punctures in somewhat obscure rows; declivity gradual to steep, sulcate, armed by two or three pairs of denticles, those in male much larger. Vestiture hairlike, rather inconspicuous.

Distribution.— North America, Europe, and Asia where native pine forests grow; 19

species are known; 7 occur in North America.

BIOLOGY.— The American species infest trees of the genus *Pinus*. They breed primarily in slash and in cut or fallen limbs and branches, although they are not uncommon in the bole or in standing, dying trees. All species are polygamous. The male forms the entrance tunnel and nuptial chamber; the females cut long egg galleries in the cambium region that radiate out from the nuptial chamber. Eggs are deposited in individual niches made by the female for that purpose. Larval mines radiate away from the egg gallery in a more or less irregular pattern; they are visible on the surface of peeled bark throughout their length. Pupation occurs in the cambium region, and young adults emerge from individual exit holes.

Key to the Species of *Pityogenes*

1. Male elytral declivity armed by three pairs of coarse denticles; female declivity rather gradual, armed by three pairs of denticles of about equal size and equally spaced; female frontal fossa large, undivided; in 5-needle pines ..... 2

— Male elytral declivity armed by two pairs of teeth, upper pair long, slender, hooked; female declivity very steep, armed by three pairs of denticles, upper pair much smaller and much closer to second pair; female fossa divided by a median septum, except undivided in *carinulatus* and absent in *meridianus* ..... 3

2(1). Pronotal disc more deeply, closely punctured; female frontal fossa large, extending well above upper level of eyes; male elytral declivity more strongly impressed, denticles distinctly larger; British Columbia and California to Arizona and Colorado; *Pinus monticola, P. flexilis*; 1.8–2.5 mm ..... 1. ***fossifrons*** **(LeConte)**

— Pronotal disc less deeply, very sparsely punctured; female frontal fossa much smaller, ending well below upper level of eyes; male elytral declivity shallowly impressed, denticles distinctly smaller; Minnesota and Newfoundland to Tennessee and North Carolina; *Pinus strobus*; 1.8–2.1 mm ..... 2. ***hopkinsi*** **Swaine**

3(1). Punctures on elytral declivity coarse, rather deep; female frons convex, devoid of fossal excavation ..... 4

— Punctures on elytral declivity fine to obsolete; female frons with a conspicuous fossal excavation ..... 5

4(3). Smaller species; upper male declivital spines less strongly hooked; discal interstriae with punctures more confused; female elytral declivity less strongly convex, sulcus wider; North Carolina to Mississippi; *Pinus echinata, P. taeda*; 2.5–3.0 mm ..... 3. ***meridianus*** **Blackman**

— Larger species; upper male declivital spines more strongly hooked; discal interstriae more regularly punctured; female elytral declivity more strongly convex, sulcus narrower; Mexico; *Pinus hartwegii*; 3.2–3.4 mm ..... 4. ***mexicanus*** **Wood**

5(3). Larger; lower fourth (variable) of posterolateral margin of male elytral declivity carinate, carina ending in lower tooth; female frontal fossa very large, extending well above upper level of eyes, undivided; British Columbia and South Dakota to California and Chihuahua; *Pinus*; 2.3–3.7 mm ..... 5. ***carinulatus*** **(LeConte)**

— Smaller; posterolateral margin of male declivity rounded; female frons with fossa smaller, not extending above upper level of eyes, divided by a median partition ..... 6

6(5). Female frontal fossa usually smaller, not as deep, often poorly formed; elytral surface and surface of vertex tending to be smoother; elytral vestiture averaging very slightly longer; E Alberta and Quebec to North Carolina; *Pinus*; 1.9–2.5 mm ..... 6. ***plagiatus*** **(LeConte)**

— Female frontal fossa larger, deeper; elytral surface and vertex tending to be wrinkled to subrugose; elytral vestiture averaging slightly shorter; British Columbia, Alberta, and South Dakota to California and Colorado; *Pinus contorta*; 1.9–2.9 mm ..... 7. ***knechteli*** **Swaine**

### 1. *Pityogenes fossifrons* (LeConte)

*Pityophthorus fossifrons* LeConte, 1876, Proc. Amer. Philos. Soc. 15:353 (Lectotype, female; Vancouver Island, British Columbia; Mus. Comp. Zool., 1028, present designation)

DIAGNOSIS.— This species is closely related to *chalcographus* (Linnaeus), of Europe and Asia, but it has the elytral declivity less strongly impressed, with the lateral denticles slightly smaller, and it has the female frons slightly narrower, with the frontal spongy area and fossa distinctly smaller.

MALE.— Length 1.8–2.5 mm, 2.6 times as long as wide; color very dark brown, almost black.

Frons broadly convex; surface shining, punctures rather small, close, moderately deep, some very feebly granulate; vestiture of fine, sparse, inconspicuous hair. Eye 2.0 times as long as wide; antennal club with suture 1 straight.

Pronotum 1.1 times as long as wide; widest at base, sides weakly arcuate, converging toward narrowly rounded anterior margin; anterior margin armed by eight subcontiguous teeth; summit at middle; anterior slope asperate; posterior area smooth, shining, surface marked by many minute points, punctures rather coarse, deep, moderately close, interstriae about equal to diameter of a puncture; median line impunctate, distinctly elevated. Vestiture restricted to marginal areas; sparse.

Elytra 1.6 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather broadly rounded behind; striae not impressed, obscure, punctures very small, not deep; interstriae about four to six times as wide as striae, somewhat irregularly marked by shallow lines, minute points, etc., punctures equal in size and appearance to those of striae, widely spaced. Declivity moderately steep, broadly sulcate, lateral margins armed by three pairs of coarse, equally spaced, pointed teeth; strial and interstrial punctures in impressed area obsolete, part of surface near suture subreticulate. Vestiture hairlike, sparse.

FEMALE.— Similar to male except central third of frons with a very deep, cone-shaped cavity extending well above upper level of eyes, area between cavity and epistomal margin spongy and finely pubescent; elytral declivity steeper, less strongly, less broadly impressed, lateral denticles much smaller but of equal size to one another.

DISTRIBUTION.— British Columbia and California to Arizona and Colorado.

CANADA: **British Columbia**: Adam's Lake, Cowitchan, Rossland, Sugar Lake, Trinity Valley. USA: **Arizona**: Hannagan Camp in Greenlee Co. **California**: Big Pines, Blancos Corral, Callahan in Siskyou Co., Glen Alpine, Grassy Lake in Lassen Co., Inyo N.F., Onion Valley in Inyo Co., White Mt. in Mono Co., Yosemite. **Colorado**: Long's Peak, Manitou Mt., Pingree Park. **Idaho**: Coeur d'Alene, Franklin Basin Road in Franklin Co., Kellogg, Kootenai, Krassel, Sand Point. **Montana**: Sheridan. **Nevada**: Lee. **Oregon**: Santiam Pass. **Utah**: Brighton, Logan Canyon, Logan Dry Canyon. **Washington**: Easton, Metaline Falls. **Wyoming**: Saratoga.

HOSTS.— *Pinus albicaulis*, *P. balfouriana*, *P. flexilis*, *monticola*, *P. strobiformis*, rarely in other hosts.

BIOLOGY.— This locally abundant species breeds mostly in slash and broken limbs and branches. In Utah the egg galleries are almost exclusively transverse; the only two gallery systems observed in Oregon were of the typical unmodified star shape. Larval mines in Utah are parallel to the grain of the wood.

NOTES.— The above treatment was based on the lectotype and on 211 other specimens. The one female syntype remaining in the LeConte collection is here designated as the lectotype of *Pityophthorus fossifrons* LeConte, as indicated above.

### 2. *Pityogenes hopkinsi* Swaine
Fig. 155

*Pityogenes hopkinsi* Swaine, 1915, New York St. Coll. For., Syracuse, Tech. Pub. 2:8 (Lectotype, female; Ste. Anne de Bellevue, Quebec; Canadian Nat. Coll., 9294, designated by Bright, 1967, Canadian Ent. 99:677)

DIAGNOSIS.— This species is distinguished from *fossifrons* (LeConte) by the smaller average size, by the less deeply, more sparsely punctured pronotal disc, by the smaller female frontal fossa, and by the less strongly impressed male elytral declivity.

MALE.— Length 1.8–2.1 mm, 2.5 times as long as wide; color brown.

Frons and pronotum as in *fossifrons* except pronotal punctures less numerous, interstriae averaging about twice as wide as diameter of a puncture. Elytra as in *fossifrons* except declivity less strongly, more narrowly impressed, lateral denticles slightly smaller.

FEMALE.— Similar to male except differing as female *fossifrons* differs from male and frontal fossa smaller, ending well below upper level of eyes, spongy area smaller; declivital sulcus not as deep, narrower.

DISTRIBUTION.— Minnesota and Newfoundland to Tennessee and North Carolina.

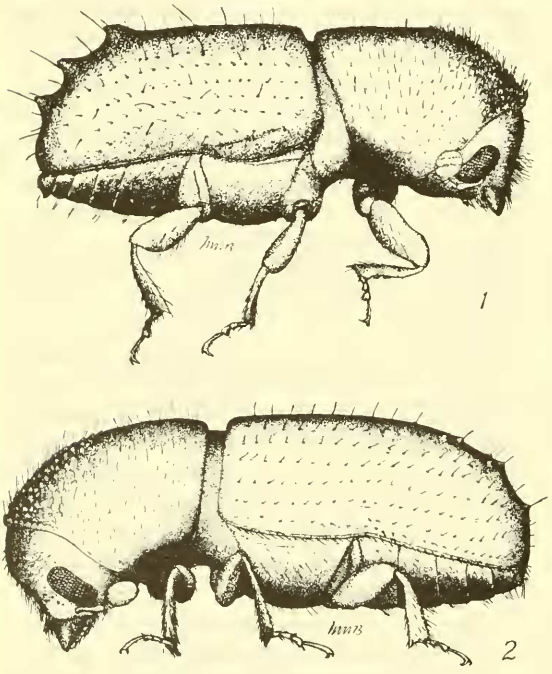



Fig. 155. *Pityogenes hopkinsi*: 1, male; 2, female. (After Blackman 1915:pl. I.)

CANADA: Newfoundland, New Brunswick, Nova Scotia, Ontario, Quebec. USA: Connecticut, Illinois, Indiana, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, Wisconsin.

HOSTS.— *Pinus strobus.*

BIOLOGY.— Essentially as in *fossifrons* (Blackman 1915).

NOTES.— The above treatment was based on 553 specimens; the lectotype was also examined.

### 3. *Pityogenes meridianus* Blackman
Fig. 156

*Pityogenes meridianus* Blackman, 1921, Mississippi Agric. Expt. Sta. Tech. Bull. 10:15 (Lectotype, male; Meridian, Mississippi; U.S. Nat. Mus., present designation)

DIAGNOSIS.— This unique species is distinguished from all other American representatives of the genus by the coarsely punctured elytral declivity, by the absence of a fossal excavation on the female frons, and by the distribution.

MALE.— Length 2.5–3.0 mm, 2.6 times as long as wide; color dark reddish brown to almost black.

Frons as in *knechteli* Swaine except more strongly convex, punctures very close, deep, rather coarse, tubercles slightly more abundant. Pronotum as in *knechteli* except punctures on disc larger and without evident granules on their margins.

Elytra about as in *knechteli* except discal punctures distinctly larger. Declivity similar except punctures in excavated area much coarser and deeper; posterolateral margin of declivity with two small teeth, margin between these denticles and upper spine with about five small granules; upper spines and vestiture as in *knechteli.*

FEMALE.— Similar to male except frontal punctures and granules much smaller; not excavated as in the other American species; declivity as in female *knechteli* except more broadly impressed, punctures coarse and deep.

DISTRIBUTION.— North Carolina to Mississippi.

USA: **Mississippi**: A&M, 3-XI-19, Mi. 10, M. W. Blackman (also Meridian, Hattiesburg). **North Carolina**: Durham, 6-X-39, *Pinus taeda*, J. A. Beal.

BIOLOGY.— This rare species evidently lives in shaded-out branches of living, standing trees.

NOTES.— The above treatment was based on the syntypic type series of 11 specimens and on one other specimen. I here designate Blackman's male type, on which his description was based, as the lectotype of this species.

### 4. *Pityogenes mexicanus* Wood

*Pityogenes mexicanus* Wood, 1980, Great Basin Nat. 40:356 (Holotype, female; Parque Nacional Zoquiapan, Mexico, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *meridianus* Blackman by the much larger size, by the shorter, more strongly hooked upper spines on the male elytral declivity, by the more regularly punctured discal interstriae, and by the much more strongly convex female elytral declivity. The female frons of this species and *meridianus* differs from all other American *Pityogenes* in lacking a deeply excavated central area.

MALE.— Length 3.2–3.4 mm, 2.6 times as long as wide; color very dark brown.

Frons broadly granulate, a few fine punctures interspersed; vestiture of fine, long, moderately abundant hair.

Pronotum essentially as in *meridianus* except minute, impressed points much more numerous.

Elytra essentially as in *meridianus* except interstrial punctures regular, about equal in size to those of striae; upper declivital spines slightly shorter, more strongly hooked, series of tubercles on lower fourth of lateral margin much lower and rounded except lowest one larger and pointed (male *meridianus* not at hand; comparison based on Blackman's drawing).

FEMALE.— Similar to male except median line on upper half of frons shallowly concave; epistomal area on median third slightly protuberant, granulate, and ornamented by moderately abundant, fine, short hair; frontal tubercles smaller; declivity shallowly, narrowly sulcate (more shallowly impressed than any other American *Pityogenes*), declivity with stouter, more abundant vestiture than in *meridianus*.

DISTRIBUTION.— Mexico.

MEXICO: **Mexico**: Parque Nacional Zoquiapan, VIII-79, *Pinus hartwegii* branch, T. H. Atkinson.

NOTES.— The above treatment was based on the type series of four specimens.

### 5. *Pityogenes carinulatus* (LeConte)
Fig. 158

*Cryphalus carinulatus* LeConte, 1874 Trans. Amer. Ent. Soc. 5:70 (Lectotype, female; California; Mus. Comp. Zool., 1005; present designation)

*Xyleborus hamatus* LeConte, 1874, Trans. Amer. Ent. Soc. 5:72 (Lectotype, male; Mojave desert, California; Mus. Comp. Zool., 1004, present designation); LeConte, 1878, Proc. Amer. Philos. Soc. 17:624. *Synonymy*

DIAGNOSIS.— This species is distinguished from other American representatives of the genus by the large size, by the very large, undivided female frontal fossa, and by the carinate ventrolateral margin of the male elytral declivity.

MALE.— Length 2.3–3.7 mm, 2.5 times as long as wide; color dark brown.

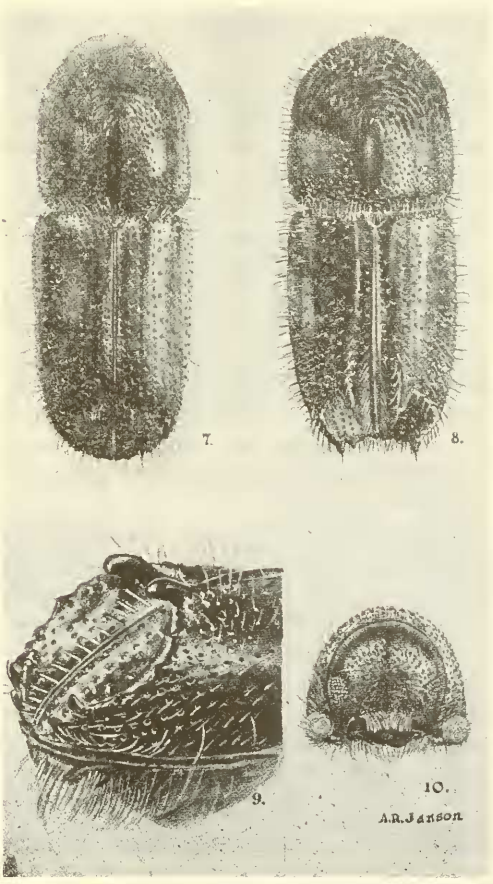



Fig. 156. *Pityogenes meridianus*: 7, female; 8–9, male; 10, female? (After Blackman 1921:13.)

Frons broadly convex, with a slight central impression; surface shining, closely, rather coarsely granulate-punctate; vestiture of fine, long hair of moderate abundance. Eye 2.3 times as long as wide. Antennal club with sutures 1 and 2 bisinuate, slightly procurved.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on slightly more than basal half, rather abruptly, arcuately narrowed to distinct constriction just before rather narrowly rounded anterior margin; anterior margin armed by about 10 small teeth; summit at middle; anterior slope coarsely asperate; posterior area smooth, shining, punctures rather small, moderately close, deep, those near summit somewhat granulate; median line impunctate, subacutely elevated. Vestiture of sparse hair.

Elytra 1.4 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal two-thirds, then arcuately narrowed to lower denticles, broadly, shallowly emarginate on median third; striae not impressed, punctures small, widely spaced, rows not always regular; interstriae smooth, shining, six or more times as wide as striae, punctures as those of striae but rows more irregular. Declivity rather steep, broadly, rather shallowly excavated; upper margin armed on interstriae 2 by a pair of long, slender, hooked, hornlike spines; lower denticles of moderate size, pointed, on ventrolateral margin on interstriae 2, ventrolateral margin strongly, acutely elevated from lower tooth about one-fourth of distance toward upper spine, remaining margin rounded; declivital face smooth and shining, punctures sparse except on striae 1, minute.

FEMALE.— Similar to male except frons deeply excavated on median area from just above epistoma to vertex, epistomal area minutely, densely punctured; declivity steeper, more narrowly, very shallowly sulcate, lateral margins rounded, armed by three small teeth, distance from denticle 1 to 2 half as great as from 2 to 3, 1 much smaller.

DISTRIBUTION.— S British Columbia and W South Dakota to California and Chihuahua.

CANADA: **British Columbia**: Aspen Grove, Midday Valley, Princeton, Shingle Creek, Vernon. USA: **Arizona**: Flagstaff, Kaibab N.F., Prescott, Sunset Crater, Williams. **California**: Alpine Co., Blanco's Corral, Cannel Meadows, Chester, Cisco, El Dorado Co., Faunskin, Fresno Co., Grass Lake, Guerneyville, Humboldt Co., Hat Creek, Huntington Lake, Kern Co., Lake Tahoe, McCloud, Myers, Norval Flats, Plumas N.F., San Bernardino Co., Shasta Co., Ventura, Weaverville. **Colorado**: Colorado N.F., Durango, Estes Park, Poudre Canyon. **Idaho**: Athol, Centerville, Coeur d'Alene, Moscow. **Montana**: Columbia Falls, Pine Grove. **Nebraska**: Nanzel, Norden, Valentine. **Nevada**: Kyle Canyon in Clark Co., Lake Tahoe. **New Mexico**: Capitan, Las Vegas, Meek. **Oregon**: Grants Pass, Hood River, La Grande, Sisters. **South Dakota**: Black Hills, Custer, Elmore, Hill City, Lead, Spearfish. **Utah**: Kamas, Long Valley Junction, Panguitch Lake, Pin Hollow in Fishlake N.F., Sanford Canyon in Dixie N.F. **Washington**: Buckeye, Spokane. **Wyoming**: Buffalo, Lusk. MEXICO: **Chihuahua**: San Juanito, 15-III-74, *Pinus*, M. M. Furniss.

HOSTS.— *Pinus jeffreyi, P. ponderosa*; less common in other species of *Pinus*, rare in other conifers.

BIOLOGY.— This species is very common in slash. The habits are essentially as described for the genus.

NOTES.— The first syntype in the LeConte series of *carinulatus*, a female, is here designated as the lectotype of *Cryphalus carinulatus* LeConte. The first syntype in the LeConte series of *Xyleborus hamatus*, a male, is here designated as the lectotype of *hamatus* LeConte. The above treatment was based on the LeConte series of 10 specimens and on 341 other specimens.

### 6. *Pityogenes plagiatus* (LeConte)

*Xyleborus plagiatus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:161 (Lectotype, male; Maryland; Mus. Comp. Zool., 1003, present designation)

*Pityogenes lecontei* Swaine, 1915, New York St. Coll. For., Syracuse, Tech. Pub. 2:10 (Holotype, male; Marquette, Michigan; Mus. Comp. Zool.); Wood, 1957, Canadian Ent. 89:400. *Synonymy*

DIAGNOSIS.— This species has the female frontal fossa divided by a median partition; the ventrolateral margin of the male elytral declivity is rounded. It is almost indistinguishable from *knechteli* Swaine, as indicated in the above key and in the diagnosis of that species.

MALE.— Length 1.9–2.5 mm, 2.5 times as long as wide; color brown to very dark brown.

Frons broadly convex; surface shining, coarsely granulate below upper level of eyes, becoming punctate above; vestiture of fine, long, moderately abundant hair; epistomal brush conspicuous. Eye and antenna as in *fossifrons* (LeConte). Pronotum as in *carinulatus* (LeConte).

Elytra as in *carinulatus* except ventrolateral margin of declivity rounded, not at all carinate near lower tooth.

FEMALE.— Similar to male except median third of frons below upper level of eyes excavated, excavation divided by a median partition, epistomal area somewhat spongy and minutely, densely pubescent; declivity as in female *carinulatus*.

DISTRIBUTION.— Alberta and Quebec to North Carolina.

CANADA: **Alberta**: Smith. **Manitoba**: Marchand, Molson. **Ontario**: Constance Bay, Geraldton, Larchwood, Low Bush, Marson, Ottawa, Petawawa Res., Red Lake, Wavell. **Quebec**: Ft. Coulogne, Maniwaki. USA: **District of Columbia**: Brightwood, Washington. **Maryland**: Beltsville. **Michigan**: Camp Raco in Chippewa Co., Marquette. **Minnesota**: Cass Lake, Cloquet, Lake Itasca, Lake of the Woods. **North Carolina**: Durham. **Pennsylvania**: Kansas Valley in Perry Co., Mt. Alto, York. **Virginia**: Arlington, Chatham, Garrisonville, Onville, Rixey. **West Virginia**: Hampshire Co., Kanawha Station, Ridgeville, Romney, Roosevelt, Wood Co.

HOSTS.— *Pinus banksiana, P. echinata, P. resinosa, p. virginiana.*

BIOLOGY.— The habits are essentially as described for the genus.

NOTES.— The above treatment was based on the lectotype of *plagiatus*, on the holotype of *lecontei*, and on 236 other specimens. From the syntypic series of LeConte I here designate the first specimen, a male, from Maryland, labeled "Type No. 1003," as the lectotype of *plagiatus*. Swaine described the seventh specimen in this series as the holotype of *lecontei*.

This species is almost indistinguishable from *knechteli* and may hybridize with that species; see the taxonomic notes under that name.

### 7. *Pityogenes knechteli* Swaine
Figs. 157–158

*Pityogenes knechteli* Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):106 (Holotype, female; Beau Vent Lake, Jasper Park, Alberta; Canadian Nat. Coll., 9295)

DIAGNOSIS.— This species is distinguished, with difficulty, from *plagiatus* LeConte by minute differences in the sculpture and vestiture, and by the female frontal fossa as indicated in the above key. It is entirely possible they are only geographical races of one another.

MALE.— Length 1.9–2.9 mm, 2.6 times as long as wide; color brown to almost black.

Virtually identical to *plagiatus* except female with frontal fossa slightly larger, much deeper than *plagiatus*; surface of elytral disc tending to be wrinkled and, toward declivity, subrugose; elytral vestiture averaging slightly shorter.

FEMALE.— See above.

DISTRIBUTION.— British Columbia, Alberta, and W South Dakota to California and Colorado.

CANADA: **Alberta**: Banff Springs, Cypress Hills, Exshaw, Jasper Park, Smith. **British Columbia**: Chetwynd, Creighton Valley, Hope Mt., Kooteney Valley, Lorna, Merritt, Peachland, Stanley, Trinity Valley. **Saskatchewan**: Cypress Hills. USA: **California**: Big Pines Park, Clover Valley in Lassen N.F., El Dorado Co., Fresno Co., Lone Pine, Madera Co., Mariposa Co., Mono Co., Myers, Rowell Meadow in Tulare Co., San Bernardino Co., Shasta Co., Tulare Co., Tuolumne Co., Yosemite. **Colorado**: Camp Hale, Colorado N.F., Estes Park, Fraser, Gould, Grand Lake, Leadville, Pingree N.P., Rocky Mt. N.P., Troga Pass. **Idaho**: Cascade, Krassel, Smith's Ferry, Soda Springs, Tuttle. **Montana**: Big Horn N.F., Columbia Falls, Glacier N.P., Mullan, Polaris, Ramshorn Canyon near Sheridan, Rocky Boy Indian Res. in Lake Co., Sula, Wisdom. **Oregon**: Chemult, North Powdery Peaks, Ochoco N.F., Warner Mts. in Lake Co. **Utah**: Elk Park in Ashley N.F., Hoop Lake in Wasatch N.F., Kamas, Logan Canyon, Mirror Lake in Summit Co. **Wyoming**: Keystone, Minview, Sheridan, Teton N.F., Wood's Landing in Albany Co.

HOSTS.— *Pinus contorta.*

BIOLOGY.— Very abundant in slash and fallen trees. The habits are essentially as described for the genus.

NOTES.— The above treatment was based on the holotype and on 357 other specimens.

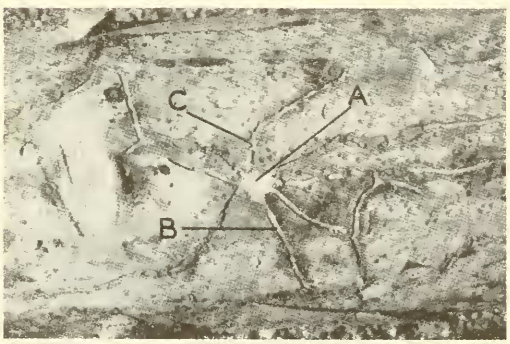



Fig. 157. *Pityogenes knechteli*, galleries: A, nuptial chamber; B, egg gallery; C, egg niche. (After Reid 1955:318.)

This is either an allopatric sibling species or a poorly differentiated subspecies of *plagiatus*. One series from Peace River, Alberta, in the zone of host hybridization, is intermediate between *knechteli* and *plagiatus*. If additional material from that region supports that indication of intergradation, then they must be treated as subspecies, as was done by Bright (1976:142).

## GENUS *PITYOKTEINES* FUCHS

*Pityokteines* Fuchs, 1911, Morphologische Studien über Borkenkäfer: I. Die Gattungen *Ips* DeGeer und *Pityogenes* Bedel, p. 33 (Type-species: *Ips curvidens* Germar, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:127)

*Orthotomides* Wood, 1951, J. Ent. Soc. Kansas 24:32 (Type-species: *Orthotomicus lasiocarpi* Swaine, original designation); Wood, 1975, Great Basin Nat. 35:21. *Synonymy*

DIAGNOSIS.— In this genus the antennal club is obliquely truncate, as in *Orthotomicus*. From *Orthotomicus* it is distinguished by the narrowly excavated elytral declivity, with the lateral margins rounded, the lower margin narrowly, poorly developed, about half as long as distance between third pair of spines; by the absence of a spiracle on abdominal tergum 7; and by the long, abundant, conspicuous vestiture on the head and anterior parts of the pronotum in the female.

DESCRIPTION.— Length 1.6–2.9 mm, 2.5–2.8 times as long as wide; color brown to very dark brown.

Frons rather strongly convex and sparsely pubescent (males) to weakly convex and densely pubescent (females, except moderately in *ornatus*, sparse in *lasiocarpi*). Eye very shallowly emarginate, rather small. Antennal scape elongate; funicle 5-segmented; club obliquely truncate, two sutures evident on anterior face, none, one, or two on posterior face. Pronotum slightly longer than wide; summit near middle, anterior area declivous and asperate, posterior area punctured. Scutellum rather large, flat. Elytra weakly to moderately striate; declivity sulcate to rather deeply excavated, impression deeper in males; lateral margins armed by three pairs of denticles, denticles larger in males; apex of declivital excavation subacutely, transversely elevated near suture, transverse length of this elevation equal to about half distance between lowest (third) denticles. Prosternal intercoxal piece acuminate.

DISTRIBUTION.— N North America and N Eurasia; nine species are known, six of them occur in North America.

BIOLOGY.— These polygamous species construct radiate or star-shaped parental galleries in the phloem of the larger limbs or bole of cut, fallen, or dying trees. Their tunnels may or may not show on the surface of peeled bark. The larval mines are rather short, somewhat irregular, and they may or may not be in contact with the cambium. Reports as to their aggressiveness vary from a primary enemy of balsam fir (*sparsus*) to a secondary invader following the attack of *Ips* in ponderosa pine (*ornatus*).

NOTES.— This genus is not sharply separated from *Orthotomicus* when only females are compared. However, when males are compared and all species are considered on a worldwide basis, two distinct cluster of species, without intermediates, are apparent. I prefer to recognize both as distinct genera. Schedl (1964) went to the opposite extreme and grouped *Ips*, *Orthotomicus*, *Acanthotomicus*, and *Pityokteines* into one large genus. In my opinion the grouping of such diverse species groups is not justified at the present time.

### Key to the Species of *Pityokteines*

1. Larger; pronotum 1.25 times as long as wide; base of second declivital tooth in male enlarged, making this tooth appear much larger than 1 or 3; female frons strongly convex, rather coarsely granulate-punctate, vestiture rather sparse, about as in male; British Columbia and South Dakota to California and Colorado; *Pinus ponderosa*, etc.; 2.1–2.9 mm ..... 1. **ornatus (Swaine)**

— Smaller; pronotum 1.05–1.20 times as long as wide; second declivital tooth in male little if any larger than third, its base moderately inflated or not; female frons very weakly convex, minutely, densely punctured, usually devoid of granules, pubescence dense and very long except greatly reduced in *lasiocarpi*; *Abies* ..... 2

2(1). Elytral declivity of male weakly to moderately impressed, with lateral denticles small; in female weakly impressed, with denticles minute to obsolete; body 2.8–3.0 times as long as wide ..... 3

— Elytral declivity of male strongly impressed, with lateral denticles rather coarse, in female moderately impressed, with denticles moderately large (as large or larger than male *minutus*); body 2.5–2.6 times as long as wide ..... 5

3(2). Female with dorsal half of frons and anterior fourth of pronotum ornamented by abundant, very long setae; posterior face of antennal club with suture 1 at apical margin; elytral punctures modertely coarse; British Columbia and Alberta to Arizona and New Mexico; *Abies lasiocarpa*; 1.7–2.3 mm ..... 2. ***minutus*** **(Swaine)**

— Female with setae on dorsal half of frons and anterior fourth of pronotum rather sparse, short; posterior face of antennal club with suture 1 subapical, 2 at apical margin; elytral punctures fine ..... 4

4(3). Lower third of female frons with a dense brush of long hair; anterior margin of pronotum more narrowly rounded; declivital sulcus more deeply, more narrowly impressed; Washington; *Abies amabilis*; 1.7–2.1 mm ..... 3. ***mystacinus*** **Wood**

— Female frons with sparse, short pubescence; anterior margin of pronotum broadly rounded; declivital sulcus more broadly, more shallowly impressed; British Columbia and Alberta to Utah; *Abies*, *Pseudotsuga*; 1.6–1.9 mm ..... 4. ***lasiocarpi*** **(Swaine)**

5(2). Strial punctures averaging slightly larger, deeper, closer; surface near lateral margins of pronotum subreticulate; British Columbia and N Idaho to California; *Abies concolor*, *A. magnifica*, *A. procera*, 1.9–2.6 mm .. 5. ***elegans*** **Swaine**

— Strial punctures averaging slightly smaller, not as deep and more widely spaced within a row; pronotal surface near lateral margins smooth; shining; E Alberta and Newfoundland to Wisconsin and West Virginia; *Abies balsamea*; 1.6–2.1 mm ..... 6. ***sparsus*** **(LeConte)**

### 1. *Pityokteines ornatus* (Swaine)

Fig. 158

*Orthotomicus ornatus* Swaine, 1916, Canadian Ent. 48:185 (Lectotype, female; Williams, Arizona; Canadian Nat. Coll., 9298, designated by Bright, 1967, Canadian Ent. 99:676)

*Pityokteines ornatus*: Wood, 1966, Great Basin Nat. 26:27

DIAGNOSIS.— This species is distinguished from other American species in the genus by the larger average size, by the basally enlarged, submammiform spine 2 on the male elytral declivity, by the less abundant vestiture on the female frons, by the more strongly convex, granulate female frons, and by the host.

MALE.— Length 2.1–2.9 mm, 3.0 times as long as wide; color very dark reddish brown.

Frons convex, a weak, transverse impression on lower half; surface shining, rather coarsely granulate-punctate from epistoma to vertex; vestiture of fine, rather abundant, moderately long hair.

Pronotum 1.25 times as long as wide; sides almost straight and parallel on basal two-thirds, anterolateral angles rather abrupt, rather broadly rounded in front; summit at

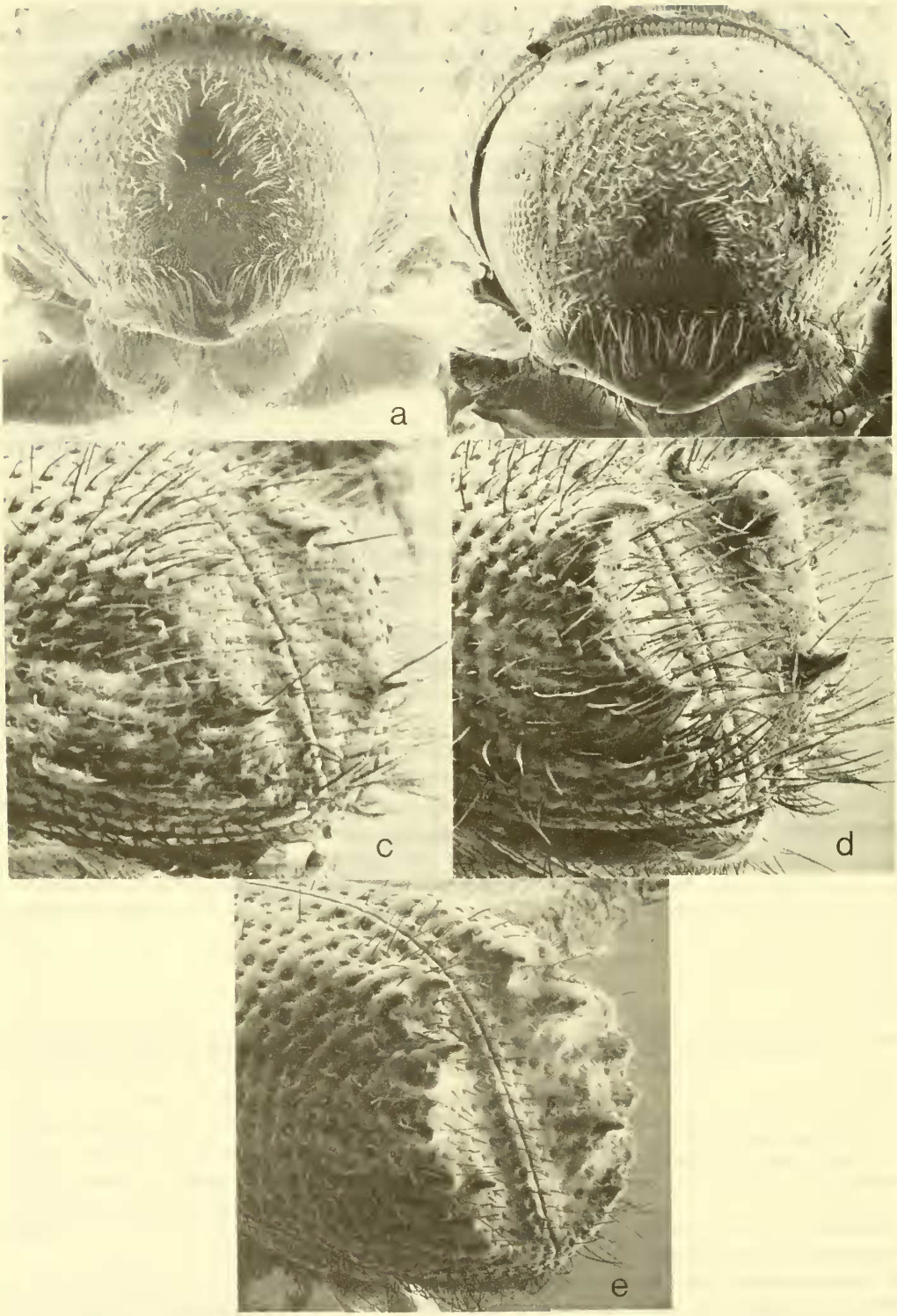



Fig. 158. Ipini spp., heads and elytral declivities: a, *Pityogenes carinulatus*, female; b, *Pityogenes knechteli*, female; c, *Pityokteines ornatus*, female, d, same, male; e, *Orthotomicus caelatus*, female. (After Bright 1976:146.)

middle; strongly declivous and rather coarsely asperate on anterior slope; posterior area smooth, shining, with obscure, minute points, punctures rather coarse, deep, moderately close. Vestiture of moderately abundant, fine, rather long hair.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal three-fourths, broadly rounded behind, with lower declivital spines interrupting outline; striae 1 moderately, others feebly impressed, punctures moderately large, deep, very close; interstriae as wide as striae, smooth, shining, with minute, obscure points, punctures uniseriate, moderately coarse, deep, widely spaced. Declivity abrupt, very steep, rather broadly, deeply excavated; interstriae 1 weakly elevated, finely, closely punctured, striae 1 deeply, coarsely punctured, lateral areas gradually, strongly elevated, with large, deep, confused punctures; a small denticle on interstriae 2 at base of declivity, spine 2 large, on an inflated, elevated, submammiform base, in line with interstriae 3, on upper third of declivity; elevated, rounded, lateral margin continued to spine 3 on lower third, spine 3 rather large, conical, slightly smaller than 2; subapical margin a rather weakly, subacutely elevated costa at apex of interstriae 1, two subtuberculate calluses on margin between costa and spine 3. Vestiture of moderately abundant, long strial and interstrial hair, longer at declivity.

FEMALE.— Similar to male except lateral margins of declivity much less strongly elevated, spines 2 and 3 little if any larger than 1; vestiture slightly shorter.

DISTRIBUTION.— S British Columbia and W South Dakota to California, Arizona, and Colorado.

CANADA: **British Columbia**: Merritt, Midday Valley, Summerland. USA: **Arizona**: Flagstaff, Kaibab N.F., Prescott, Walker, Williams. **California**: Bass Lake, Bear Lake, Burney, Carrville, Charlton, Chiquita Basin, Crystal Lake, Fallen Leaf Lake, Faunskin, Hackamore, Hat Creek, Idyllwild, Little Yosemite, Mather, Madrone, McCloud, Modoc N.F., Moffit Creek near Ft. Jones, Mt. Laguna, Northfork, Pinehurst, Placerville, San Jacinto Mts., Sugar Pine, Swayne, Tehachapi Mt. in Kern Co., Trinity Co., Tulare Co., Yosemite. **Colorado**: Bailey, Cascade, Colorado N.F., Colorado Springs, Fort Collins, Gunnison, Las Animas, Larkspur, San Isabel N.F., Uncompahgre N.F. **Idaho**: Centerville. **Montana**: Bighorn N.F., Pine Grove, Riggins. **New Mexico**: Albuquerque, Bandelier Mts., Capitan, Cloudcroft, Ft. Wingate, Lincoln N.F., Los Alamos, Sandia Mts. **Oregon**: Ashland, Ft. Rock, Keno, Klamath N.F., Klamath Falls, Ochoco N.F. **South Dakota**: Black Hills, Elmore, Hill City. **Utah**: Beaver, Bryce N.P., Elk Park in Ashley N.F., Pin Hollow in Fishlake N.F., Panguitch Lake, Long Hollow in Dixie N.F., Sanford Canyon in Dixie N.F., Parowan.

HOSTS.— *Pinus ponderosa*, less common in *P. attenuata*, *P. contorta*, *P. edulis*, *P. jeffreyi*, and *Picea pungens*.

BIOLOGY.— This species attacks the bole of dying, standing, cut, or fallen trees usually in association with *Ips* species well after the *Ips* are established. It infests the islands of phloem that remain. The gallery system may be entirely or partly in the phloem, or it may contact the cambium and be visible on peeled bark. Because the tunnels may be entirely concealed in peeled bark, it commonly is overlooked.

NOTES.— The above treatment was based on 234 specimens, several of which I had compared to Swaine's type series.

### 2. *Pityokteines minutus* (Swaine)

*Dryocoetes minutus* Swaine, 1912, Canadian Ent. 44:352 (Lectotype, female; Canadian Nat. Coll., 9370, designated by Bright, 1967, Canadian Ent. 99:674)

*Pityokteines minutus*: Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):124

*Pityokteines jasperi* Swaine, 1916, Canadian Ent. 48:181 (Lectotype, female; Jasper Park, Alberta; Canadian Nat. Coll., 9296, designated by Bright, 1967, Canadian Ent. 99:677); Wood, 1957, Canadian Ent. 89:401. *Synonymy*

DIAGNOSIS.— This species is distinguished from others in the genus by the more poorly developed declivital spines, by the slender body form, and by the host.

MALE.— Length 1.7–2.3 mm, 2.8 times as long as wide; color dark brown.

Frons and pronotum about as in *ornatus* (Swaine) except pronotum 1.20 times as long as wide.

Elytra as in female *ornatus* except striae 1 weakly, others not impressed, punctures smaller, more widely spaced, lateral margin of declivity on interstriae 6 and 7 with small, subtuberculate calluses, and denticles more sharply pointed.

FEMALE.— Similar to male except frons very weakly, broadly convex, minutely, densely punctured over entire area, granules absent, densely covered by very long hair,

anterior margin of pronotum ornamented by similar hair; elytral declivity somewhat similar but shallowly, narrowly excavated, lateral areas rounded, not elevated, denticles reduced to small granules, sometimes entirely absent; elytral vestiture slightly shorter.

DISTRIBUTION.— British Columbia and Alberta to Arizona and New Mexico.

CANADA: **Alberta**: Jasper Park, Tidler. **British Columbia**: Hope Trail (46 mile camp), Lorna, McGillivary. USA: **Arizona**: Grand Canyon N.P., Kaibab N.F., Pinaleno Mts. **Colorado**: Gould, Rabbit Ears Pass, Rico, Ridgeway, Wolf Creek Pass. **Montana**: Columbia Falls, Glacier N.P. **New Mexico**: Grants, Sandia Mts. **Oregon**: Crescent, Grant Co., Odel Lake. **Utah**: Hobble Creek in Utah Co., Horse Valley in Dixie N.F., Kamas, Logan Canyon, Logan Dry Canyon, Manti, Soapstone Creek in Wasatch N.F. **Washington**: Metaline Falls. **Wyoming**: Saratoga.

HOSTS.— *Abies lasiocarpa.*

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on 228 specimens, several of which were compared directly to the type series of *minutus* and *jasperi.*

### 3. *Pityokteines mystacinus* Wood

*Pityokteines mystacinus* Wood, 1975, Great Basin Nat. 35:29 (Holotype, female; Mount Rainier National Park, Washington; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *minutus* (Swaine) by the smaller size, by the very different ornamentation of hair on the female frons, by the finer pronotal and elytral punctures, and by other characters. It is probably much more closely related to *lasiocarpi* (Swaine).

FEMALE.— Length 1.7–2.1 mm, 3.0 times as long as wide; color brown.

Frons similar to *lasiocarpi* except more broadly convex, surface not as smooth, somewhat dull, punctures averaging smaller and, on lower third, becoming almost obsolete; vestiture on lower third abundant, rather long, epistomal brush very broad, rather dense; setae on upper half of frontal area sparse, short. Antennal club almost as in *lasiocarpi.*

Pronotum as in *lasiocarpi* except anterior margin more narrowly rounded; vestiture uniformly short as in *lasiocarpi.* Elytra as in *lasiocarpi* except punctures on disc slightly larger, very slightly more confused on basal half, and declivital striae 1 more strongly impressed, with punctures on striae 1 slightly larger, subapical transverse elevation at apex of sulcus more distinct (but still rather obscure); position, number, and size of tubercles as in *lasiocarpi.* Vestiture similar in abundance, but very slightly longer than in *lasiocarpi.*

MALE.— Similar to female except upper half of frons more strongly convex, vestiture on lower third greatly reduced in abundance and length; elytral declivity with sulcus slightly deeper (about as in male *lasiocarpi*) but narrower.

DISTRIBUTION.— Washington.

USA: **Washington**: Mt. Rainier N.P., 21-VIII-62, silver fir, D. E. Bright.

HOST.— *Abies amabilis.*

NOTES.— The above treatment was based on the type series of 5 specimens.

### 4. *Pityokteines lasiocarpi* (Swaine)

Fig. 160

*Orthotomicus lasiocarpi* Swaine, 1916, Canadian Ent. 48:183 (Lectotype, female; Rogers Pass, British Columbia; Canadian Nat. Coll., 9300, subsequent designation by Bright, 1967, Canadian Ent. 99:676)

*Orthotomides lasiocarpi*: Wood, 1951, J. Ent. Soc. Kansas 24:32.

*Pityokteines lasiocarpi*: Wood, 1975, Great Basin Nat. 35:21

DIAGNOSIS.— This species is rather easily distinguished from other *Pityokteines* species by characters of the antennal club, by the vestiture of the female, and by the much smaller declivital spines in the male.

MALE.— Length 1.6–1.9 mm, 2.8 times as long as wide; color dark brown.

Frons broadly convex; surface smooth, shining, with rather fine, close, deep punctures below, becoming larger and rather sparse toward vertex; vestiture of fine, rather sparse, short hair.

Pronotum 1.2 times as long as wide; widest behind middle, sides feebly arcuate, subparallel on posterior two-thirds, broadly rounded in front; summit very slightly in front of middle; anterior slope rather strongly declivous, moderately, closely asperate; posterior area smooth, shining, deeply, rather closely punctured. Vestiture of fine, inconspicuous hair.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal three-fourths, broadly

rounded behind; striae 1 feebly, others not impressed, punctures small, spaced within a row by about twice diameter of a puncture; interstriae three to four times as wide as striae, smooth, shining, punctures fine, uniseriate, spacing about equal to those of striae. Declivity rather steep, shallowly impressed; sutural interstriae rather weakly elevated, with a row of minute subgranulate punctures, shallowly impressed from position of striae 1, gradually ascending to position of striae 3, surface shining, sparse, minute punctures confused, no indication of rows; all margins rounded, armed by three pairs of small, pointed denticles. Vestiture of rows of short, erect strial hair, and rows of distinctly longer, fine, interstrial hair.

FEMALE.— Similar to male except elytral declivity less strongly, more narrowly impressed, lateral denticles minute.

DISTRIBUTION.— British Columbia and Alberta to Utah.

CANADA: **Alberta**: Banff, Blairmore, Edmonton. **British Columbia**: Kootenay Pass, Rogers Pass. USA: **Idaho**: Coeur d'Alene, Collens, Franklin Basin Road in Franklin Co. **Montana**: Glacier N.P. **Oregon**: Gold Lake in Willamette N.F. **Utah**: Brighton, Kamas, La Sal Mts., Logan Canyon, Logan Dry Canyon, Mt. Nebo. **Washington**: Mt. Rainier.

HOSTS.— *Abies amabilis*, *A. lasiocarpa*, *Picea engelmannii*, *Pseudotsuga menziesii*.

BIOLOGY.— This polygamous species breeds in the bole and large limbs of cut, fallen, or dying trees. The parental tunnels are in the cambium region and feebly scar the surface of the wood. They are of the radiate or star-shaped type. Larval mines are relatively short, and show on the phloem surface of peeled bark. It is not an aggressive species and rarely becomes abundant.

NOTES.— The above treatment was based on Swaine's type series and on 265 other specimens.

### 5. *Pityokteines elegans* Swaine
Fig. 160

*Pityokteines elegans* Swaine, 1916, Canadian Ent. 48:182 (Lectotype, female; Hood River, Oregon; Canadian Nat. Coll., 9297, designated by Bright, 1967, Canadian Ent. 99:677)

DIAGNOSIS.— This species is distinguished from *ornatus* (Swaine) by the sexually dimorphic frons, in the male virtually devoid of granules, by the more widely spaced strial punctures, by the smaller base of declivital spine 2, with well developed marginal tubercles between spines 2 and 3, and by the host.

MALE.— Length 1.9–2.6 mm, 2.6 times as long as wide; color dark brown.

Frons as in *ornatus* except almost entirely devoid of granules. Pronotum 1.13 times as long as wide; essentially as in *ornatus* except punctures immediately behind summit subgranulate to granulate; surface near lateral margins subreticulate.

Elytra 1.6 times as long as wide, 1.4 times as long as pronotum; as in *ornatus* except striae 1 weakly, others not impressed, punctures more widely spaced; declivital spine 2 with base only slightly inflated; lateral margin of declivity with rounded granules on interstriae 5 and 6 between spines 1 and 2; vestiture shorter, less abundant.

FEMALE.— Similar to male except frons feebly concave, densely, minutely punctured from epistoma to vertex, surface on lower half minutely subgranulate; frons covered by abundant, long, fine hair, similar hair on anterior margin of pronotum; elytral declivity as in female *ornatus*.

DISTRIBUTION.— British Columbia and N Idaho to California.

CANADA: **British Columbia**: Genoa Bay at Duncan, Qualicum. USA: **California**: El Dorado Co., Grassy Lake, Humboldt Co., Lake Tahoe, Lassen N.F., Lassen N.P., Madera Co., Mariposa Co., Modoc Co., Mt. Raymond Trail, Placer Co., Plumas Co., Sequoia N.F., Norval Flats in Lassen Co., Shasta Co., Trinity Co., Tulare Co., Tuolumne Co., Yosemite. **Idaho**: Deception Creek, Coeur d'Alene, Potlatch. **Oregon**: Ashland, Corvallis, Hood River, Pinehurst. **Washington**: Metaline Falls, Spokane.

HOSTS.— *Abies concolor*, *A. magnifica*, less common in other hosts, except apparently restricted to *Pseudotsuga menziesii* in northern Idaho.

BIOLOGY.— Evidently more common in dying, standing trees up to about 25 cm in diameter. Habits apparently are as described for the genus.

NOTES.— The above treatment was based on 132 specimens, several of which were compared to Swaine's type series by me.

### 6. *Pityokteines sparsus* (LeConte)

*Xyleborus sparsus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:160 (Holotype, female; Point Keweenaw

on Lake Superior, Michigan; Mus. Comp. Zool., 1002)

*Pityokteines sparsus*: Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):123

*Tomicus balsameus* LeConte, 1878, Proc. Amer. Philos. Soc. 17:625 (Lectotype, male; Central New York; Mus. Comp. Zool., present designation); Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):123. *Synonymy*

DIAGNOSIS.— This species is distinguished, with difficulty, from *elegans* Swaine by the slightly smaller, more widely spaced strial punctures, by the smooth, shining, nonreticulate lateral areas of the pronotum, and by the distribution.

MALE.— Length 1.6–2.1 mm, 2.5 times as long as wide; color dark brown.

Evidently identical to *elegans* except as noted in above diagnosis.

FEMALE.— Differing from female *elegans* as male and female of that species differ from one another.

DISTRIBUTION.— Alberta and Newfoundland to Wisconsin and West Virginia.

CANADA: **Alberta**: Lesser Slave Lake. **Manitoba**: Whiteshell Prov. Park. **New Brunswick**: Acadia Station, Bathurst, Fredericton, Hillsboro, McGraw Brook, Plaster Rock, Riley Brook. **Newfoundland**: Comerbrook, Pasadena. **Nova Scotia**: Kejimukuyik, Kemptown. **Ontario**: Algonquin N.P., Barrie, Boys, Calandar, Caramat, Cogama, Lanark, Matatchewan, Pass Lake, South March, Whitney. **Quebec**: Gaspé Co., Hudson, Kazabazua, Laniel, Montreal, Ste. Anne de Bellevue, Stoke. **Saskatchewan**: Prince Albert N.P. USA: **Maine**: Brunswick, Camp Caribou, Guilford, Monmouth. **Massachusetts**: Fitchburg. **Michigan**: Charlevoix, Grand Island, Harbor Spring, Ingleside, Mackinaw, Marquette, Point Keweenaw, Seney. **Minnesota**: Atkin, Ely Lake, Itaska Park, St. Louis Co. **New Hampshire**: Dartmouth, Gorham, Waterville, Went Loc. **New York**: Axton, Cranberry Lake, Elka Park, Saranac Inn. **Pennsylvania**: Tamarack. **West Virginia**: Kanawha Station. **Wisconsin**: Cedar Island, Clintonville.

HOST.— *Abies balsamea*.

BIOLOGY.— As in *elegans*.

NOTES.— The above treatment was based on the holotype of *sparsus*, on the type series of *balsameus*, and on 613 other specimens. Because a type has not been selected, I here designate the first male syntype in the LeConte series as lectotype of *balsameus* LeConte.

## GENUS *ORTHOTOMICUS* FERRARI

*Onthotomicus* Ferrari, 1867, Die Forst- und Baumsuchtschädlichen Borkenkäfer, p. 44 (Type-species: *Bostrichus laricis* Fabricius, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:126)

*Orthotomicus* Ferrari, 1869, Berliner Ent. Zeitschr. 12:256 (correlation of lapsus calami)

*Neotomicus* Fuchs, 1911, Morphologische Studien uber Borkenkäfer, 1. Die gattungen *Ips* DeGeer und *Pityogenes* Bedel, p. 33 (Type-species: *Bostrichus laricis* Fabricius, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:125); Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):121. *Synonymy*

DIAGNOSIS.— This genus is intermediate between *Pityokteines* Fuchs and *Ips* DeGeer. It shares with *Pityokteines* the obliquely truncate antennal club, the more abrupt, sexually dimorphic elytral declivity, with a more poorly developed apical margin. It differs from *Pityokteines* in having the apical margin of the elytral declivity transversely longer than the distance between the third pair of spines, with the lateral margin more strongly, more continuously elevated, and in having the frons sexually dimorphic. It differs from *Ips* by the structure of the antennal club, by the more striking sexually dimorphic elytral declivity, and by the third (lowest) pair of declivital spines being distinctly mesad of the lateral margin.

DESCRIPTION.— Length 2.4–3.3 mm, 2.5 times as long as wide; color very dark reddish brown.

Frons convex, granulate-punctate in both sexes; vestiture sparse, inconspicuous. Eye elongate-oval, shallowly emarginate. Antennal scape elongate; funicle 5-segmented; club obliquely truncate, two recurved sutures indicated on anterior face. Pronotum slightly longer than wide; summit indefinite, near middle; anterior area strongly declivous and asperate, posterior area punctate. Scutellum rather large, almost flat. Elytra striate; declivity abrupt, broadly excavated, lateral margins elevated, dentate, apical margin broadly, acutely elevated, forming a continuous costa as long transversely as width of entire excavated area, last (lowest) denticle placed mesad of lateral margin; declivity moderately sexually dimorphic. Tibiae as in *Ips*.

DISTRIBUTION.— Coniferous forests of northern North America, Europe and Asia; about a dozen species are known; one occurs in North America.

BIOLOGY.— The species are polygamous and phloeophagous. They construct modified

radiate parental gallery systems in the cambium of coniferous hosts. They attack the bole or large limbs of dying, standing, cut, or fallen trees. They are of secondary ecological importance.

NOTES.— This genus has been of doubtful validity since it was first proposed. It occupies an intermediate position between *Pityokteines*, from which it is doubtfully distinct, and *Ips*, with which it intergrades somewhat. It is recognized here because these three groups are about equally distinct from one another and, in my opinion, it is not in the interest of either taxonomy or forestry to group *Pityokteines* and *Ips* in the same genus. If they are not grouped, the only alternative appears to be to give equal status to *Orthotomicus*. The reduction of one or all these groups to subgeneric status only relegates the problem to a different level and solves nothing. Although most of the published discussion on this problem has involved the relationship of *Orthotomicus* and *Ips*, it is my opinion that *Orthotomicus* genetically and structurally is much more closely allied to *Pityokteines*.

### *Orthotomicus caelatus* (Eichhoff)

Fig. 158, 160

*Tomicus caelatus* Eichhoff, 1868, Berliner Ent. Zeitschr. 11:402 (Syntypes; Pennsylvania, Carolina; presumably lost in Hamburg Mus.)

*Tomicus decretus* Eichhoff, 1868, Berliner Ent. Zeitschr. 11:402 (Lectotype, female; New Orleans, Louisiana; Brussels Mus., present designation); LeConte, 1868, Trans. Amer. Ent. Soc. 2:177. *Synonymy*

*Xyleborus vicinus* LeConte, 1874, Trans. Amer. Ent. Soc. 5:72 (Holotype, female; British Columbia; Mus. Comp. Zool., 985); LeConte, 1876, Proc. Amer. Philos. Soc. 15:360 and Wood, 1973, Great Basin Nat. 33:179. *Synonymy*

*Xyleborus punctipennis* LeConte, 1878, Proc. Amer. Philos. Soc. 17:624 (Holotype, female; Marquette, Michigan; Mus. Comp. Zool., 1293); Wood, 1973, Great Basin Nat. 33:179. *Synonymy*

DIAGNOSIS.— This is the only American species of this genus.

MALE.— Length 2.4–3.3 mm, 2.5 times as long as wide; color very dark reddish brown.

Frons broadly convex, a slight transverse elevation near epistoma; surface granulate-punctate, at least part of surface above eyes usually reticulate.

Pronotum 1.16 times as long as wide; sides almost straight and parallel on more than basal half, rather broadly rounded in front; summit indefinite, slightly in front of middle; anterior slope rather coarsely asperate; posterior area shining, often subreticulate laterally, rather coarsely, deeply punctured, those near summit granulate to subasperate. Vestiture hairlike, inconspicuous.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal three-fourths, subtruncate behind with third pair of denticles interrupting outline; striae 1 distinctly, others feebly impressed, punctures moderately coarse, deep, close; interstriae as wide as striae, smooth, shining, punctures uniseriate, rather widely spaced. Declivity abrupt, very steep, broadly excavated; face of declivity deeply, broadly excavated, smooth, shining, punctures on striae 1 in an indistinct row, rather coarse, shallow, not clearly formed, punctures in lateral areas similar, confused; lateral margins rather strongly elevated from interstriae 2 at base to sutural apex; spine 1 at base on interstriae 2 moderately large, acutely pointed; spine 2 basally separate from 1, in line with interstriae 3, its base enlarged and united with a prominence in line with interstriae 4, spine 2 rather large, acutely pointed; margin at interstriae 5 and 6 armed by separate rounded nodules, nodule at 7 poorly formed; spine 3 at level of a point between interstriae 6 and 7, set well mesad of lateral margin, as large as spine 1; subapical margin formed by a subacutely elevated undulating costa from suture to a point between nodule of interstriae 7 and spine 3. Vestiture of rows of coarse interstrial hair, supplemented near base of declivity by shorter, strial hair.

FEMALE.— Similar to male except declivital excavation not as deep, lateral margins not as high, declivital spines distinctly smaller.

DISTRIBUTION.— Alaska and Nova Scotia to California and Florida.

ALASKA: Numerous localities. CANADA: Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland, Northwest Territories, Nova Scotia, Ontario, Prince Edward Island, Saskatchewan, Yukon. USA: Alabama, Arizona, Arkansas, California, Colorado, Connecticut, District of Columbia, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio,

Oregon, Pennsylvania, South Dakota, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, Wyoming.

HOSTS.— Probably any species of *Pinus*, *Picea*, or *Larix* within its range.

BIOLOGY.— This common species attacks stumps, boles, limbs, and branches of dying trees, slash, etc. It is more common in the lower bole in thick bark. It is of secondary importance and usually accompanies the attack of more aggressive species. The habits are as described for the genus; egg galleries are short.

NOTES.— The above treatment was based on the holotypes of *vicinus* and *punctipennis*, on Eichhoff specimens in the U.S. National Museum, possibly syntypes, of *caelatus*, on 3 syntypes of *decretus*, and on 1,209 other specimens. The first female syntype in the Chapuis series in the Brussels Museum is here designated as the lectotype for *decretus* Eichhoff.

## GENUS *ACANTHOTOMICUS* BLANDFORD

*Acanthotomicus* Blandford, 1894, Trans. Ent. Soc. London 1894:89 (Type-species: *Acanthotomicus spinosus* Blandford, monobasic)

*Mimips* Eggers, 1932, Rev. Zool. Bot. Afr. 22:33 (Type-species: *Ips pilosus* Eggers, original designation); Wood, 1972, Great Basin Nat. 32:191. *Synonymy*

DIAGNOSIS.— As in *Ips* DeGeer, this genus has the antennal club strongly flattened, the lateral margin of the elytral declivity acutely to subacutely elevated, with all denticles on its summit, and the acutely elevated, transverse, subapical lower margin of the declivity broad. From *Ips* it is distinguished by the very strongly procurved sutures of the antennal club, by the large, coarsely faceted eyes, by the much smaller average size, and by the hosts.

DESCRIPTION.— Length 1.6–2.7 mm, 2.5–2.6 times as long as wide; color yellowish brown to very dark reddish brown; vestiture hairlike.

Frons in American species dimorphic, convex or partly impressed in males, more broadly flattened to impressed and pubescent in females. Eye very large, coarsely faceted; shallowly emarginate. Antennal scape elongate; funicle 5-segmented; club moderately subcircular, large, strongly flattened, sutures (when visible) very strongly procurved. Pronotum slightly longer than wide; summit near middle; anterior slope moderately, closely asperate, rather strongly declivous, anterior margin armed or not; posterior area punctate. Scutellum rather large, flat. Elytra striate; declivity rather steep, broadly excavated, lateral margins elevated, dentate, subapical margin rather strongly elevated, broad, usually more strongly sculptured in males.

DISTRIBUTION.— Tropical areas of Central and South America, Africa, and the Indo-Malayan area to Australia; more than 30 species are known, of which 10 occur in Central and South America, 3 of them from Central America.

BIOLOGY.— These phloeophagous, predominantly polygamous species infest limbs and branches of cut or fallen trees. The parental galleries are of the radiate type with short egg galleries. Larval mines are in the phloem and may or may not show on peeled bark. Up to 11 females were associated with one male (*bidens* Wood), although the average number for that species was about 5; *ocularis* (Wood) apparently is monogamous.

NOTES.— Judging from recent additions to this genus and its discovery in tropical America, many more species remain to be described and much information on habits and behavior of named species must be gathered before a meaningful classification can be devised.

### Key to the Species of *Acanthotomicus*

1. Elytral declivity armed on upper two-thirds by at least three pairs of marginal denticles, ventrolateral margins encompassing an arc of less than one-third of a circle ..... 2

— Elytral declivity armed on upper third by one or two pairs of marginal denticles, combined ventrolateral margins encompassing an arc of more than half of a circle ..... 3

2(1). Smaller; male frons weakly impressed on lower half; anterior margin of pronotum finely serrate; pronotal disc partly reticulate; declivital setae on sutural interstriae stout, blunt; basal area of spine 2 on elytral declivity weakly developed; Veracruz and Jamaica to Venezuela; *Spondias mombin*; 1.6–2.0 mm ..... 1. ***mimicus*** **(Schedl)**

— Larger; male frons very strongly impressed on lower half; anterior margin of pronotum devoid of denticles; pronotal disc smooth, shining; declivital setae on sutural interstriae longer, slender, pointed; basal area of spine 2 on elytral declivity more strongly elevated; Venezuela; *Spondias mombin*; 1.9–2.4 mm ..... 2. ***analogus*** **(Wood)**

3(2). Lateral margins of elytral declivity armed by two pairs of spines; Costa Rica to Panama; *Spondias mombin*; 2.3–2.5 mm ..... 3. ***fortis*** **(Wood)**

— Lateral margins of elytral declivity armed by one pair of spines: Panama; 2.3–2.6 mm ..... 4. ***chiriquensis*** **(Blandford)**

### 1. *Acanthotomicus mimicus* (Schedl)

Fig. 159

*Mimips mimicus* Schedl, 1961, Pan Pacific Ent. 37:227 (Holotype, male; Turrialba, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished, with difficulty, from *analogus* (Wood) by the smaller size, by the weakly impressed lower frons of the male, by the finely serrate anterior margin of the pronotum, by the more poorly developed basal area of spine 2 on the elytral declivity, and by the shorter, stouter, blunt setae on the sutural interstriae of the declivity.

MALE.— Length 1.6–2.0 mm, 2.5 times as long as wide; color yellowish brown.

Frons convex, moderately, transversely impressed on slightly less than lower half, less strongly toward median line; surface mostly shining, rather coarsely punctured above, more finely and with sparse granules below; vestiture of rather sparse, coarse, long hair. Antennal club subcircular, with two rather strongly procurved sutures clearly marked by rows of setae, suture 1 not attaining middle of club.

Pronotum 1.1 times as long as wide; widest just behind middle, sides weakly arcuate, anterior margin broadly rounded; anterior margin armed by about 10 small serrations; summit not clearly defined; anterior slope moderately asperate; posterior area rather coarsely, not deeply punctured, shining except obscure reticulation toward summit on some specimens. Vestiture hairlike, confined to marginal areas.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal two-thirds, then convergently arcuate and truncate on slightly more than median half behind; striae not impressed, punctures moderately large, rather deep; interstriae as wide as striae, smooth, shining, punctures uniseriate, equal in size and appearance to those of striae but not quite as deep. Declivity steep, broadly excavated as in *Ips*; face of declivity broadly concave, punctures large, shallow, concave, sutural interstriae feebly elevated; lateral margins rather strongly elevated from interstriae 2 to sutural apex; interstriae 2 at base armed by a moderately large, pointed denticle, 3 armed by a slightly larger denticle; 4 and 5 armed by a rounded nodule, bases of denticle 2 on interstriae 3 and nodule on 4 connected, denticle 3 on margin at interstriae 6 as large as denticle 1; ventrolateral margin forming a continuous undulating costa from lateral margin at interstriae 7 to sutural apex. Vestiture of coarse, blunt, moderately short, interstrial setae, supplemented toward declivital base by shorter strial setae; sparse setae on declivital face short, blunt.

FEMALE.— Similar to male except frons more broadly convex, impression scarcely indicated, finely, densely punctured, devoid of granules, ornamented by abundant, fine, long hair; denticles and nodules on elytral declivity slightly smaller.

DISTRIBUTION.— Veracruz and Jamaica to Venezuela and Brazil.

MEXICO: Veracruz: Lago Catemaco, 1-3-V-69, D. E. Bright. COSTA RICA: Turrialba, Cartago, dry wood, F. Nevermann. PANAMA: Barro Colorado Island, Canal Zone, 27-XII-63, 70 m, No. 340, evidently *Spondias mombin*, S. L. Wood; Ft. Clayton, 22-XII-63, 35 m, No. 323, evidently *Spondias mombin*, S. L. Wood. OTHER COUNTRIES: 9 km S Barrancas, Barinas, Venezuela, 5-XI-69, 150 m, No. 115, *Spondias mombin*, S. L. Wood; 40 km E Cantón, Barinas, Venezuela, 8-III-70, 70 m, No. 394, *Spondias mombin*, S. L. Wood; Try., Good Hope, Jamaica, II-VIII-66, A. T. Howden.

HOST.— *Spondias mombin*.

BIOLOGY.— This species was taken from slash and from broken, fallen limbs and branches. The habits are essentially as described for the genus. About three to five females were associated with a male. Parental and larval mines penetrated the entire phloem tissue; they were not confined to the cambium region. When in competition with *analogus* for space in the same branches, this species restricted its activity to branches 2 to 3 cm in diameter. In the absence of competition in Panama, it attacked limbs up to 8 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 155 other specimens.

This species bears a very strong resemblance to *Ips* and, except for the antennal club, could very well be placed in that genus.

### 2. *Acanthotomicus analogus* (Wood)

*Mimips analogus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):40 (Holotype, male; 40 km E Cantón, Barinas, Venezuela; Wood Coll.)

Although this Venezuelan species has not been reported from Central America, it is mentioned here because its host does occur there and because it probably would be overlooked if special attention were not called to its very close resemblance to *mimicus* Schedl. Information that will permit identification of it is presented in the above key and in the treatment of *mimicus*. It attacks the broken limbs and branches of *Spondias mombin* larger than 3 cm in diameter.

### 3. *Acanthotomicus fortis* (Wood)

Fig. 159

*Mimips fortis* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):40 (Holotype, male; Finca Taboga, about 15 km SW Cañas, Guanacaste, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is easily recognized by characters summarized in the above key.

MALE.— Length 2.3–2.5 mm, 2.6 times as long as wide; color very dark brown.

Frons as in *analogus* except transverse impression much weaker; vestiture sparse, fine. Pronotum as in *analogus* except anterior margin indistinctly serrate, discal punctures slightly larger, not as close.

Elytra 1.5 times as long as wide; disc as in *analogus* but punctures very slightly smaller, deeper; strial and interstrial punctures equal in size. Declivity very steep, truncate, broadly concave; lower two-thirds margined by an

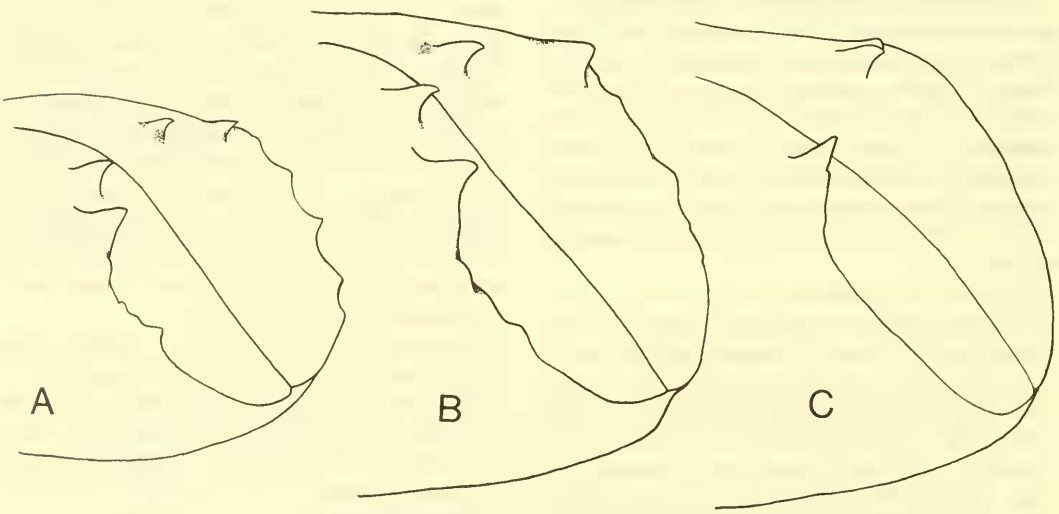



Fig. 159. *Acanthotomicus* spp., male elytral declivity: A, *mimicus*; B, *fortis*; C, *granulatus*. (After Wood 1971:39–41.)

elevated, subacute, continuous, slightly undulating ridge, upper third armed by two coarse teeth (directed caudad), one in line with interstriae 2, second in line with interstriae 4; face of declivity shining, with moderately abundant, large, shallow punctures. Vestiture of rather long, fine, interstrial hair, a few supplemental setae near declivity.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Finca Taboga, about 15 km SW Cañas, Guanacaste, 8-II-67, presumably *Spondias mombin*. PANAMA: Ft. Clayton, Canal Zone, 22-XII-63, 35 m, No. 340, presumably *Spondias mombin*, S. L. Wood.

HOST.— Presumably *Spondias mombin*.

BIOLOGY.— The one specimen from Panama was taken with a series of *mimicus* (Schedl) from a limb presumed to be *Spondias mombin*. The habits evidently are very similar to those of *mimicus*.

NOTES.— The above treatment was based on the type series of four male specimens.

### 4. *Acanthotomicus chiriquensis* (Blandford)

*Xylocleptes chiriquensis* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):189 (Lectotype, male; British Mus. Nat. Hist., present designation)

*Mimips chiriquensis*: Wood, 1966, Great Basin Nat. 26:24

DIAGNOSIS.— This species is distinguished from *granulatus* (Ferrari) by the smooth, shining posterior areas of the pronotum, by the smaller punctures on the elytral disc, by the larger, stouter, posteriorly directed spines that are in line with striae 2 at the basal margin of the declivity, by the three or four minute denticles on the lateral margin of the male declivity, and by the smaller declivital punctures.

MALE.— Length 2.3–2.6 mm, 2.7 times as long as wide; color reddish brown.

Frons and pronotum as in *fortis* (Wood) except anterior margin of pronotum more coarsely serrate, 1.1 times as long as wide, posterior area smooth, shining, punctures small, rather close, moderately deep.

Elytra 1.5 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on basal three-fourths, broadly rounded behind; striae not impressed, punctures very small, distinct; interstriae smooth, shining, 2 very shallowly impressed; interstriae slightly irregular, shining, at least six times as wide as striae, punctures almost uniseriate, as large as those of striae but less clearly formed. Declivity rather abrupt, steep, broadly, shallowly concave; declivital face smooth, shining, with small, confused, rather close punctures, suture distinctly elevated; lateral margin distinctly, subacutely elevated on a circular arc from sutural apex to striae 3 at base of declivity, a large, stout, pointed spine at declivital base on interstriae 2, about one and one-half times as long as its basal width, its apex directed toward elytral apex; central half of lateral margin bearing three widely spaced, pointed granules. Vestiture of coarse, moderately long, interstrial hair, similar setae on sutural interstriae of declivity.

FEMALE.— Similar to male except major spine at base of declivity about half as large; lateral margin of declivity less strongly elevated (frons partly concealed by pronotum, remainder covered by glue).

DISTRIBUTION.— Panama.

PANAMA: Volcán de Chiriquí, Chiriquí, 3–4,000 ft, G. C. Champion.

NOTES.— The above treatment was based on Blandford's three syntypes. The first syntype, a male, is here designated as the lectotype of *Xylocleptes chiriquensis* Blandford.

## GENUS *IPS* DEGEER

*Ips* DeGeer, 1775, Mémoires pour servir à l'histoire des insectes 5:190 (Type-species: *Tomicus typographus* = *Dermestes typographus* Linnaeus, subsequent designation by Bergroth, 1884, Berliner Ent. Zeitschr. 28:230)

*Cumatotomicus* Ferrari, 1867, Die Forst- und Baumzuchtschädlichen Borkenkäfer, p. 44 (Type-species: *Bostrichus stenographus* Duftschmidt = *B. sexdentatus* Boerner, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:119); Hagedorn, 1910, Coleopterorum Catalogus 4:47. *Synonymy*

*Cyrtotomicus* Ferrari, 1867, Die Forst- und Baumzuchtschädlichen Borkenkäfer, p. 44 (Type-species: *Ips acuminatus* Gyllenhal, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:120); Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége, ser. 2, 8:254. *Synonymy*

DIAGNOSIS.— This genus is distinguished from *Orthotomicus* Ferrari, as indicated in the diagnosis of that genus, and from *Acanthotomicus* Blandford by the strongly flattened antennal club, with sutures strongly to moderately bisinuate (except in *concinnus* and *mexicanus*), by the smaller, finely granulate eye, by the larger average size, and by the coniferous hosts.

DESCRIPTION.— Length 2.1–6.9 mm, 2.4–2.8 times as long as wide; color yellowish brown to almost black, vestiture hairlike.

Frons simple to strongly, sexually dimorphic. Eye finely faceted; small, shallowly emarginate, its width much less than length of scape, its length much less than twice length of scape. Antennal scape elongate; funicle 5-segmented; club subcircular to oval, strongly flattened, two sutures on anterior face weakly bisinuate to strongly angulate. Pronotum about equal in length and width; summit near middle, not strongly developed; anterior slope strongly declivous, coarsely asperate, anterior margin not serrate; posterior area punctate. Scutellum rather large, flat. Elytra striate, declivity concavely excavated, lateral margins dentate, all teeth on summit, transverse length of ventrolateral subapical margin as wide as declivital excavation, strongly elevated. Tibiae as in other Ipini.

DISTRIBUTION.— Coniferous forests of North America south to northern Nicaragua, Europe and Asia south to North Africa, India, and Australia; more than 60 species have been assigned to the genus; of these 25 occur in North America.

BIOLOGY.— All American species attack coniferous trees of the genera *Pinus* and *Picea*. Although most of them breed in slash, broken, fallen, or dying trees, some species under favorable conditions are capable of making successful primary attacks on healthy trees. They are polygamous and phloeophagous; the elongate egg galleries are in the cambium; eggs are deposited in individual niches (two exceptions). Larval mines are short to very long, straight to irregular, and always visible on peeled bark. From one to several generations per year may be produced.

NOTES.— This genus intergrades with *Orthotomicus* and with *Acanthotomicus*. For the most part these groups are distinct and easily characterized. Exceptions occur with *latidens* (LeConte) and *spinifer* (Eichhoff), from North America, and *erosus* Wollaston, from Europe, which form a compact group having the general features of *Orthotomicus*, but the antennal club and the position of teeth on the elytral declivity place them in *Ips*. To make these genera definable, they are placed in *Ips*. The species *concinnus* (Mannerheim) and *mexicanus* (Hopkins) are very closely related to one another, but they are intermediate in characters between *Ips*, *Acanthotomicus* and, perhaps, *Orthotomicus*. The antennal club is much as in some *Acanthotomicus*, the elytral declivity is somewhat like *Orthotomicus*, and the size, eye, hosts, frons, and other minor characters are as in *Ips*. Three possible solutions might be used to settle this problem: (1) accept an unsatisfactory grouping with the intermediate species grouped in definable, established genera; (2) group all these genera into one large genus, thus relegating the problem from the suprageneric level to the infrageneric level and, in my opinion, thereby magnify the problem that should be overcome; or (3) describe each of the intermediate groups as undefinable taxa that are even more difficult to recognize than those now available. As unsatisfactory as it is, the first alternative is followed below.

Since it often is desirable to divide a well-known, economically important group into species groups, the following are suggested: *concinnus* group (*concinnus* and *mexicanus*), *latidens* group (*latidens* and *spinifer*), *perturbatus* group (*perturbatus*, *perroti*, *woodi*, and *hunteri*), *tridens* group (*tridens*, *pilifrons*, and *borealis*), *pini* group (*pini*, *avulsus*, and *bonanseai*), *plastographus* group (*plastographus* and *integer*), *emarginatus* group (*emarginatus* and *knausi*), *calligraphus* group (*calligraphus*), and *grandicollis* group (*grandicollis*, *lecontei*, *montanus*, *paraconfusus*, *confusus*, and *hoppingi*).

Of these nine species groups, that portion of the Palaearctic fauna known to me does not include representatives of the *concinnus*, *tridens*, or *grandicollis* groups. The Eurasian fauna includes representative of the *latidens* (*erosus* Wollaston), *perturbatus* (*amitinus* Eichhoff, *cembrae* Heer, *duplicatus* Sahlberg, *fallax* Eggers, *subelongatus* Molschulsky), *pini* (*mannsfeldi* Wachl), *plastographus* (*hauseri* Reitter, *longifolia* Stebbing, *nitidus* Eggers, *stebbingi* Strohmeyer, *typographus* Linnaeus), *emarginatus* (*acuminatus* Gyllenhal), and *calligraphus* (*sexdentatus* Boerner) groups. There are no Eurasian species groups of *Ips* known to me that are not represented in North America. The much greater diversity of the Nearctic fauna, coupled with the complete absence of unique Eurasian species groups, suggests an American origin of *Ips*.

Key to the Species of *Ips*

1. Elytral declivity steep, rather short, distance from anterior margin of elytra at scutellum to base of declivity on interstriae 1 much greater (more than 1.25 times) than distance from base of declivity to sutural apex of declivity; ventrolateral subapical margins of elytral declivity moderately produced, transversely much wider, circumscribing at least one-third of a circle, its lateral extremity ending near third (last and largest) denticle; antennal club with sutures 1 and 2 feebly or very strongly, broadly procurved ..... 2

— Elytral declivity more gradual, distance from anterior margin of elytra at scutellum to base of declivity on interstriae 1 about equal to or less than distance from base of declivity to sutural apex of declivity; ventrolateral margin of elytral declivity very strongly produced, narrower, circumscribing an arc much less than one-third of a circle, its lateral extremities ending remote from largest denticle (normally denticle 3), one or more additional denticles usually occurring between this point and denticle 3 (except *emarginatus*); sutures 1 and 2 of antennal club weakly bisinuate to strongly angulate ..... 5

2(1). Larger; sutures on antennal club very strongly procurved; strial and interstrial punctures subequal in size, not always in clearly definable rows; spine 3 on declivity subcapitate, a distinct constriction before its apex; *concinnus* group ..... 3

— Smaller; sutures on antennal club weakly procurved, almost straight; strial punctures at least twice as large as those of interstriae, in clearly defined rows; spine 3 on declivity cylindrical or conical, not constricted before its apex; *latidens* group ..... 4

3(2). Punctures on posterior third of pronotum fine, close, those behind summit often finely granulate or connected by longitudinally strigose lines; pronotal vestiture more abundant, coarser; Alaska to N California; *Picea sitchensis*; 3.5–4.6 mm ..... 1. ***concinnus*** **(Mannerheim)**

— Punctures on posterior third of pronotum moderately coarse, usually not at all granulate or strigose; pronotal vestiture finer, apparently less abundant; Alaska and Alberta to Guatemala; *Pinus*; 3.6–5.0 mm ..... 2. ***mexicanus*** **(Hopkins)**

4(2). Frons granulate-punctate, granules small, inconspicuous; antennal club slightly larger, scape length about 1.2 times width of club; spine 3 on elytral declivity smaller, tapered from its base, usually not larger than 2, pointed; British Columbia and Quebec to California, Chihuahua, and West Virginia; *Pinus*; 2.3–3.6 mm ..... 3. ***latidens*** **(LeConte)**

— Frons granulate-punctate, a pair of large granules near center; antennal club slightly smaller, scape length about 1.3 times width of club; spine 3 much larger than 2, not tapered on its basal two-thirds, usually blunt; California; *Pinus sabiniana*; 2.6–3.4 mm ..... 4. ***spinifer*** **(Eichhoff)**

5(1). Lateral margins of elytral declivity armed by four pairs of spinelike denticles (spine 3 in *emarginatus* group bifid); antennal club with sutures feebly to strongly bisinuate (angulate in *integer* group); frons with or without a prominent median tubercle, devoid of foveate impression ..... 6

— Lateral margins of declivity armed by five or six pairs of spines; antennal club with sutures strongly angulate; frons with a conspicuous median denticle (absent in some females) and, in most species, a subfoveate impression (impression always present when denticle absent) ..... 27

6(5). Smaller species; spine 3 on elytral declivity somewhat cylindrical, constricted or not ..... 7

— Larger species; spine 3 on elytral declivity very large, strongly flattened and conspicuously emarginate at its tip (in some female *knausi* it may appear as two small denticles); *emarginatus* group ..... 26

7(6). Discal interstriae irregularly, uniseriately punctured (*perturbatus* almost impunctate); spine 3 on male elytral declivity subcapitate, usually sharply pointed at its apex and directed caudodorsad; frons sexually dimorphic or not; hosts *Picea* (except *woodi* and *perroti* in *Pinus*) ..... 8

— Discal interstriae impunctate except near declivity in some species; spine 3 on male declivity usually blunt, its apex slightly bent and directed somewhat caudoventrad; frons feebly if at all dimorphic; hosts *Pinus* ..... 21

8(7). Frons similar in both sexes, broadly, almost uniformly convex, granulate-punctate, not unusually pubescent in female; *perturbatus* group ..... 9

— Frons slightly to profoundly dimorphic, broadly convex and granulate-punctate in males, slightly to profoundly protuberant in females; *tridens* group ..... 12

9(8). Discal interstriae impunctate except near declivity; discal interstriae two to three times as wide as striae; strial punctures small, not noticeably reduced near declivity; punctures on pronotal disc small, shallow; Alaska and New Brunswick to Montana and Michigan; *Picea*; 4.0–4.7 mm ..... 5. ***perturbatus*** **(Eichhoff)**

— Discal interstriae at least sparsely punctured; discal interstriae distinctly less than twice as wide as striae; strial punctures near declivity about half as large as on disc ..... 10

10(9). Smaller; slender, 2.7 times as long as wide; antennal club more slender, sutures almost straight; Alberta and New Brunswick to Minnesota and Michigan; *Pinus*; 2.7–3.5 mm ..... 6. ***perroti*** **Swaine**

— Larger, stouter, 2.4–2.5 times as long as wide; antennal club wider, its sutures rather strongly bisinuate ..... 11

11(10). Strial punctures coarse, deep, interstrial punctures at least half as large as those of striae; interstriae only slightly wider than striae; pronotal punctures rather coarse, deep; Alberta to Nevada and New Mexico; *Pinus flexilis*, *P. strobiformis*; 3.5–4.7 mm ..... 7. ***woodi*** **Thatcher**

— Strial punctures moderately fine, interstrial punctures fine, less than half as large as those of striae; interstriae almost twice as wide as striae; pronotal punctures rather fine; Utah, Colorado, and Arizona; *Picea pungens*; 3.3–4.0 mm ..... 8. ***hunteri*** **Swaine**

12(8). Smaller, 2.6–3.8 mm; surface of female frons above eyes smooth, even, punctures minute, lower frons weakly, rather broadly protuberant, its surface with small granules, sparse or absent (*borealis* Swaine) ..... 13

— Larger, 3.3–5.0 mm; surface of female frons above eyes smooth; rather irregular, punctures moderately coarse, poorly defined, lower frons weakly to profoundly protuberant, part or all its surface usually rather coarsely granulate .... 16

13(12). Female frons weakly protuberant on lower half, surface, at least at sides below and entire area above eyes, with very minute, almost obsolete punctures, granules minute or obsolete; epistoma without conspicuous granules ..... 14

— Female frons almost evenly, broadly convex, sparsely pubescent over entire area below upper level of eyes, punctures small, distinct from epistoma to vertex; epistoma with a transverse row of granules ..... 15

14(13). Female frons entirely glabrous, rather weakly inflated below, entire surface smooth, with sparse, minute punctures, entirely devoid of granules; Alaska and Montana to Newfoundland and Maine; *Picea glauca*; 3.0–3.7 mm ..... 9. ***borealis borealis*** **Swaine**

— Female lower frons feebly to moderately inflated (variable), moderately to densely pubescent on median half below upper level of eyes, punctate area mostly very finely granulate; S British Columbia; *Picea glauca, P. engelmannii*; 2.6–3.4 mm ..... 10. ***borealis swainei*** **R. Hopping**

15(13). Female frontal pubescence rather short, very fine, lower frons not inflated, granules very small; SE Wyoming (?) and W South Dakota to Colorado; *Picea glauca*; 3.0–3.8 mm ..... 11. ***borealis lanieri*** **Wood**

— Female frontal pubescence longer, coarser, lower frons feebly inflated, granules distinctly larger; Nova Scotia; *Picea glauca*; 3.2–3.6 mm ..... 12. ***borealis thomasi*** **G. Hopping**

16(12). Average size smaller, 3.3–4.3 mm; strial punctures smaller, not as deep, interstriae at least twice as wide as striae; Alaska to California and W Montana; *tridens* (Mannerheim) ..... 17

— Average size larger, 4.4–5.0 mm; strial punctures coarse, deep, interstriae very slightly wider than striae; S Idaho and Montana to Arizona and New Mexico; *pilifrons* Swaine ..... 18

17(16). Female frons feebly if at all elevated, granulate, sparsely pubescent; Alaska to California; *Picea sitchensis*; 3.8–4.3 mm ..... 13. ***tridens tridens*** **(Mannerheim)**

— Female frons moderately to profoundly protuberant from epistoma to upper level of eyes, granulate or not, glabrous to densely pilose; Alaska and Northwest Territories to California and Wyoming; *Picea engelmannii, P. glauca*; 3.3–4.3 mm ..... 14. ***tridens engelmanni*** **Swaine**

18(16). Female frons weakly if at all protuberant on lower half, granulation similar to male, vestiture sparse, partly or entirely fine and long; Wyoming and Utah to Colorado and Arizona; *Picea engelmannii, P. pungens*; 4.4–5.0 mm ..... 17. ***pilifrons utahensis*** **Wood**

— Female frons moderately to very strongly protuberant below upper level of eyes, glabrous or vestiture of minute pile, granulation very different from male ..... 19

19(18). Female frons strongly protuberant but elevated area strongly sulcate on median line, sides of sulcus glabrous to densely pilose; S Colorado to New Mexico; *Picea pungens, P. engelmannii*; 4.4–5.0 mm ..... 16. ***pilifrons sulcifrons*** **Wood**

— Female frons moderately protuberant, without a deep median sulcus, pile, when present, more broadly distributed ..... 20

20(19). Female frontal protuberance occupying lower 80 percent (maximum development) of distance from epistoma to upper level of eyes, pilose area confined to median 50 percent of distance between eyes, lateral areas more sparsely, finely granulate; Mt. Wheeler, Nevada; *Picea engelmannii*; 3.9–4.9 mm ..... 18. ***pilifrons thatcheri*** **Wood**

— Female frontal protuberance occupying 115 percent (maximum development) of distance from epistoma to upper level of eyes, pilose area confined to median 80 percent of distance between eyes, lateral areas more coarsely, closely granulate; north central Colorado to SW Wyoming; *Picea engelmannii*; 4.0–5.0 mm ..... 15. ***pilifrons pilifrons*** **Swaine**

21(7). Sutures 1 and 2 on antennal club broadly bisinuate; lower frons regularly granulate, without a median tubercle, fovea, or carina; smaller, 2.1–4.3 mm; *pini* group ..... 22

— Sutures 1 and 2 on antennal club strongly bisinuate, acutely angulate at middle; lower frons with a median tubercle, carina, or fovea; larger, 4.2–5.4 mm; *plastographus* group ..... 24

22(21). Interstriae little if any wider than striae; ventrolateral margin of elytral declivity moderately, subacutely extended; declivital spines forming short, blunt cones, spine 3 not capitate in male; Wisconsin and New Jersey to E Texas and Florida; *Pinus*; 2.1–2.8 mm ..... 19. ***avulsus*** **(Eichhoff)**

— Interstriae at least one and one-half times as wide as striae; ventrolateral subapical margin of declivity very strongly, acutely extended; declivital margin usually higher, more acutely pointed, spine 3 capitate in male ..... 23

23(22). Major median frontal tubercle connected by a carina to epistomal tubercle; pronotal disc usually more uniformly punctured, punctures in posterolateral areas little if any larger than those behind summit; punctures on pronotal disc usually less than one-third as large as strial punctures; S Arizona to Honduras; *Pinus*; 2.9–3.4 mm ..... 20. ***bonanseai*** **(Hopkins)**

— Frons without a major median tubercle or elevation; pronotal punctures behind summit less dense and much smaller than those in posterolateral areas, largest punctures at least two-thirds as large as those of striae; Alaska and Newfoundland to Chihuahua and North Carolina; *Pinus*; 3.3–4.3 mm ..... 21. ***pini*** **(Say)**

24(21). Median epistomal and frontal tubercles usually connected by a continuous carinate elevation; strial punctures at middle of disc often subquadrate or wider than long; interstriae 3–5 rarely with punctures near declivity, those present uniseriate; British Columbia and South Dakota to Guatemala; *Pinus*; 4.6–5.7 mm ..... 22. ***integer*** **(Eichhoff)**

— Median epistomal (if present) and frontal tubercles rarely connected by a carina; strial punctures usually smaller, circular; interstriae 3–5 commonly punctured on posterior third of disc, those present usually confused; smaller ..... 25

25(24). Median frontal tubercle moderately developed; striations on female stridulatory organ (pars stridens) on vertex more closely spaced; struts on male aedeagus proportionately longer; British Columbia and Wyoming to central California; *Pinus contorta*; 4.0–5.2 mm ..... 23. ***plastographus plastographus*** **(LeConte)**

— Median frontal tubercle rather poorly developed; striations on pars stridens more widely spaced; struts on male aedeagus proportionately shorter; Oregon and California coasts; *Pinus radiata, P. murricata, P. contorta*, 4.0–5.1 mm ..... 24. ***plastographus maritimus*** **Lanier**

26(6). Interstrial punctures absent; declivital spine 4 absent (rarely present in female); British Columbia and E Montana to Baja California; *Pinus*; 5.5–6.9 mm ..... 25. ***emarginatus*** **(LeConte)**

— Interstrial punctures present; declivital spine 4 present; S Nevada and E South Dakota to Arizona and New Mexico; *Pinus ponderosa*; 4.9–6.4 mm ..... 26. ***knausi*** **Swaine**

27(5). Subapical margin of elytral declivity transversely short, equal to about two-fifths distance between largest (third) spines; lateral margins armed by six pairs of spines; California and Quebec to Jamaica and Honduras; *Pinus*; 3.8–5.9 mm ..... 27. ***calligraphus*** **(Germar)**

— Subapical margin of elytral declivity longer, equal to three-fourths distance between largest (third) spines; lateral margins armed by five pairs of spines ..... 28

28(27). Distance from spine 2 to spine 1 on elytral declivity conspicuously greater than from spine 1 to suture ..... 29

— Distance from spine 2 to spine 1 equal to or less than from spine 1 to suture ..... 30

29(28). Male frons armed by one median tubercle placed well above epistoma; Manitoba and Quebec to Florida and Honduras; *Pinus*; 2.9–4.6 mm ..... 28. ***grandicollis*** **(Eichhoff)**

— Male epistoma armed at median line by a pair (transverse) of tubercles; Arizona and New Mexico to Honduras; *Pinus*; 4.0–4.7 mm ..... 29. ***lecontei*** **Swaine**

30(28). Frontal fovea poorly developed in both sexes; upper margin of enlarged median tubercle on male frons comparatively remote from epistoma, attaining upper level of eyes; frontal vestiture usually not as long or as abundant; British Columbia and W Montana to California; *Pinus monticola*; 4.6–5.4 mm ..... 30. ***montanus*** **(Eichhoff)**

— Frontal fovea usually deeply impressed in both sexes; enlarged median tubercle on male frons almost on epistoma, remote from upper level of eyes; frontal vestiture usually more abundant, longer; smaller than 4.3 mm ..... 31

31(30). Frons almost always with a few small, often obscure punctures in central area among granules; major tubercle on male frons usually larger, more broadly rounded; punctures on elytral declivity smaller, more widely spaced; S Oregon to California and W Nevada; *Pinus ponderosa*; 3.8–4.3 mm ..... 31. ***paraconfusus*** **Lanier**

— Frons almost always entirely devoid of punctures; major tubercle on male frons usually smaller, more acutely pointed; punctures on declivity slightly larger, their abundance greater and spacing closer; S California and Colorado to Baja California and W Texas; pinyon pines; 3.5–4.2 mm ..... 32. ***confusus*** **(LeConte)** and 33. ***hoppingi*** **Lanier**

### 1. *Ips concinnus* (Mannerheim)

*Bostrichus concinnus* Mannerheim, 1852, Moskov. Obshch. Isp. Prirody, Otd. Biol. Biul. (Bull. Soc. Imp. Nat. Moscou) 25:358 (reprint p. 76) (Lectotype, sex?; Sitka Island, Alaska; Univ. Zool. Mus. Helsinki, present designation)

*Tomicus hirsutus* Eichhoff, 1868, Berliner Ent. Zeitschr. 11:402 (Syntypes?; Sitka, Alaska; presumably lost with Hamburg Mus.); Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:233. *Synonymy*

*Ips chamberlini* Swaine, 1925, Canadian Ent. 57:196 (Holotype, female?: Astoria, Oregon; Canadian Nat. Coll., 1376); Wood, 1957, Canadian Ent. 89:397. *Synonymy*

DIAGNOSIS.— This species is distinguished from the closely allied *mexicanus* (Hopkins) by the finer, closer punctures on the pronotum, with those behind the summit often finely granulate or connected by longitudinal strigose lines, by the slightly more abundant pronotal vestiture, and by the host.

MALE.— Length 3.5–4.6 mm, 2.5 times as long as wide; color dark reddish brown.

Frons broadly convex, a large, somewhat subfoveate, median impression just below upper level of eyes; epistomal margin rather shallowly emarginate, a slight impression in lateral area above epistoma; surface shining, closely, rather coarsely granulate, granules gradually replaced above eyes by punctures; median area between fovea and epistoma occupied by a large, blunt tubercle; vestiture sparse, inconspicuous. Antennal club with sutures poorly formed, strongly procurved, suture 1 reaching middle.

Pronotum 1.03 times as long as wide; widest at base, sides feebly arcuate, converging very slightly on basal half, broadly rounded in front; summit at middle; anterior slope rather finely asperate; posterior area shining, finely, deeply, rather closely punctured, a few punctures behind summit subasperate. Vestiture of fine, long, rather abundant hair.

Elytra 1.5 times as long as wide; sides almost straight and parallel on basal three-fourths, narrowed slightly before broadly truncate apex; striae not impressed; strial and interstrial punctures of equal size and appearance, small deep, confused or (sometimes) strial punctures in indistinct rows. Declivity steep, deeply, broadly excavated; surface of concavity shining, punctures small, confused, rather close; lateral margins armed by three pairs of spines; spine 1 rather small, acutely pointed, in line with striae 2; spine 2 larger, acute, in line with striae 3, its elevated basal area extending as a crest two-thirds distance to spine 3; spine 3 much larger, cylindrical, subcapitate, evidently in line with striae 6; posterolateral subapical margin strongly, acutely elevated from suture to just below and equal to lateral margin of spine 3. Vestiture of rather abundant, fine, long hair.

FEMALE.— Similar to male except major, median, frontal tubercle greatly reduced or absent; declivital spines 1 and 2 very slightly smaller, 3 distinctly smaller and usually not subcapitate.

DISTRIBUTION.— Coastal margin of Alaska to N California.

ALASKA: Edna Bay on Kosciusko Isl., Hollis, Hower, Juneau, Seagull Creek, Seward. CANADA: **British Columbia**: Massett on Queen Charlotte Isl., Stanley Park. USA: **California**: Crescent City. **Oregon**: Astoria (probably accidental), Currie Co., Florence, Mary's Peak (in flight), Newport, Otis, Seaside. **Washington**: Hoquiam.

HOST.— *Picea sitchensis.*

BIOLOGY.— The bole of cut or fallen trees is selected for attack. The parental galleries are constructed mostly in the phloem, scoring the wood very lightly. The three to five egg tunnels associated with each male are strongly curved. The egg niches are very large and each may contain about three to six (usually four) eggs. The larval mines radiate from the parental galleries on a somewhat long, irregular course. Pupation occurs in the bark. Young adults may feed for an extended period before emerging from the brood host.

NOTES.— Of the five specimens of this species in the Mannerheim collection, only the two collected by Frankenhaeuser are eligible for consideration as syntypes. Of these one has been labeled *Bostrichus concinnus* sp. n. by Mannerheim and has subsequently had a red type label attached to its pin. I designate this specimen as the lectotype of *B. concinnus* Mannerheim. In addition to the Mannerheim series, the holotype of *chamberlini* and 206 other specimens were examined. Authentic specimens of *hirsutus* have not been located; I see no reason to question the synonymy proposed for this name by Eichhoff, because *mexicanus* is not known to occur as far north as the type locality of *hirsutus* and the description eliminates the possibility of confusing it with any other species.

The type series of *chamberlini* was taken at Astoria, Oregon, from Douglas fir. This inland record from an abnormal host suggests that infested logs of Sitka spruce might have been transported to Astoria, where specimens emerged and, under stress, entered the abnormal host. Both the locality and the host are abnormal for this species.

### 2. *Ips mexicanus* (Hopkins)

Fig. 160

*Tomicus mexicanus* Hopkins, 1905, preprint of Proc. Ent. Soc. Washington 7:75 (Lectotype, female; Mexico City, Mexico; U.S. Nat. Mus., 7513, present designation)

*Ips radiatae* Hopkins, 1915, Proc. Ent. Soc. Washington 17:54 (Holotype, female?; Berkeley, California; U.S. Nat. Mus., 7461); Hopping, 1963, Canadian Ent. 95:1094. *Synonymy*

DIAGNOSIS.— This species is distinguished from the closely allied *concinnus* (Mannerheim) by the more coarsely punctured pronotal disc, the punctures usually not at all granulate, by the slightly less abundant pronotal hair, and by the host.

MALE.— Length 3.6–5.0 mm, 2.5 times as long as wide; color dark reddish brown.

Frons as in *concinnus* except tubercles arming epistomal process much coarser and central fovea averaging deeper. Pronotum as in *concinnus* except punctures in posterior area distinctly larger, not as dense, those behind summit not granulate; vestiture slightly less abundant. Elytra as in *concinnus* except punctures averaging slightly larger.

FEMALE.— Similar to male except differing as in *concinnus.*

DISTRIBUTION.— Alaska and Alberta to Guatemala.

ALASKA: Douglas Island, Juneau. CANADA: **Alberta**: Cameron Lake. **British Columbia**: Aspen Grove, Field, Hope Mts., Kane Valley, Nahun, Pender Harbor. USA: **Arizona**: Williams. **California**: Alameda Co., Berkeley,

Contra Costa Co., Del Monte, Del Norte Co., El Dorado Co., Gasquette R.S., Inverness, Lake Eiler in Lassen N.F., Lake Valley, Los Angeles, Meyers, Monterey, Oakland, Pacific Grove, Palo Alto, Placerville, San Bernardino Co., San Francisco, Santa Barbara Co., Santa Clara Co., Santa Cruz Co., Trinity Co., Tulare Co., Yosemite. **Colorado**: Gould, Hahn's Peak, Littleton, Poudre Canyon in Larimer Co. **Idaho**: Coeur d'Alene, Krassel, Payette, Priest River, Utah Co. **Montana**: Bozeman, Columbia Falls, Glacier N.P., Sula. **Oregon**:

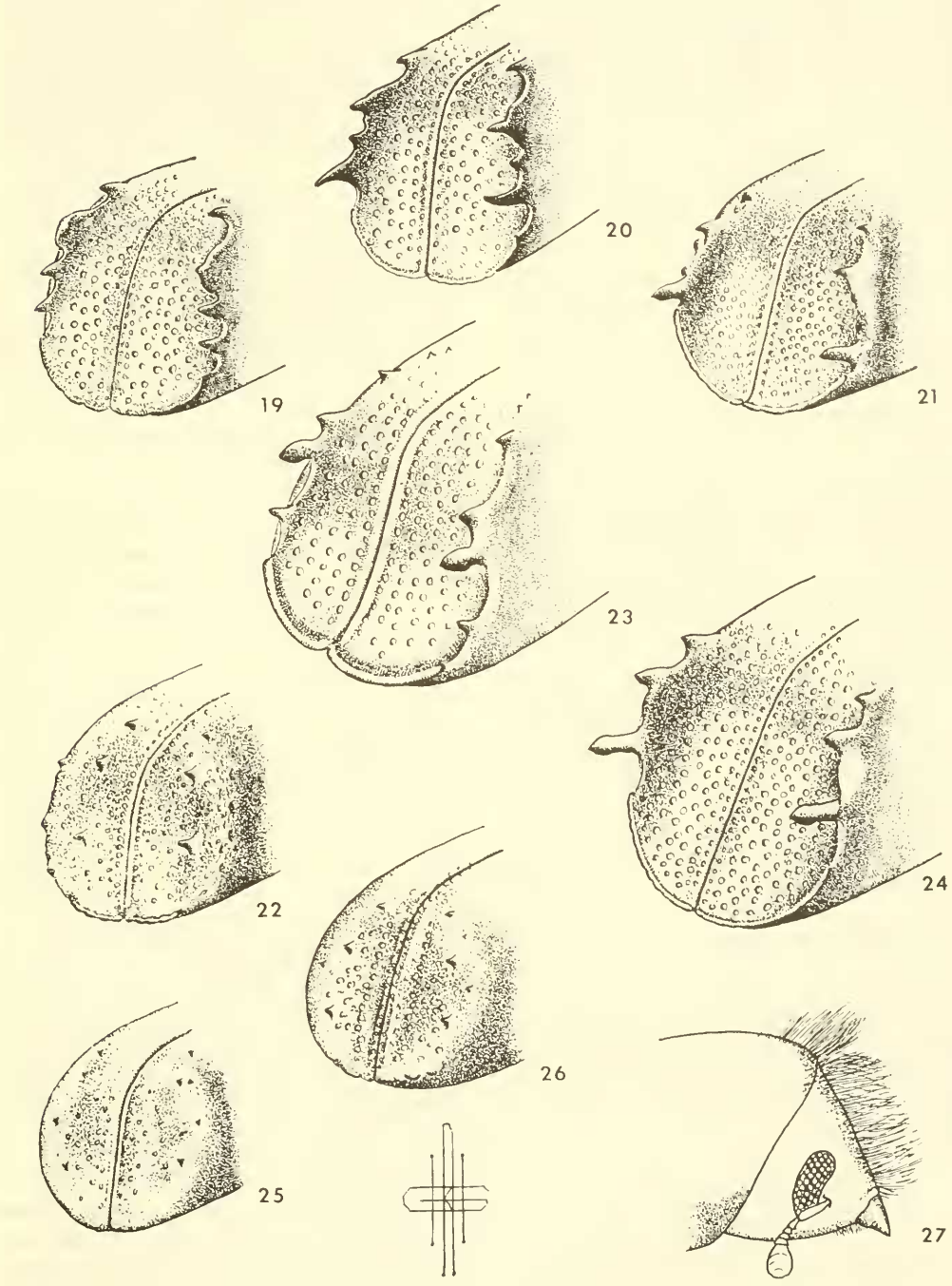



Fig. 160. Ipini declivities and heads: 19, *Ips erosus* (Europe); 20, *Ips latidens*, male; 21, *Ips spinifer*, female; 22, *Orthotomicus caelatus*, female; 23, *Ips plastographus*, male; 24, *Ips mexicanus*; 25, *Pityokteines lasiocarpi*, female; 26–27, *Pityokteines elegans*, female. (After Hopping 1963:65).

Badger Creek, Crater Lake N.P., Joseph, Ochoco N.F., Santiam Pass, Seaside. **Utah**: Elk Park in Ashley N.F., Kamas, Logan Canyon, Mirror Lake in Summit Co., Soapstone Creek in Uinta N.F. **Wyoming**: Bighorn N.F., Cheyenne, Cody, Keystone, Saratoga, Teton N.P., Wapiti, Washakie. MEXICO: **Baja California**: Guadeloupe Isl. **Distrito Federal**: Mexico City. **Chiapas**: San Cristóbal. **Durango**: La Ciudad, El Salto. **Hidalgo**: Tulancingo, Zacatlán, Zimapán. **Mexico**: Amecameca. **Michoacán**: Carapan. **Puebla**: Texmelucan. **Veracruz**: Perote, Las Vegas, Jacal. GUATEMALA: San Cristóbal, Totonicipan.

HOSTS.— *Pinus attenuata, P. contorta, P. cooperi, P. durangensis, P. hartwegii, P. leiophylla, P. montezumae, P. muricata, P. pseudostrobus, P. radiata.*

BIOLOGY.— Although consistent anatomical characters are not apparent, the habits of the Canadian-United States population is different from the Mexican-Guatemalan population. In the United States stumps or the butt of dying, standing trees are attacked at or near ground level. The gallery systems are essentially as in *concinnus* except they engrave the wood more deeply. The Mexican-Guatemalan form attacks the bole of standing trees well above the ground level (2 m or more) and may occur in felled material. The egg galleries are straight (longitudinal) for at least two-thirds of their length, with the terminal third curved.

NOTES.— The holotypes of both *mexicanus* Hopkins and *radiatae* Hopkins were examined in addition to 147 specimens from Canada and the United States, and 42 specimens from Mexico and Guatemala.

Several characters, such as the biology, coarseness of elytral punctures, length and texture of declivital setae, and height of the subapical margin of the declivity, might be used to separate *mexicanus* and *radiatae* into allopatric species. However, these characters are not sufficiently consistent in the material at hand to warrant such a separation. A more detailed analysis of additional material is required before a final conclusion should be made concerning the taxonomic status of these populations.

### 3. *Ips latidens* (LeConte)

Fig. 160

*Tomicus latidens* LeConte, 1874, Trans. Amer. Ent. Soc. 5:72 (Holotype, female; California; Mus. Comp. Zool., 1015)

*Ips longidens* Swaine, 1911, Canadian Ent. 47:214 (Lectotype, male; Ithaca, New York; Canadian Nat. Coll., 9299, designated by Bright, 1967, Canadian Ent. 99:676); Hopping, 1963, Canadian Ent. 95:64. *Synonymy*

*Ips guildi* Blackman, 1922, New York St. Coll. For., Syracuse, Tech. Publ. 16:137 (Holotype, female; Grand Lake, Colorado; U.S. Nat. Mus.); Hopping, 1963, Canadian Ent. 95:64. *Synonymy*

DIAGNOSIS.— This species is distinguished from the closely allied *spinifer* (Eichhoff) by the smaller, less conspicuous frontal granules, by the larger antennal club, and by the smaller, tapered spine 3 on the elytral declivity.

MALE.— Length 2.3–3.6 mm, 2.7 times as long as wide; color dark reddish brown.

Frons broadly, weakly concave, a shallow, transverse impression on lower half; surface smooth, shining, with small, rather sparse granules, granules intermixed with punctures above eyes; epistomal margin shallowly emarginate, vestiture of sparse, long hair, epistomal brush conspicuous. Antennal club flattened, sutures weakly procurved.

Pronotum 1.2 times as long as wide; sides almost straight on basal half, broadly rounded in front; summit slightly anterior to middle; anterior slope rather coarsely asperate; posterior area smooth, shining, punctures moderately coarse, deep, moderately close. Vestiture of moderately abundant, fine, long hair.

Elytra 1.5 times as long as wide; sides almost straight and parallel on basal three-fourths, slightly narrowed at declivity, truncate behind, with median half feebly subemarginate, spine 3 projecting; striae 1 moderately, others weakly impressed, punctures, coarse, deep; interstriae as wide as striae, smooth, shining, weakly convex, punctures fine, uniseriate. Declivity steep, broadly, deeply excavated; surface of concavity smooth, shining, punctures rather coarse, deep, moderately close; lateral margins strongly elevated, armed by three pairs of denticles; spine 1 moderately large, acutely pointed, in line with striae 2, spine 2 slightly larger, acutely pointed, its basal margin continuing two-thirds of distance to spine 3, spine 3 much larger, conical, tapered from its base to subacute apex; subapical ventrolateral margin rather strongly, acutely elevated, extending from suture to just below spine 3, occupying more than one-third of a complete circle. Vestiture of fine, long, rather abundant hair, except very short on declivity.

FEMALE.— Similar to male except declivital excavation not quite as deep, spines 1 and 2 slightly smaller, spine 3 distinctly smaller.

DISTRIBUTION.— S British Columbia and Quebec to California, Chihuahua, and West Virginia.

CANADA: Alberta, British Columbia, Ontario, Quebec, Saskatchewan. USA: Arizona, California, Colorado, Idaho, Massachusetts, Montana, New Hampshire, New Mexico, New York, Oregon, Pennsylvania, Utah, Washington, West Virginia, Wyoming. MEXICO: Chihuahua: Cusarara, San Juanito.

HOSTS.— *Pinus albicaulis*, *P. contorta*, *P. edulis*, *P. flexilis*, *P. jeffreyi*, *P. lambertiana*, *P. monticola*, *P. ponderosa*, *P. strobus*.

BIOLOGY.— Unthrifty or broken limbs are most commonly selected for attack, although the bole may also be utilized. The egg galleries are comparatively short; they tend to be longitudinal; there are from two to about five egg galleries associated with each large nuptial chamber. The eggs are deposited in individual niches. The larval mines are moderately long.

NOTES.— The holotypes of *latidens* and *guildi*, the lectotype of *longidens*, and 267 other specimens were examined.

Due to an error in the identification of *latidens*, Blackman named *guildi* and placed *spinifer* as a synonym of *latidens*. This error also led to the description of *sabinianae*, a synonym of *spinifer*.

The anatomical differences between eastern and western populations of this species appear to be of insufficient magnitude or importance to justify the recognition of geographical races.

Frons as in *latidens* except slightly more strongly concave, with lateral impressions immediately above epistoma slightly deeper, granules averaging slightly larger; a transverse pair of very coarse, submedian tubercles just below upper level of eyes; epistomal margin armed by a uniseriate row of granules, lateral ones rather coarse. Antennal club apparently averaging larger than *latidens*, with sutures less strongly procurved.

Pronotum and elytral disc essentially as in *latidens*. Declivity as in *latidens* except spine 3 larger, cylindrical, not tapered from base, apex appearing somewhat subcapitate or bent ventrad.

FEMALE.— Similar to male except major tubercles at center of frons and on epistoma slightly smaller; spine 3 on declivity usually slightly smaller.

DISTRIBUTION.— California and possibly S Oregon.

USA: California: Alameda Co., Amador Co., Arroyo Valley, Auburn, Butte Co., Calaveras Co., Colusa Co., Contra Costa Co., Shingle Springs in El Dorado Co., Kern Co., Lake Co., Los Angeles Co., Madera Co., Mariposa Co., Monterey Co., Morgan, Mt. Diablo, Napa Co., Nevada Co., North Fork, Placerville, Red Bluff, Redding, Riverside, Sacramento, San Andres, San Diego, San Diego Co., San Luis Obispo Co., Santa Barbara Co., Santa Clara Co., Shasta Co., Siskiyou Co., Solano Co., Trinity Co., Tuolumne Co., Weaverville, Yolo Co.

HOST.— *Pinus sabiniana*.

BIOLOGY.— Basically as in *latidens* except that apparently only the lower bole and stump are attacked.

NOTES.— The above treatment was based on 19 paratypes of *sabinianae* and on 95 other specimens.

### 4. *Ips spinifer* (Eichhoff)
Fig. 160

*Tomicus spinifer* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:499 (Holotype, sex?; California; presumably lost with Hamburg Mus.)

*Orthotomicus sabinianae* G. Hopping, 1963, Canadian Ent. 95:64 (Holotype, male; Middletown, Lake Co., California; California Acad. Sci.); Wood, 1973, Great Basin Nat. 33:177. *Synonymy*

DIAGNOSIS.— This species is distinguished from the closely related *latidens* (LeConte) by a pair of enlarged frontal tubercles, by the larger antennal club, and by the larger, untapered spine 3 on the elytral declivity.

MALE.— Length 2.6–3.4 mm, 2.7 times as long as wide; color reddish brown.

### 5. *Ips perturbatus* (Eichhoff)
Fig. 161

*Tomicus perturbatus* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:274 (Syntypes?; Amerique boreali; presumably lost with Hamburg Mus.)

*Tomicus hudsonicus* LeConte, 1876, Proc. Amer. Philos. Soc. 15:366 (Lectotype, female; Hudson Bay Territory; Mus. Comp. Zool., 26, present designation); Swaine, 1918, Dom. Canadian Dept. Agric. Ent. Br. Tech. Bull. 14(2):115. *Synonymy*

*Tomicus interpunctus* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:241 (Syntypes?; Sitka, Alaska; presumably lost with Hamburg Mus.); Wood, 1977, Great Basin Nat. 37:386. *Synonymy*

DIAGNOSIS.— This species is distinguished from *pini* (Say) and *hunteri* Swaine by the larger body size, and by the smaller strial

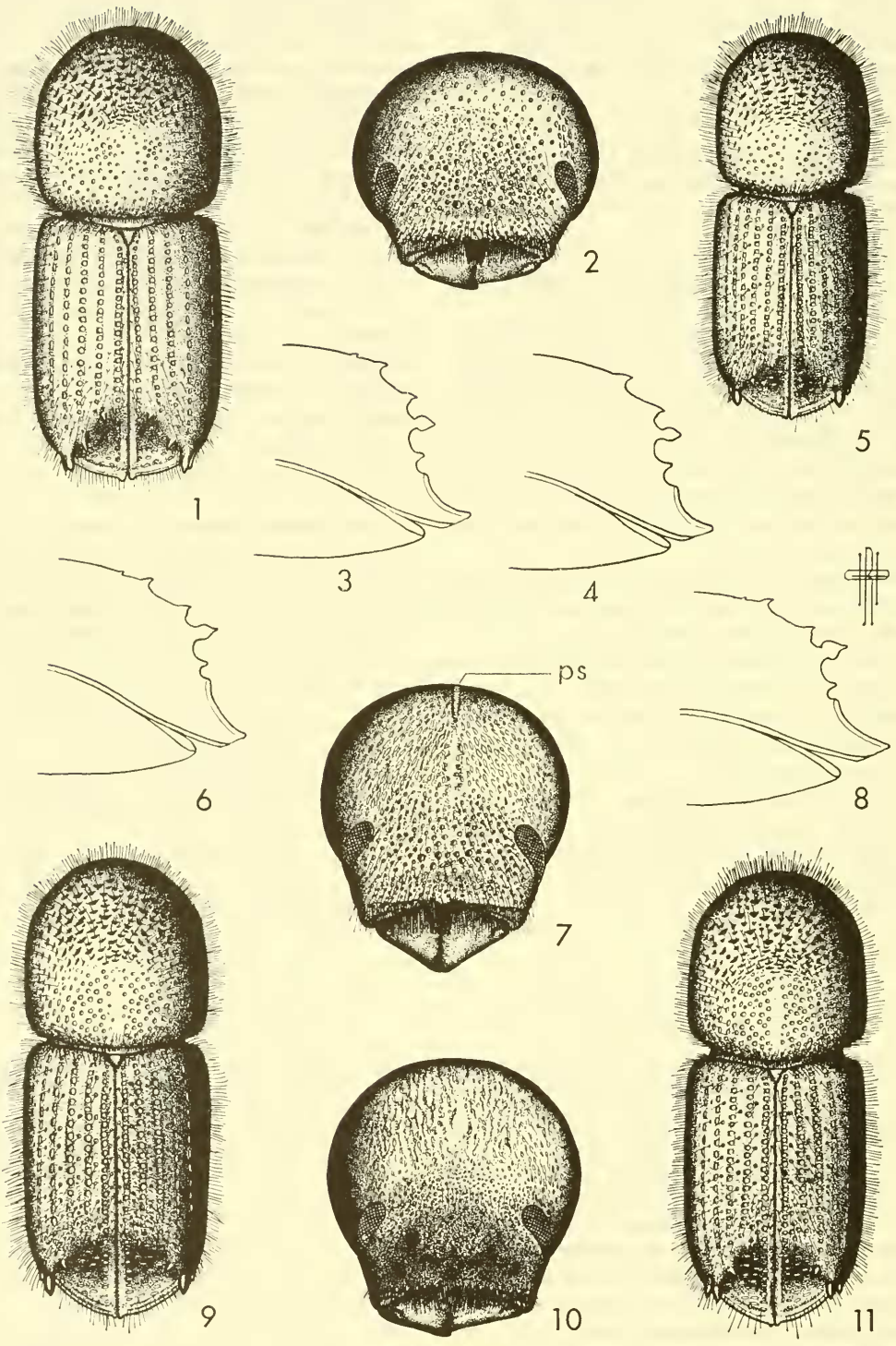



Fig. 161. *Ips* spp.: 1–3, *perturbatus*, male, 4, same, female; 5, *hunteri*, male; 6, *woodi*, male, 7–8, 11, same, female; 10, *pilifrons utahensis*, female. (After Hopping 1965:536.)

punctures with proportionately wider interstriae. It has some interstrial punctures near the declivity, fewer than *hunteri*, but more than *pini*.

MALE.— Length 4.0–4.7 mm, 2.6 times as long as wide; color dark brown.

Frons broadly, rather evenly convex, shining; surface rather coarsely, deeply, closely punctured, punctures gradually replaced by moderately large, isolated, rounded tubercles below, a transverse pair near center distinctly larger; a uniseriate row of tubercles on epistomal margin; vestiture of rather sparse, fine, long hair.

Pronotum 1.07 times as long as wide; sides almost straight and parallel on basal half, rather broadly rounded in front; summit at middle; anterior slope rather coarsely asperate; posterior aréa smooth, shining, punctures rather small, deep, moderately close. Vestiture of moderately abundant, fine, long hair, except glabrous on small discal area.

Elytra 1.4 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on basal two-thirds, converging slightly before broadly rounded posterior margin, apex slightly produced, then narrowly emarginate at suture; striae feebly impressed, punctures moderately coarse, deep; interstriae smooth, shining, weakly convex, impunctate on basal half, posterior half with fine, uniseriate punctures at least near declivity, commonly extending anteriorly as far as middle of disc. Declivity moderately steep, broadly excavated; face of concave area smooth, punctures rather sparse, coarse, confused; lateral margins strongly elevated, armed by four pairs of spines; spine 1 immediately mesad of striae 2, pointed, moderately coarse, 2 in line with striae 3, slightly larger than 1, sharing base with spine 3; spine 3 distinctly larger than 2, capitate, with apex pointed, not bent; spine 4 as large as 2, blunt, intermediate in position between spine 3 and lateral end of elevated, transverse, subapical costa; subapical costa strongly, acutely elevated, equal in total transverse length to distance between mesal surfaces of spine 3, its arc completing about one-fourth of a circle. Vestiture confined to sides and base of declivity, of long, slender hair.

FEMALE.— Similar to male except declivital spines very slightly smaller.

DISTRIBUTION.— Alaska and New Brunswick to Montana and Michigan.

ALASKA: Fairbanks, Glennallen, Kenai Peninsula, Larstrum, Mentasia, Middle fork of Chandler River, Sheenjek River, Talkeetna. CANADA: **Alberta**: Athabasca Landing, Andrew, Banff Springs, Calgary, Edmonton, Lesser Slave Lake, Nordegg, Whirlpool River at Jasper. **British Columbia**: Fort John, Glacier, Hope Mt., Kaslo, Likely, Lower Post, Polly River Crossing, Nicola, Stanley, Trinity Valley. **Manitoba**: Aweme, Gillan, Onah, Red Deer. **New Brunswick**: Bathurst, Nictor Lake. **Northwest Territories**: Aklavik, Ft. McPherson. **Ontario**: Frater, Lake of the Woods, Monteith, Nakina, Ogoki, Ottawa, Petawawa. **Quebec**: Aylmer, Gaspé, Mistassini, Rupert House, Trinity Bay. **Saskatchewan**: Cypress Hills, Regina. **Yukon Territory**: Elsa, Kluane Lake, Rampart House, Snag, Swim Lake, Whitehorse. USA: **Maine**: Camp Caribou. **Michigan**: Marquette, Lake Superior. **Minnesota**: Duluth, Ely in Lake Co. **Montana**: Arlee.

HOST.— *Picea glauca*, one record from *P. engelmannii*.

BIOLOGY.— Apparently the boles of unthrifty, cut, or fallen trees are selected for attack. The parental tunnels are of the typical tuning fork pattern; the moderately long larval mines radiate from them.

NOTES.— The above treatment was based on the syntypes of *hudsonicus* and on 351 other specimens. The first syntype of *hudsonicus* in the LeConte collection bears a "type" label and another "Type No. 21." That specimen is here designated as the lectotype of *Tomicus hudsonicus* LeConte. Apparently other representatives of the original series were sent by LeConte to Eichhoff, who (Eichhoff 1878:250) referred them to *perturbatus*. The size and original description also make it possible to recognize this species in the absence of a type.

The type locality of *interpunctus* is Sitka, Alaska. The original description indicates that the type was 4.0 mm long, it had a transversely arranged pair of coarse tubercles on the frons, and the basal parts of the elytral interstriae were impunctate. Because only *perturbatus* and *tridens* (Mannerheim) occur on Sitka Island, and because size and both characters fit *perturbatus*, but not *tridens*, *interpunctus* is placed in synonymy.

This species is very similar to *typographus* (Linnaeus) of Eurasia, but that species has only one median frontal tubercle and a dull surface on the elytral declivity.

### 6. *Ips perroti* Swaine
Fig. 165, 166

*Ips perroti* Swaine, 1915, Canadian Ent. 47:356 (Holotype, male; Isle Perrot, Quebec; Canadian Nat. Coll., 9301)

DIAGNOSIS.— This species is distinguished from *woodi* Thatcher by the smaller size, by the more slender form, and by the more slender antennal club with the sutures almost straight.

MALE.— Length 2.7–3.5 mm, 2.7 times as long as wide; color dark reddish brown.

Frons essentially as in *perturbatus* except with only one major tubercle on median line almost on epistoma; epistomal tubercles progressively larger toward median line.

Pronotum 1.23 times as long as wide; essentially as in *perturbatus* except entire discal area devoid of pubescence.

Elytra 1.6 times as long as wide; outline essentially as in *perturbatus*; striae 1 weakly, others not impressed, punctures rather coarse, deep; interstriae one and one-half times as wide as striae, smooth, shining, basal half impunctate, posterior half with sparse, coarse, rather deep punctures. Declivity about as in *perturbatus* except punctures in concave area larger; spine 1 in line with striae 2; spine 2 with apex curved more nearly caudad, its base more closely associated with base of spine 3, spine 3 very stout, not capitate, with a small point at apex; spine 4 as large as 2 but blunt. Vestiture restricted to sides and base of declivity, of very long, rather abundant hair.

FEMALE.— Similar to male except declivital spines slightly smaller, more slender, spine 3 much more slender, conical, pointed.

DISTRIBUTION.— Alberta and New Brunswick to Minnesota and Michigan.

CANADA: **Alberta**: McLeod, Peace River, Strachen, Watino. **Manitoba**: Aweme, Victoria Beach. **New Brunswick**: Salmon River. **Ontario**: August, Constance Bay, Nester Falls, Petawawa. **Quebec**: Aylmer, Ft. Coulonge, Isle Perrot. USA: **Michigan**: Roscommon. **Minnesota**: Cloquet, Lake Itasca, Itasca Park, Wandena Co.

HOSTS.— *Pinus banksiana*, *P. resinosa*.

BIOLOGY.— The bole and larger limbs of unthrifty, cut, or fallen trees are usually selected for attack. The parental gallery pattern is essentially as in *perturbatus*; however, the larval mines are very short and usually curve back toward their origins, with pupation occurring near the egg tunnel.

NOTES.— The above treatment was based on the holotype and on 194 other specimens.

### 7. *Ips woodi* Thatcher
Fig. 161

*Ips woodi* Thatcher, 1965, Canadian Ent. 97:493 (Holotype, female; Beaver Creek, Logan Canyon, Utah; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from *perroti* Swaine by the larger size, by the stouter body form, by the bisinuate sutures of the antennal club, and by the distribution.

MALE.— Length 3.5–4.7 mm, 2.4 times as long as wide; color very dark brown to almost black.

Frons moderately convex, with a weak, narrow, transverse impression just above epistoma; surface shining, coarsely, closely granulate from epistoma to well above eyes, coarsely punctured toward vertex; vestiture of sparse, fine hair. Antennal club with suture 1 strongly bisinuate, 2 obtusely angulate.

Pronotum 1.1 times as long as wide; essentially as in *perturbatus* except punctures on posterior areas rather coarse. Vestiture of fine, long hair, except disc glabrous.

Elytra 1.5 times as long as wide; outline essentially as in *perturbatus* except apex evenly rounded, sutural notch almost obsolete; striae 1 moderately, others feebly impressed, punctures rather coarse, deep, except distinctly smaller at base and near declivity; interstriae smooth, shining, slightly wider than striae, impunctate on basal fourth of disc, sparsely, uniseriately, rather finely punctured behind. Declivity as in *perturbatus*.

FEMALE.— Similar to male except declivital spines slightly smaller.

DISTRIBUTION.— S Alberta to Nevada and New Mexico.

CANADA: **Alberta**: Bellevue R.S., Burmis. USA: **Arizona**: 20 miles S Alpine in Greenlee Co.; San Francisco Peaks. **Idaho**: Elk City in Nezperce N.F. **Montana**: Coal Creek in Glacier N.P. **Nevada**: Bear Creek Summit in Elko Co. **New Mexico**: Cloudcroft. **Utah**: Huntington Canyon, Logan Canyon. **Wyoming**: Atlantic City.

HOSTS.— *Pinus flexilis* and *P. strobiformis*.

BIOLOGY.— The large limbs and bole of unthrifty, cut, and fallen trees are selected for attack. The gallery patterns are typical of the genus, with the parental system longitudinal, resembling a narrow tuning fork.

NOTES.— The above treatment was based on the holotype, on 13 paratypes, and on 160 other specimens.

### 8. *Ips hunteri* Swaine
Fig. 161

*Ips hunteri* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):31 (Holotype, female?; Creede, Colorado; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *perturbatus* (Eichhoff) by the smaller size, by the larger strial punctures and proportionately narrower interstriae, and by the distribution.

MALE.— Length 3.3–4.0 mm, 2.5 times as long as wide; color very dark brown to almost black.

Frons as in *perturbatus* except pair of major tubercles usually much smaller. Pronotum as *perturbatus* except punctures slightly coarser, but finer than in *woodi* Thatcher.

Elytra 1.5 times as long as wide; as in *woodi* except strial punctures slightly smaller; interstriae usually with more minute, impressed points, about one and one-half times as wide as striae; a greater tendency for interstriae 1 to bear a series of rounded tubercles on posterior half.

FEMALE.— Similar to male except declivital spines slightly smaller.

DISTRIBUTION.— Utah and Colorado to N Arizona.

USA: **Arizona**: Kaibab N.F., Safford, White River. **Colorado**: Creede, Poudre Canyon in Larimer Co., Rico in Dolores Co. **Utah**: Beaver, Huntington Canyon, Panguitch, Parowan Canyon, Sanford Canyon in Dixie N.F., Wolf Creek Pass.

HOSTS.— *Picea pungens*, less common in *P. engelmannii*.

BIOLOGY.— The boles of unthrifty, cut, or fallen trees are attacked. The egg galleries are comparatively short and are not oriented with the grain of the wood; they may be diagonal, transverse, or longitudinal, curved or straight.

The normal host is *Picea pungens*; records from *P. engelmannii* usually prove to be roosting records, misidentified host, or result from unusual local conditions.

NOTES.— The above treatment was based on the holotype, on 3 paratypes, and on 96 other specimens.

### 9. *Ips borealis borealis* Swaine
Fig. 162

*Ips borealis* Swaine, 1911, Canadian Ent. 45:213 (Lectotype, female; St. Anthony, Newfoundland; Canadian Nat. Coll., 9302, designated by Bright, 1967, Canadian Ent. 99:675)

DIAGNOSIS.— This species is distinguished from *tridens* Mannerheim by the smaller size, and by the very different sculpture of the female frons. The female frons is glabrous and entirely smooth.

FEMALE.— Length 3.0–3.7 mm, 2.5 times as long as wide; color dark brown.

Frons convex above, moderately protuberant from just below upper level of eyes to epistoma; surface dull, entirely smooth, devoid of all indications of punctures and granules; glabrous except for conspicuous epistomal brush. Antennal club with suture 1 weakly, 2 moderately bisinuate.

Pronotum 1.1 times as long as wide; essentially as in *perturbatus* except punctures in posterior areas slightly larger and less regular in size.

Elytra 1.5 times as long as wide; essentially as in *perturbatus* except posterior margin slightly more narrowly rounded; striae 1 moderately, others feebly impressed, punctures rather small, deep; interstriae smooth, shining, feebly convex, twice as wide as striae, sparsely, uniseriately punctured, except punctures on 1 replaced by granules or tubercles. Declivity as in *perturbatus* except spine 3 stouter, not capitate.

MALE.— Similar to female except frons more evenly convex, feebly protuberant, surface with a few fine punctures above, a few fine granules on lower half; sparsely pubescent; declivital spines very slightly larger.

DISTRIBUTION.— Alaska and Newfoundland to Montana, Minnesota, and Maine.

ALASKA: Ohmer Lake on Kenai Peninsula, Rampart House. CANADA: **Alberta**: Alexander Falls on McKenzie Highway, Banff, Canada Prairie, Cypress Hills, Edmonton, Kananaskis, Mitsue, Peace River below Cherry Point, Pidmondon, Smith, Wabamun. **British Columbia**: Kootenay Valley. **Manitoba**: Aweme, Clear Lake, Red Deer, Riding Mts., Winnipeg. **New Brunswick**: Halcomb, McGraw Brook, Plaster Rock, Riley Brook. **Newfoundland**: Pasadena, St. Antony. **Northwest Territories**: Aklavik, Great Bear Lake, Ft. Simpson, Ft. Smith, Reindeer Depot on McKenzie River Delta. **Ontario**: Hawk Junction, Lake Abitibi, Low Buck, Radiant, Smoky Falls on Mattagami River. **Quebec**: Gaspé Co., Godbout, Lake Opasatika, Mt. Albert, Rupert House. **Saskatchewan**: Big River, Canoe Lake, Prince Albert

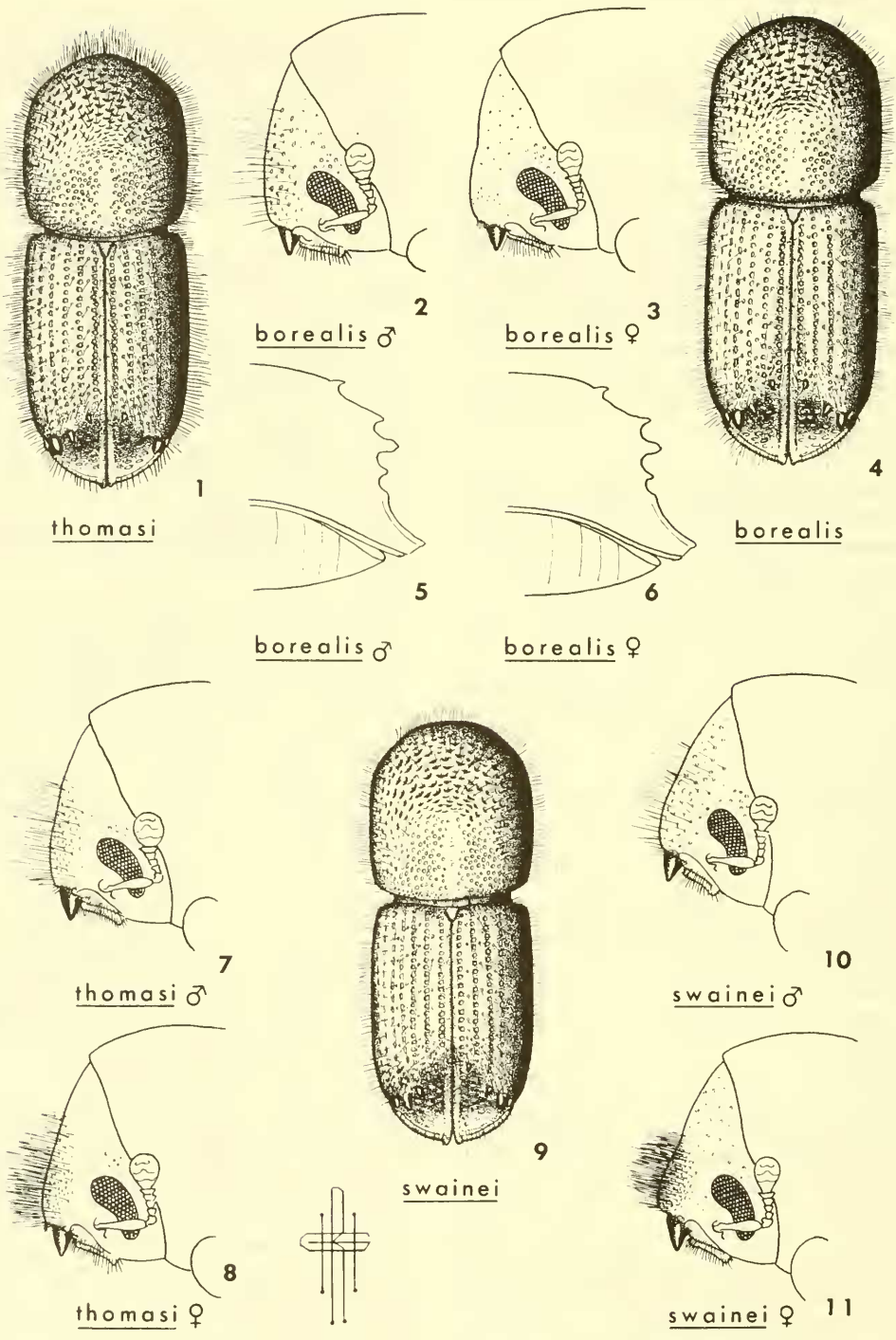



Fig. 162. *Ips borealis* subspecies: 1, *thomasi*, male, 8, same, female; 2, 4–5, 7, *borealis*, male, 3, 6, same, female; 9–10, *swainei*, male, 11, same, female. (After Hopping 1965:195.)

N.P. USA: **Maine**: Maine Agricultural Experiment Station. **Minnesota**: Itasca Park. **Montana**: Gillam.

HOST.— *Picea glauca.*

BIOLOGY.— Essentially as in *perturbatus.*

NOTES.— The above treatment was based on the lectotype and on 937 other specimens.

One female specimen from Ohmer Lake on Kenai Peninsula, Alaska, has fine pubescence on the epistoma. The significance of this hair could not be determined.

### 10. *Ips borealis swainei* R. Hopping
Fig. 162

*Ips swainei* R. Hopping, 1939, Canadian Ent. 71:169 (Holotype, female; Creighton Valley, Lumby, British Columbia; Canadian Nat. Coll.)

DIAGNOSIS.— This subspecies is distinguished from *b. borealis* Swaine by the slightly more protuberant female frons, with rather dense, long pubescence on the lower half, and by the distribution.

FEMALE.— Length 2.6–3.4 mm, 2.6 times as long as wide; as in *b. borealis* Swaine except for female frons.

Frons below upper level of eyes rather weakly to abruptly, rather strongly protuberant; this protuberance densely, deeply punctured (granules often present) and pubescent; vestiture moderately long, varying from rather sparse to dense.

MALE.— As in male *b. borealis* or sometimes with larger frontal granules.

DISTRIBUTION.— Creighton Valley and Trinity Valley, British Columbia.

CANADA: **British Columbia**: Lumby Creighton Valley, 18-VI-22, *Picea engelmannii*, R. Hopping; Trinity Valley, 6-VIII-54, *P. engelmannii*, J. M. Kinghorn; Vernon, VII-22, R. Hopping.

HOST.— *Picea engelmannii.*

BIOLOGY.— As in *b. borealis.*

NOTES.— The above treatment was based on the holotype and on 93 other specimens. This, presumably, is a geographically variable race of *borealis.* Some female specimens are indistinguishable from *b. borealis* except for the presence of a few punctures and setae on the lower frons. Other specimens in the same series exhibit the maximum expression of frontal protuberance and vestiture.

### 11. *Ips borealis lanieri* Wood

*Ips borealis lanieri* Wood, 1974, Brigham Young Univ. Sci. Bull. Ser. 19(1):27 (Holotype, female; 1 mile S Brownsville, Lawrence Co., South Dakota; Wood Coll.)

DIAGNOSIS.— This subspecies differs from *b. thomasi* G. Hopping by the less strongly inflated lower female frons, with smaller granules and shorter, less abundant, finer vestiture, and by the distribution.

FEMALE.— Length 3.0–3.8 mm, 2.6 times as long as wide; as in *b. borealis* except for the female frons.

Frons as in *b. borealis* except much less strongly protuberant on lower half, entire frons with small, distinct punctures and, on lower half, a few fine granules; epistomal margin bearing a row of rather coarse granules. Frontal vestiture short, very sparse.

MALE.— Similar to female except frontal punctures and granules much larger, more numerous.

DISTRIBUTION.— Black Hills in South Dakota to Colorado.

USA: **Colorado**: 20 miles (32 km) NW Pagosa Springs, Hinsdale Co., 28-VI-68. *Picea engelmannii*, S. L. Wood; Newcastle, VII-46, *P. engelmannii*, C. L. Massey. **South Dakota**: 2 miles (3 km) SW Lead, 18-VI-68, *P. glauca*, S. L. Wood; Brownsville, 18-VI-68, *P. glauca*, S. L. Wood.

HOSTS.— *Picea engelmannii* and *P. glauca.*

BIOLOGY.— As in *b. borealis.*

NOTES.— The above treatment was based on 121 specimens, including the type series.

### 12. *Ips borealis thomasi* G. Hopping
Fig. 162

*Ips thomasi* G. Hopping, 1965, Canadian Ent. 97:193 (Holotype, female; Ingonish, Nova Scotia; Canadian Nat. Coll.)

DIAGNOSIS.— This subspecies is distinguished from *b. lanieri* Wood by the more strongly inflated lower part of the female frons, with larger granules and much more abundant, longer, coarser vestiture, and by the distribution.

FEMALE.— Length 3.2–3.6 mm, 2.5 times as long as wide; as in *b. lanieri* except for frons.

Frons feebly to weakly protuberant on lower half, inflated area rather coarsely, closely granulate-punctate and pubescent; pubescence moderately to very abundant, long; epistoma bearing a row of moderately coarse tubercles.

MALE.— Similar to female except lower frons feebly protuberant, more sparsely pubescent, granules less abundant, slightly larger.

DISTRIBUTION.— Nova Scotia.

CANADA: **Nova Scotia**: Ingonish, 30-X-61, *Picea glauca*, J. B. Thomas.

BIOLOGY.— Presumably as in *b. borealis.*

NOTES.— The above treatment was based on the holotype, on 24 paratypes, and on 26 other specimens.

### 13. *Ips tridens tridens* (Mannerheim)
Fig. 163

*Bostrichus tridens* Mannerheim, 1852, Moskov. Obshch. Isp. Prirody, Otd. Biol. Biul. (Bull. Soc. Imp. Nat. Moscou) 25:357 (reprint p. 75) (Lectotype, female; Sitka Island, Alaska; Univ. Zool. Mus., Helsinki, present designation)

*Bostrichus interruptus* Mannerheim, 1852, Moskov. Obshch. Isp. Prirody, Otd. Biol. Biul. (Bull. Soc. Imp. Nat. Moscou) 25:357 (reprint p. 75) (Lectotype, female; Sitka Island, Alaska; Univ. Zool. Mus., Helsinki, present designation); Wood, 1969, Great Basin Nat. 29:115. *Synonymy*

DIAGNOSIS.— This species is distinguished from *borealis* Swaine by the larger size and by the more strongly granulate female frons. This subspecies is distinguished from *t. engelmanni* Swaine by the feebly protuberant female frons, which is almost as coarsely granulate and as sparsely pubescent as in the male.

FEMALE.— Length 3.8–4.3 mm, 2.5 times as long as wide; color dark brown to almost black.

Frons convex, feebly protuberant below upper level of eyes, contour of upper area somewhat irregular; surface shining, rather densely, rather finely granulate with few, fine punctures interspersed below, granules largely replaced by punctures toward vertex; epistomal margin with a row of coarse granules; vestiture of rather sparse, fine, long hair.

Pronotum 1.15 times as long as wide; as in *b. borealis* except punctures in posterior areas averaging smaller, slightly closer.

Elytra 1.5 times as long as wide; as in *b. borealis* except strial punctures smaller, interstriae almost three times as wide as striae.

MALE.— Similar to female except lower frons less distinctly protuberant, granules larger, particularly those on epistomal margin; declivital spines very slightly larger.

DISTRIBUTION.— Coastal area from Alaska to N California.

ALASKA: Seward, Sitka Island. CANADA: **British Columbia**: Agassiz, Mission Inn, Revelstoke Mts., Vancouver. USA: **California**: Crescent City, Del Norte. **Oregon**: Astoria, Branden, Clatsop, Hebo, Jackson, Marshfield, New Denmark. **Washington**: Hoquiam, Kent, Spokane.

HOSTS.— *Picea sitchensis,* a few records from *P. glauca* in Alaska.

BIOLOGY.— Basically as in *perturbatus* (Eichhoff) except egg galleries usually longer, with parallel galleries closer together.

NOTES.— Five specimens are in the Mannerheim collection under the name *Bostrichus tridens* Ménétriés. Three of these, all from Sitka, are with other type material and consist of (1) a female taken by Pippingsköld, and (2 and 3) two males taken by Holmberg. The other two specimens are with duplicates and unsorted material and consist of (1) a female *t. engelmanni* from Sitka without the name of the collector, and (2) a specimen of *pini* (Say) from another location and received from Chapius. The female from Sitka taken by Pippingsköld bears Mannerheim's label and is here designated as the lectotype of *tridens.* Five specimens of *Bostrichus interruptus* Mannerheim are in the Mannerheim collection from Sitka; only one was taken by Frankenhaeuser and bears a type label; it is marked as a male, but is actually a female, and it is here designated as the lectotype of *interruptus.* The female lectotypes of *tridens* and *interruptus* were compared directly to one another and to my female from Oregon. The above treatment was based on my homotype and on 194 other specimens.

### 14. *Ips tridens engelmanni* Swaine
Figs. 163–164

*Ips engelmanni* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):30 (Lectotype, female; Rogers Pass, British Columbia; Canadian Nat. Coll., 9308, designated by Bright, 1967, Canadian Ent. 99:675)

*Ips yohoensis* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):31 (Lectotype, female; Yoho Valley, British Columbia; Canadian Nat. Coll., 9309, designated by Bright, 1967, Canadian Ent. 99:676); Wood, 1977, Great Basin Nat. 37:396. *Synonymy*

*Ips dubius* Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):119 (Holotype, male; Rogers Pass, British Columbia; Canadian Nat. Coll.); Wood, 1957, Canadian Ent. 89:397. *Synonymy*

*Ips semirostris* G. Hopping, 1963, Canadian Ent. 95:213 (Holotype, female; Kenai Peninsula, Alaska; Canadian Nat. Coll.); Wood, 1977, Great Basin Nat. 37:386. *Synonymy*

*Ips amiskwiensis* G. Hopping, 1963, Canadian Ent. 95:216 (Holotype, female; Amiskwi River, Yoho Nat. Pk., British Columbia; Canadian Nat. Coll.); Wood, 1977, Great Basin Nat. 37:386. *Synonymy*

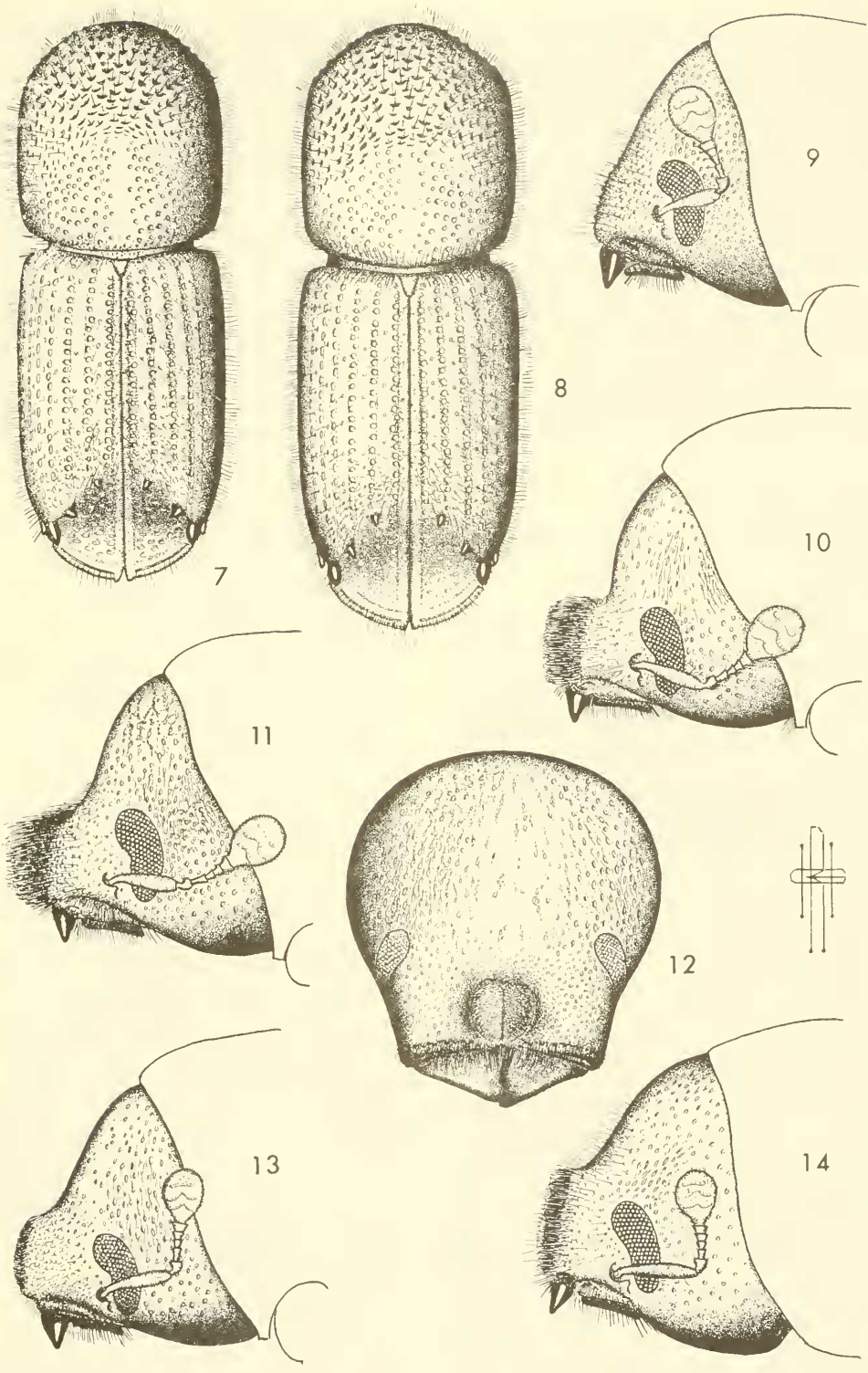



Fig. 163. *Ips* spp.: 7–8, *tridens engelmanni*, male, 10–11, same, female; 9, *tridens tridens*, female; 12–13, *pilifrons sulcifrons*, female; 14, *pilifrons pilifrons*, female. (After Hopping 1965:163.)

DIAGNOSIS.— This subspecies is distinguished from *t. tridens* (Mannerheim) by the moderately to profoundly protuberant female frons, with frontal vestiture varying from glabrous to densely pilose and from minute pile to long hair.

FEMALE.— Length 3.3–4.3 mm, 2.5 times as long as wide; as in *t. tridens* (Mannerheim) except for frons.

Frons below upper level of eyes varying from moderately to abruptly, profoundly protuberant, protuberance granulate to rugose, glabrous to pilose; vestiture, when present, varying from minute to long and very abundant. Epistomal tubercles minute or obsolete (highly variable within or between series).

MALE.— Similar to female except frons as in *t. tridens* male.

DISTRIBUTION.— Alaska and Northwest Territories to N California and NW Wyoming.

ALASKA: Echo Cove, Fick Cove at Chichagoff Isl., Hollis, Juneau, Kenai Peninsula, Lastrum, McKinley N.P., Rogers Point, Seward, Sheenjek, Sitka Island. CANADA: **Alberta**: Banff, Blairmore, Carbondale Road near Crowsnest, Exshaw. **British Columbia**: Barkerville, Emerald Lake, Glacier, Kooteney, Lumberton, Marble Canyon, Nahun, Nicola, Quesnel, Queens Lake, Pine Pass, Stanley, Terrace, Trinity Valley, Two Sisters Mt., Vermillion, Yoho N.P. **Northwest Territories**: Aklavik. **Yukon**: Otter Lake, Rancheria, Swim Lakes. USA: **California**: Callahan in Siskiyou Co. **Idaho**: Coeur d'Alene, Krassel, Lakeview. **Montana**: Banfield, Cable Creek at Libby, Cedar Lake in Lake Co., Columbia Falls, Eureka, Glacier N.P. **Oregon**: Dixie Pass, Gold Lake in Willamette N.F., Suttle Lake, Tollgate. **Washington**: Parkway. **Wyoming**: Yellowstone N.P.

HOSTS.— *Picea glauca, P. engelmannii,* and, in Alaska, *P. sitchensis.*

BIOLOGY.— As in *t. tridens.* Lanier (1966) reported partial gynogenetic parthenogenesis and abnormal sex ratios in this subspecies.

NOTES.— The type series of *engelmanni, dubius,o and yohoensis* and the holotypes of *amiskwiensis* and *semirostris* were examined, as well as 580 other specimens.

The female frons of this subspecies varies radically in protuberance and in vestiture. This variability, coupled with partial parthenogenesis, has produced anatomically uniform local populations adjacent to uniform local populations of other very different anatomical forms. It is also possible to find three or more anatomically different forms of females in the same parental gallery system with one male, or in the brood of a single female. It must be concluded, therefore, that the female frons in this subspecies is genetically unstable and can take a wide variety of forms unrelated to geographical origin or host relationships.

### 15. *Ips pilifrons pilifrons* Swaine
Figs. 163, 164

*Ips pilifrons* Swaine, 1912, Canadian Ent. 46:353 (Holotype, female; Colorado; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *t. tridens* (Mannerheim) by the larger size, by the larger, deeper strial punctures and proportionately narrower interstriae, by the different modifications of the female frons, and by the distribution. From *p. sulcilfrons* Wood it is distinguished by the sculpture of the female frons.

FEMALE.— Length 4.4–5.0 mm, 2.5 times as long as wide; color very dark brown.

Frons as in *t. tridens* except contour of vertex more regular, more sharply punctured; area below upper level of eyes feebly to moderately protuberant, granules much more numerous, particularly in lateral areas; row of epistomal tubercles present at least laterally; vestiture of dense, minute velvetlike pile with no long hair. (Intergrades between *p. pilifrons* and *p. utahensis* often with a combination of pile and long hair.)

Pronotum as in *t. tridens* except punctures in posterior areas averaging slightly larger.

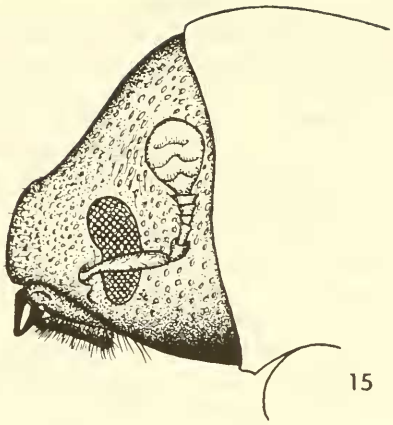
Elytra 1.5 times as long as wide; as in *t. tridens* except striae more distinctly impressed, punctures larger, interstriae one to almost two times as wide as striae, rarely with minute impressed points; declivity slightly more deeply concave, lateral margins slightly more strongly elevated (distinctly more than in *t. engelmanni*), spine 3 longer, distinctly capitate.

MALE.— Similar to female except frons as in male *t. tridens* but surface much more rugose in addition to granules; declivital spines slightly larger, 3 capitate with apex subacute.

DISTRIBUTION.— North central Colorado and adjacent Wyoming.

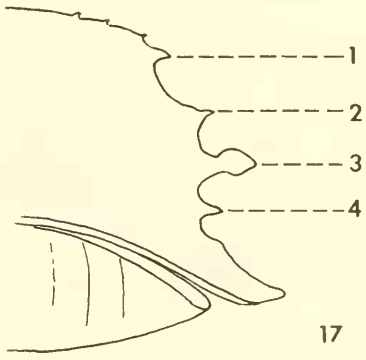
USA: **Colorado**: Craig, Glenwood Springs, Rabbit Ears Pass; those from Pingree Park and Redfeather Lakes more or less intergrade with *p. utahensis.* **Wyoming**: Snowy Range west of Laramie.

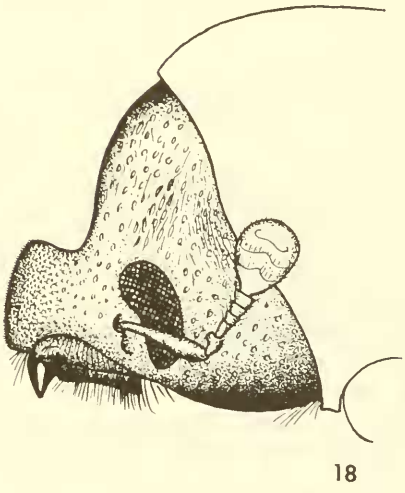
HOST.— *Picea engelmannii.*









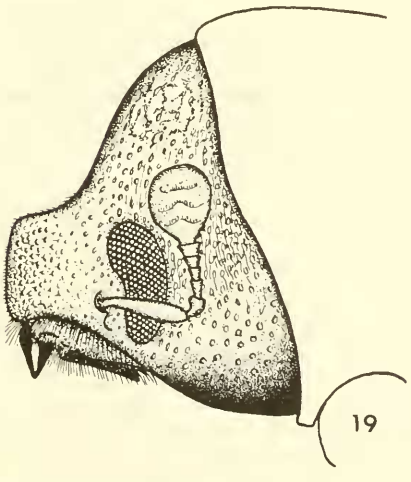








Fig. 164. *Ips* spp., dorsal and lateral aspects of declivity: 15, 18–19, *tridens engelmanni*, female, 16, same, male; 17, *pilifrons sulcifrons*, male; 20, *pilifrons pilifrons*, male. (After Hopping 1965:165.)

BIOLOGY.— As in *t. tridens.*

NOTES.— The above treatment was based on the holotype of *pilifrons* and on 61 other specimens. Specimens of this species from Wyoming, the eastern part of the Uinta Mountains in Utah, and from northwestern Colorado are assigned to *p. utahensis* although intergradation with *p. pilifrons* is apparent. Females from these areas may have a certain amount of dense frontal pubescence, but the pile is usually considerably longer, particularly at the margins, than is seen in specimens from Rabbit Ears Pass, Colorado. A population with similar minute velvetlike pile on the female frons, from Mount Wheeler, Nevada, has other frontal characters that were used to define the subspecies *p. thatcheri.*

### 16. *Ips pilifrons sulcifrons* Wood
Figs. 163–164

*Ips sulcifrons* Wood, 1960, Great Basin Nat. 20:67 (Holotype, female; Santa Fe Ski Basin, New Mexico; California Academy of Sciences)

DIAGNOSIS.— This subspecies is distinguished from *p. pilosus* Swaine by the strongly protuberant female frons, which is deeply, narrowly sulcate, with the sides of the sulcus varying from glabrous to densely, minutely pubescent.

FEMALE.— Length 4.4–5.0 mm, 2.6 times as long as wide; as in *p. pilifrons* except for female frons.

Frons rather strongly to profoundly protuberant below uppper level of eyes, protuberance deeply divided by an abrupt median sulcus; surfaces (exclusive of sulcus) smooth, shining, finely, rather closely punctured, most of punctures on protuberance accompanied by a minute granule; surfaces of sulcus rather finely granulose, either glabrous (rare) or densely covered by minute velvetlike pile.

MALE.— Apparently indistinguishable from male *p. pilifrons.*

DISTRIBUTION.— SW Colorado to New Mexico.

USA: **Colorado**: 20 miles (32 km) SW Del Norte, 26-VI-68, *Picea engelmannii*, W. G. Harwood. **New Mexico**: Coyote: 23-VIII-67, *P. engelmannii*, C. J. Germain; Pocos, 18-IX-67, *P. engelmannii*, C. J. Germain; Santa Fe Ski Basin, 13-VIII-62, *P. pungens, P. engelmannii*, S. L. Wood; near Santa Fe, 6-X-49, O. Bryant; Sandia Mts., 30-V-69, *P. engelmannii*, S. L. Wood.

HOSTS.— *Picea engelmannii, P. pungens.*

BIOLOGY.— As in *t. tridens.*

NOTES.— The above treatment was based on 11 paratypes, on 71 topotypes, and on 43 other specimens.

This is apparently a distinct geographical race of *pilifrons*; however, I have seen no intergrades or indications of sympatry. Hopping (1965:166) reports specimens from Cedar Breaks Nat. Mon. and Beaver, Utah, but my examination of those specimens indicates they are of *p. utahensis.* It appears that *p. pilifrons* and *p. sulcifrons* arose simultaneously from *p. utahensis* from a stock that then became subdivided through isolation.

### 17. *Ips pilifrons utahensis* Wood
Fig. 161

*Ips utahensis* Wood, 1960, Great Basin Nat. 20:66 (Holotype, female; Logan Canyon, Utah; Wood Coll.)

DIAGNOSIS.— This subspecies is distinguished from other subspecies of *pilifrons* by the very weakly protuberant, much more strongly granulate, more sparsely pubescent female frons. The pilosity of the female frons tends to integrate somewhat on the margins of *p. pilifrons* distribution.

FEMALE.— Length 4.4–5.0 mm, 2.5 times as long as wide; color very dark brown.

Frons on lower half only slightly more inflated than in male, granulation almost as coarse and dense as in male; vestiture usually only slightly more abundant in male, fine, long, a small amount of short pilose pubescence often present at margins of *p. pilifrons* distribution, but setae at margins of pilose area much longer than in *p. pilifrons.*

Pronotum and elytra as in *p. pilifrons.*

MALE.— As in *p. pilifrons* male.

DISTRIBUTION.— Wyoming and W Colorado to N Arizona.

USA: **Arizona**: Grand Canyon N.P., Kaibab N.F., San Francisco Mts. **Colorado**: Boulder, Cochetopa, Gould, Holy Cross N.F., Leadville, Los Pinos Pass in Saguache Co., Montezuma N.F., Newcastle, Pagosa Springs in Hinsdale Co., Pingree Park, Steamboat Springs. **Idaho**: Franklin Basin Road in Franklin Co., Viola. **Utah**: Alta, Ashley N.F., Beaver, Dixie N.F., Fishlake N.F., La Sal Mts., Logan Canyon, Mammoth Mt., Monte Cristo, Monticello, Park City, Spirit Lake in Uinta Mts., Wolf Creek Pass. **Wyoming**: Buffalo, Hayden, Saratoga.

HOST.— *Picea engelmannii.*

BIOLOGY.— As in *p. pilifrons.*

NOTES.— The above treatment was based on the holotype and on 661 other specimens.

In the east central part of its range this subspecies tends to intergrade with *p. pilifrons*. It appears that *p. utahensis* is the parental population that gave rise to all of the other subspecies of *pilifrons*.

### 18. *Ips pilifrons thatcheri* Wood

*Ips pilifrons thatcheri* Wood, 1975, Great Basin Nat. 35:29 (Holotype, female; Mt. Wheeler, Nevada; Wood Coll.)

DIAGNOSIS.— This subspecies is distinguished from *p. pilifrons* Swaine by characters of the female frons as indicated below. The comparisons are based on females having the maximum expression of frontal characters.

FEMALE.— Length 3.9–4.9 mm, 2.5 times as long as wide; color very dark brown.

Frons similar to *p. pilifrons* except less strongly, less extensively elevated, elevation occupying lower 80 percent of median distance from epistoma to upper level of eyes (115 percent in *p. pilifrons*) and pubescent area occupying less than 50 percent of median area between eyes (80 percent in *p. pilifrons*); lateral areas much more sparsely, more finely granulate than in *p. pilifrons*. Pronotum, elytra, and other features essentially as in *p. pilifrons*.

MALE.— Similar to male *p. pilifrons* except frontal vestiture less abundant and shorter, particularly along epistoma.

DISTRIBUTION.— Mt. Wheeler, Nevada.

USA: **Nevada**: Mt. Wheeler at Baker Creek, 8-VIII-38, *Picea engelmannii*, T. O. Thatcher; Mt. Wheeler, 10-VIII-74, 10,000 ft elevation, *P. engelmannii*, S. L. Wood.

HOST.— *Picea engelmannii*.

BIOLOGY.— As in *p. pilifrons*.

NOTES.— The above treatment was based on the type series of 50 specimens and on 3 other specimens.

### 19. *Ips avulsus* (Eichhoff)

Fig. 165

*Tomicus avulsus* Eichhoff, 1868, Berliner Ent. Zeitschr. 11:402 (Syntypes?: Amerique boreali; presumably lost with Hamburg Mus.)

DIAGNOSIS.— This species is distinguished from the allied *pini* (Say) and *bonanseai* (Hopkins) by the smaller size, by the poorly developed, subacute ventrolateral margin of the elytral declivity, by the wider striae and proportionately narrower interstriae, and by the smaller, noncapitate spine 3 on the male declivity.

MALE.— Length 2.1–2.8 mm, 2.6 times as long as wide; color rather dark reddish brown.

Frons broadly convex, rather weakly, transversely impressed above epistoma; surface shining, coarsely, deeply, closely punctured, with a few granules intermixed, a large, rounded, median tubercle just below center; epistoma with a row of coarse granules; vestiture of sparse hair. Sutures of antennal club moderately bisinuate.

Pronotum 1.2 times as long as wide; sides almost straight and parallel on posterior two-thirds, rather broadly rounded in front; summit in front of middle; anterior slope rather coarsely asperate; posterior area smooth, shining, punctures rather coarse, deep, moderately close. Discal area glabrous, sides and asperate area with rather sparse, moderately long hair.

Elytra 1.4 times as long as wide; outline as in *perturbatus* (Eichhoff); striae 1 slightly, others not impressed, punctures rather coarse, deep, smaller near base and near declivity; interstriae as wide as striae, smooth, shining, impunctate except two or three punctures on each near declivity. Declivity about as in female *perturbatus*; lateral margins armed by four spines as in *perturbatus*, but smaller, spines 2 and 3 with a moderately developed basal connection; subapical margin subacute, less strongly elevated than in related species.

FEMALE.— Similar to male except basal connection between spines 2 and 3 more poorly developed.

DISTRIBUTION.— Wisconsin and New Jersey to E Texas and Florida.

USA: **Alabama**: Mobile. **Arkansas**: DeQueen. **District of Columbia**: Washington. **Florida**: Baldwin, Dade Co., Gainesville, Lake Co., LaBelle, Oleno St. Pk., Orlando, Tampa. **Georgia**: Cornelia, Clarke Co., Everett, Rebun, Tybee. **Louisiana**: Bogalusa. **Mississippi**: Hattiesburg. **New Jersey**: Trenton. **North Carolina**: Ashville, Broadman, Flat Rock, Horse Cove, Pink Beds, Southern Pines, Tryon. **Pennsylvania**: Arendtsville, Chambersburg, Mt. Alto, North Mt., Philadelphia, York. **South Carolina**: Chicora, Greenville, Lumber, Spartinsburg. **Texas**: Call, Karnack, Kirbyville, Nacogdoches, Sourlake. **Virginia**: Camp Pickett in Nottoway Co., Richardsville. **West Virginia**: Kanawha Station, Morgantown, Pendleton, Roosevelt. **Wisconsin**: Madison. OTHER AREAS: Bahama Islands.

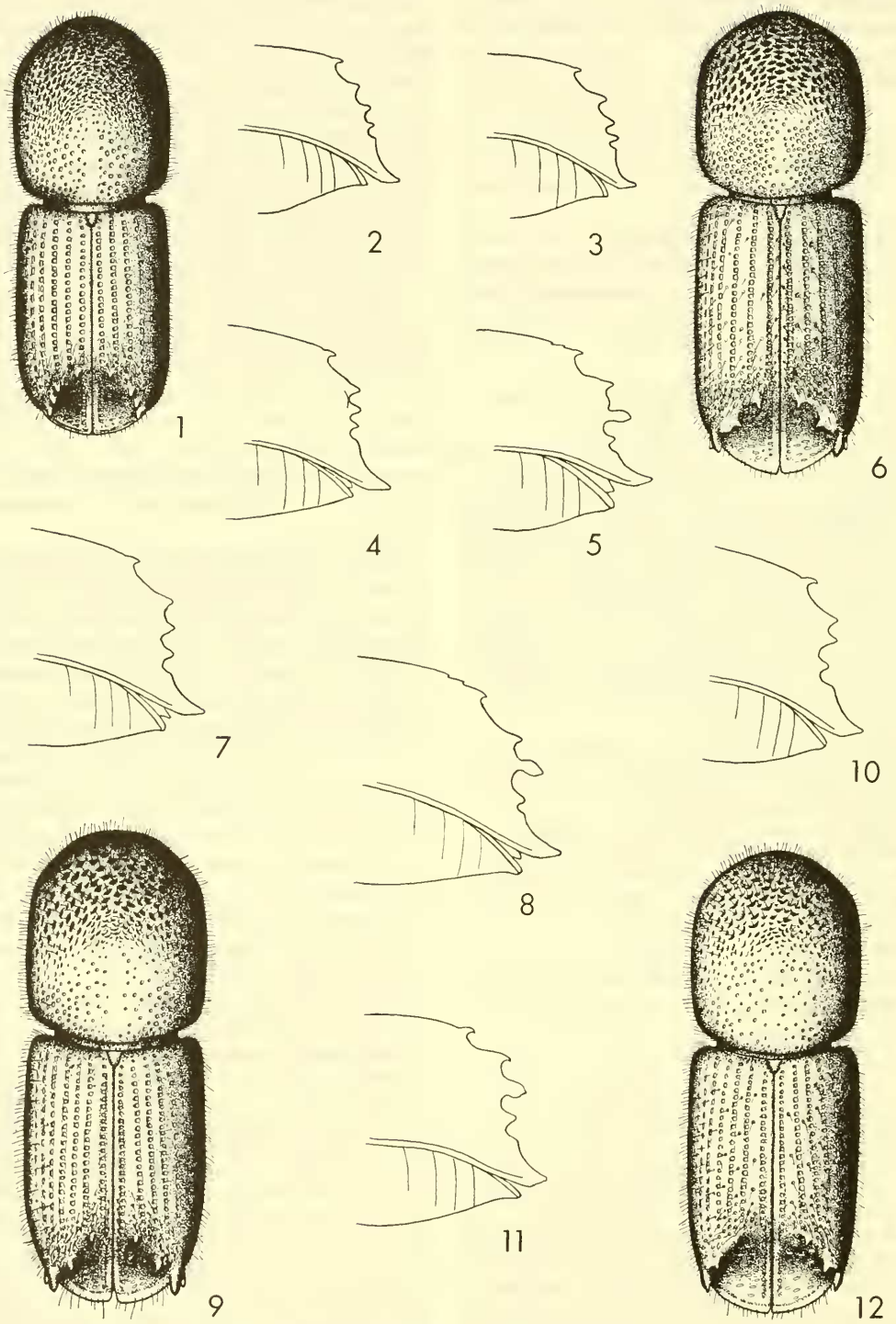



Fig. 165. *Ips* spp.: 1, 3, *avulsus*, male, 2, same, female; 4, *bonanseai*, female, 5–6, same, male; 7, *pini*, female, 8–9, same, male; 10, *perroti*, female, 11–12, same, male. (After Hopping 1964:973.)

HOSTS.— *Pinus* spp.

BIOLOGY.— As in *pini*.

NOTES.— The above treatment was based on 528 specimens, including the specimens of LeConte and Schwarz, some of which may have been examined by Eichhoff. This species is easily identified from the original description. Eichhoff (1878:256) gives Carolina as the type locality.

### 20. *Ips bonanseai* (Hopkins)
Fig. 165

*Tomicus bonanseai* Hopkins, 1905, Preprint of Proc. Ent. Soc. Washington 7:76 (Lectotype, male; Tacubaya, Mexico; U.S. Nat. Mus., 7514, present designation)

DIAGNOSIS.— This species is distinguished from *pini* (Say) by the smaller size, by the differences in pronotal punctures cited in the above key, by the distribution, and by the larger frontal tubercle, which is connected by a low costa to a smaller epistomal tubercle.

MALE.— Length 2.9–3.4 mm, 2.5 times as long as wide; color very dark reddish brown.

Frons essentially as in *pini* except frontal granules less abundant, larger but lower, fewer than one-fourth of them above upper level of eyes; median tubercle distinctly larger, and connected by a weak costa to a slightly smaller median tubercle on epistoma.

Pronotum as in *pini* except punctures on disc and lateral areas about equal in size. Elytra as in *pini* except strial punctures evidently average very slightly larger.

FEMALE.— Similar to male except declivital spines slightly smaller, 3 usually not capitate.

DISTRIBUTION.— S Arizona to Honduras.

USA: **Arizona**: Graham Mts., Pima Co., Pinaleno, Portal, Rustler Peak in Chiricahua Mts., Safford, Santa Catalina Mts., Santa Rita Mts. MEXICO: **Chiapas**: San Cristóbal. **Distrito Federal**: Mexico City. **Durango**: El Salto, La Ciudad. **Hidalgo**: Tulancingo. **Jalisco**: El Tala. **Mexico**: Amecameca. **Michoacán**: Bosenchene. **Puebla**: Texmelucan. **Temescaltepec**: Real de Arriba. **Veracruz**: Las Vigas. GUATEMALA: Guatemala. HONDURAS: Buenos Aires in Cortéz.

HOSTS.— *Pinus montezumae*, *P. ponderosa*, *P. pseudostrobus*, *P.* spp.

BIOLOGY.— Evidently as in *pini*, but found more commonly in limbs.

NOTES.— The above treatment was based on the holotype of *bonanseai* and on 964 other specimens. Hopkins based this species on a syntypic male and female. Although his male is in poor condition, its characters are more diagnostic; therefore, I here designate that male as the lectotype of *bonanseai*.

### 21. *Ips pini* (Say)
Figs. 165, 166

*Bostrichus pini* Say, 1826, J. Acad. Nat. Sci. Philadelphia 5:257 (Syntypes?: probably Pennsylvania; evidently lost)

*Bostrichus dentatus* Sturm, 1826, Catalog meiner Insecten-Sammlung, Erster Theil, Käfer, p. 76 (Amer. Bor.); Eggers, 1931, Wiener Ent. Zeit. 47:185. *Synonymy*

*Bostrichus pallipes* Sturm, 1826, Catalog meiner Insecten-Sammulung, Erster Theil, Käfer, p. 76 (apparently as nomen nudum); Eggers, 1931, Wiener Ent. Zeit. 47:185. *Synonymy*

*Tomicus praefrictus* Eichhoff, 1868, Berliner Ent. Zeitschr. 11:401 (Syntypes?; Amerique boreali; presumably lost with Hamburg Mus.); Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:252. *Synonymy*

*Tomicus oregonis* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:274(Holotype, male; Oregon; Brussels Mus.); Hopping, 1964, Canadian Ent. 96:974. *Synonymy*

*Tomicus rectus* LeConte, 1876, Proc. Amer. Philos. Soc. 15:365 (Lectotype, female; Oregon, only a blue paper disk on lectotype; Mus. Comp. Zool., 1023, present designation); Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):117. *Synonymy*

*Ips laticollis* Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):116 (Lectotype, male; Ottawa, Ontario, Canada; Canadian Nat. Coll., 9303, designated By Bright, 1967, Canadian Ent. 99:675); Wood, 1957, Canadian Ent. 89:398. *Synonymy*

DIAGNOSIS.— This species is distinguished from the very closely related *bonanseai* (Hopkins) by characters summarized in the above key and in the diagnosis of *bonanseai*.

MALE.— Length 3.3–4.3 mm, 2.5 times as long as wide; color dark reddish brown to almost black.

Frons broadly convex, moderately, narrowly, transversely impressed above epistoma; surface shining, irregular, rather coarsely, deeply, closely punctured on vertex, intermixed with and gradually replaced by rather coarse, rounded granules toward epistoma, at least a third of granules above upper level of eyes; a moderately large major tubercle on median line midway between upper level of eyes and epistoma; epistomal margin with a row of rather coarse tubercles, without a major tubercle on median line; vestiture of sparse, fine, long hair. Sutures of antennal club moderately bisinuate.

Pronotum 1.1 times as long as wide; essentially as in *avulsus* except punctures in discal area slightly smaller, those near lateral margins slightly larger.

Elytra 1.7 times as long as wide; as in *perturbatus* except striae 1 weakly, others not impressed; interstriae smooth, shining, impunctate, usually each with one or two punctures near declivital margin; four spines on lateral margins as in *perturbatus* except apex of spine 3 bent slightly ventrad.

FEMALE.— Similar to male except major frontal tubercle slightly smaller; declivital spines slightly smaller, particularly 3, spine 3 usually not capitate.

DISTRIBUTION.— Alaska and Newfoundland to Chihuahua and North Carolina.

ALASKA: Two localities at southern tip. CANADA: Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland, Nova Scotia, Ontario, Quebec, Saskatchewan, Yukon. USA: Arizona, California, Colorado, Connecticut, District of Columbia, Idaho, Maine, Massachusetts, Michigan, Minnesota, Montana, Nebraska, Nevada, New Hampshire, New Mexico, New York, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Utah, Vermont, Washington, West Virginia, Wisconsin, Wyoming. MEXICO: **Chihuahua**: La Laja.

HOSTS.— *Pinus banksiana*, *P. contorta*, *P. jeffreyi*, *P. ponderosa*, *P. strobus*, rarely in other hosts.

BIOLOGY.— Unthrifty, fallen, or cut trees and large limbs are selected for attack. It frequently infests the tops and larger limbs of trees being attacked by *Dendroctonus* and thereby may accelerate and intensify an epidemic. They rarely are able to sustain a primary attack without the association of *Dendroctonus*. The parental galleries are Y-shaped and longitudinal, usually with three females associated with each male. The egg galleries are comparatively long. From three to four generations may be completed each year.

NOTES.— The above treatment was based on the type series of *rectus* and *laticollis*, on the LeConte series of *pini*, on the holotype of *oregonis*, and on 3,834 other specimens. The identity of *pini* was established by LeConte from notes and specimens of T. W. Harris, who saw Say's types. Based on specimens sent

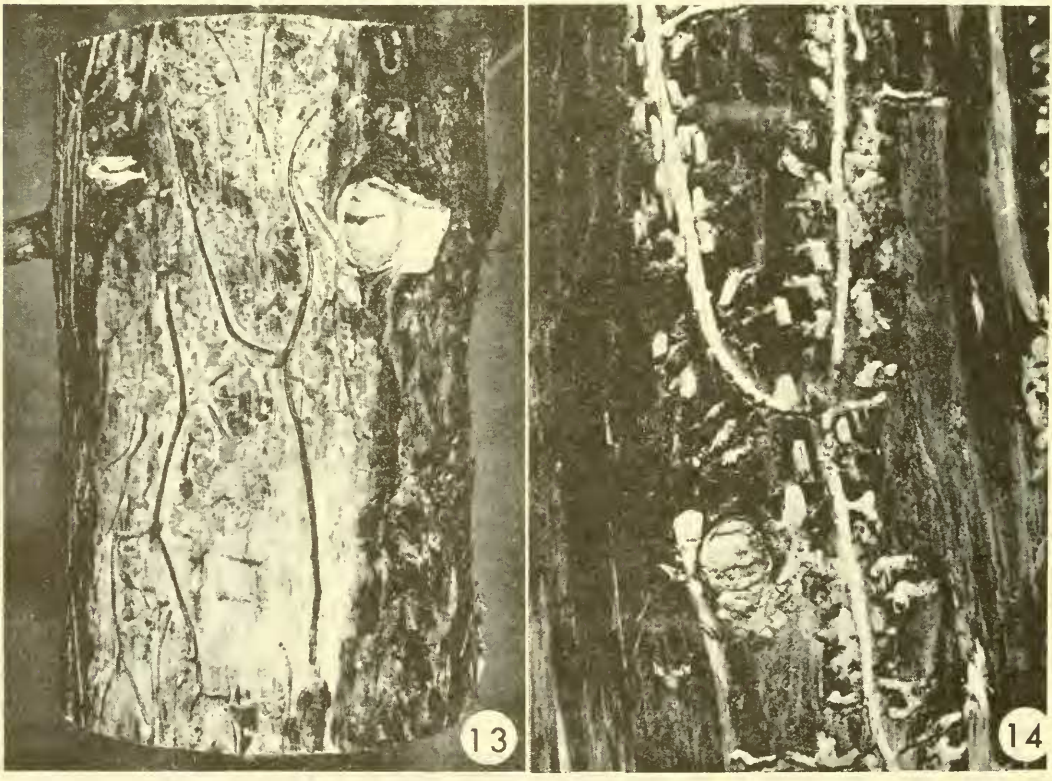



Fig. 166. *Ips* spp., galleries: 13, *pini*; 14, *perroti*. (After Hopping 1964:975.)

by LeConte, Eichhoff placed his *praefectus* in synonymy. The first specimen of *rectus* now in the LeConte collection and labeled Type No. 1023, is here designated as the lectotype of *rectus* LeConte.

### 22. *Ips integer* (Eichhoff)
Figs. 167, 168

*Tomicus integer* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:273 (Syntypes?; Mexico; presumably lost with Hamburg Mus.)

DIAGNOSIS.— This species is distinguished from *plastographus* (LeConte) by the larger average size, by the carinate ridge connecting the major median frontal tubercle to the epistomal margin, and by other characters summarized in the above key.

MALE.— Length 4.6–5.7 mm, 2.6 times as long as wide; color brown to almost black.

Frons convex, with a weak, transverse impression above epistoma; surface shining, coarsely, closely granulate from epistoma to vertex, punctures almost obsolete except on vertex; a coarse major median tubercle intermediate in position between epistoma and upper level of eyes connected by an elevated costa to another smaller major tubercle on epistoma; epistoma with a transverse row of coarse tubercles. Vestiture fine, sparse, long. Antennal club with sutures 1 and 2 acutely angulate.

Pronotum 1.1 times as long as wide; as in *perturbatus* except punctures on posterior half moderately coarse, close, rather deep, those on posterior part of disc decreasing in size until rather small near posterior margin.

Elytra 1.5 times as long as wide; outline essentially as in *perturbatus*; striae 1 slightly, others not impressed, punctures moderately coarse, rather deep; interstriae smooth, shining, one to one and one-half times as wide as striae, impunctate at least on anterior two-thirds, fine, uniseriate punctures near declivity, sometimes extending almost to middle of disc. Declivity basically as in *perturbatus*, with spine 3 larger, capitate, apex usually not bent. Vestiture as in *perturbatus*.

FEMALE.— Similar to male except major tubercles on frons slightly smaller; declivital spine 3 smaller, not capitate.

DISTRIBUTION.— British Columbia and South Dakota to Guatemala (eastern slopes only of the Sierra Nevada Mountains in California).

CANADA: **British Columbia**: Armstrong, Beaverdell, Canal Flats, Coldwater Creek, Cottrell, Jerome, Kimberley, Lorna, Lumby in Creighton Valley, Merritt in Midday Valley, Nicola, Oliver, Peachland, Princeton, Skookumchuck, Summerland, Vernon, Wasa, Westwold. USA: **Arizona**: Alpine in Greenlee Co., Chiricahua Mts., Flagstaff, Ft. Valley, Globe, Gila N.F., Grand Canyon, Jerome, Kaibab N.F., Kendrick Mt., Lake Mary, Mormon Lake, Mt. Lemon, Paradise, Portal, Prescott, Safford, San Francisco Mts., Santa Catalina Mts., Springvale, White Mt., Williams. **California**: Alpine Co., Antelope Creek in Siskiyou Co., Clio in Plumas Co., Downieville in Sierra Co., Norval Flats and Poison Lake in Lassen Co. **Colorado**: Bailey, Boulder, Colorado N.F., Fish Creek in Montezuma Co., Hustead, Larkspur, Montezuma N.F., Norwood, Pagosa Springs, Pingree N.P., San Isobelle N.F., Trichere, Waldo Canyon, Woodland Park. **Idaho**: Cascade, Centerville, Coeur d'Alene, Cragmont, Moscow, Nezperce, Orofino, St. Joseph N.F., Smiths Ferry. **Montana**: Bull Mts., Darby, Drummond, Havre, Pine Grove, Rocky Boy Indian Reservation in Hill Co., Warland. **New Mexico**: Capitan, Cloudcroft, Jemez Springs, Las Vegas, Lincoln N.F., Mescalero Indian Reservation, Parsons, Ruidoso, Sacramento Mts., Santa Fe, Vermejo. **Oregon**: Baker, Bend, Dallas, Grant Co., Hidaway, Jackson Co., Kirk, Sparta, Summit Prairie, Willowa. **South Dakota**: Harney. **Utah**: Long Hollow in Dixie N.F., Long Valley Junction, Navajo Mt., Panguitch. **Washington**: Buckeye, Mt. Adams, Palouse, Soda Falls, Spokane, Yakima. MEXICO: **Chihuahua**: La Laja, Mesa del Huracán. **Durango**: Buenos Aires, El Salto. **Hidalgo**: Tulancingo. **Jalisco**: Mt. Colima, Mazamitla. **Mexico**: Laguna de Zempodla. **Michoacán**: Carapan. **Puebla**: Texmelucan. **Tlaxcala**: Desierto Leones. **Veracruz**: Las Vigas, Perote. **Zacatecas**: "El Gardo," Valparaíso. GUATEMALA: San Cristóbal, Sololá.

HOSTS.— *Pinus arizonica*, *P. chihuahuana*, *P. cooperi*, *P. durangensis*, *P. engelmannii*, *P. leiophylla*, *P. patula*, *P. ponderosa*, *P. pseudostrobus*, and *P. tenuifolia*; rarely *P. contorta* and other conifers.

BIOLOGY.— Thick barked fallen trees or logs are usually selected for attack. From one to five elongate, longitudinal egg galleries are associated with each nuptial chamber. Larval mines are moderately long. Young adults do not tunnel into the wood at or near the pupal cells as in *plastographus*.

NOTES— The above treatment was based on 1,276 specimens. The identity of this species was based on the series of Chapuis, LeConte, Hopkins, Swaine, Blackman, and Eggers.

### 23. *Ips plastographus plastographus* (LeConte)

Fig. 160

*Tomicus plastographus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:163 (Holotype, male; California; Mus. Comp. Zool., 1016)

*Ips plastographus plastographus*: Lanier, 1970, Canadian Ent. 102:1415

DIAGNOSIS.— This species is distinguished from *integer* (Eichhoff) by the smaller average size, by the absence of a connecting carina from the major median frontal tubercle to the epistomal margin, and by the smaller, circular strial punctures. From *p. maritimus* Lanier it differs by the larger major frontal tubercle and by other minor characters included in the above key.

MALE.— Length 4.0–5.2 mm, 2.6 times as long as wide; as in *integer* except as noted in diagnosis and below.

Major median frontal and epistomal tubercles smaller, not connected by an elevated costa; sutures of antennal club angled at about 90 degrees, not acute; strial punctures smaller than in *integer*, interstriae one and one-half to two times as wide as striae.

FEMALE.— Similar to male except major frontal tubercles smaller; declivital spine 3 distinctly smaller, usually not capitate.

DISTRIBUTION.— S British Columbia and NE Wyoming to central California.

CANADA: **British Columbia**: Cranbrook. USA: **California**: Numerous localities in the following counties (Lanier 1970): Alpine, El Dorado, Fresno, Lassen, Madera, Mariposa, Mono, Nevada, Placer, Plumas, Riverside, San Bernardino, Shasta, Siskiyou, Trinity, Tulare, Tuolumne. **Idaho**: Targhee Pass in Fremont Co. **Oregon**: Crater Lake, Diamond Lake in Douglas Co., Fly Creek in Union Co., Florence, Lake of the Woods in Klamath Co., Sand Lake in Siuslaw N.F., Warner Mts. **Montana**: Drummond, Missoula N.F., Parsnip Mt. in Lincoln Co., Georgetown Lake in Deer Lodge Co., Whitefish in Flathead Co. **Wyoming**: Old Faithful in Yellowstone N.P., Shoshone N.F.

HOST.— *Pinus contorta*, rarely in *P. ponderosa*.

BIOLOGY.— The upper side of fallen or cut logs is usually selected for attack. Two or three longitudinal egg galleries extend from each nuptial chamber. When two egg tunnels extend in the same direction, they are parallel and less than 5 cm apart. Larval mines wander irregularly; young adults have the unusual habit of boring into the wood to a depth of about 1 cm (Lanier 1967).

NOTES.— The above treatment was based on the male holotype and on 176 other specimens.

### 24. *Ips plastographus maritimus* Lanier

*Ips plastographus maritimus* Lanier, 1970, Canadian Ent. 102:1417 (Holotype, female; Rio del Mar, Santa Cruz Co., California; Canadian Nat. Coll.)

DIAGNOSIS.— This subspecies is distinguished from *p. plastographus* (LeConte) by the near absence of the major median frontal tubercle, and by other minor characters included in the above key.

MALE.— Length 4.0–5.1 mm, 2.6 times as long as wide; as in *p. plastographus* except for the smaller major frontal tubercles, more widely spaced striations on the pars stridens, and proportionately shorter struts on the male aedeagus.

FEMALE.— Apparently similar to male except declivital spine 3 smaller.

DISTRIBUTION.— The coastal margin of Oregon and California.

USA: **California**: Carmel, Cambria Pines in San Luis Obispo Co., Crescent City, Del Monte, Ft. Brag, Inverness, Myers Flat, Monterey, Oakland, Pacific Grove, Palo Alto, Rio del Mar, San Mateo. **Oregon**: Seaside, Tillamook.

HOSTS.— *Pinus contorta*, *P. muricata*, *P. radiata*, one authentic record from *Picea sitchensis*.

BIOLOGY.— Apparently as in *p. plastographus*.

NOTES.— The above treatment was based on the holotype and on 87 other specimens. This is not a well-marked subspecies and its validity is very doubtful.

### 25. *Ips emarginatus* (LeConte)

Figs. 167, 168

*Tomicus emarginatus* LeConte, 1876, Proc. Amer. Philos. Soc. 15:364 (Lectotype, female; Oregon; Mus. Comp. Zool., 1024, present designation)

DIAGNOSIS.— This very large and distinctive species is easily recognized by characters summarized in the above key.

MALE.— Length 5.5–6.9 mm, 2.8 times as long as wide; color very dark brown.

Frons broadly convex, a slight impression above epistoma; surface shining, coarsely, closely granulate from epistoma to well above eyes, granules gradually replaced by punctures toward vertex; epistoma with a

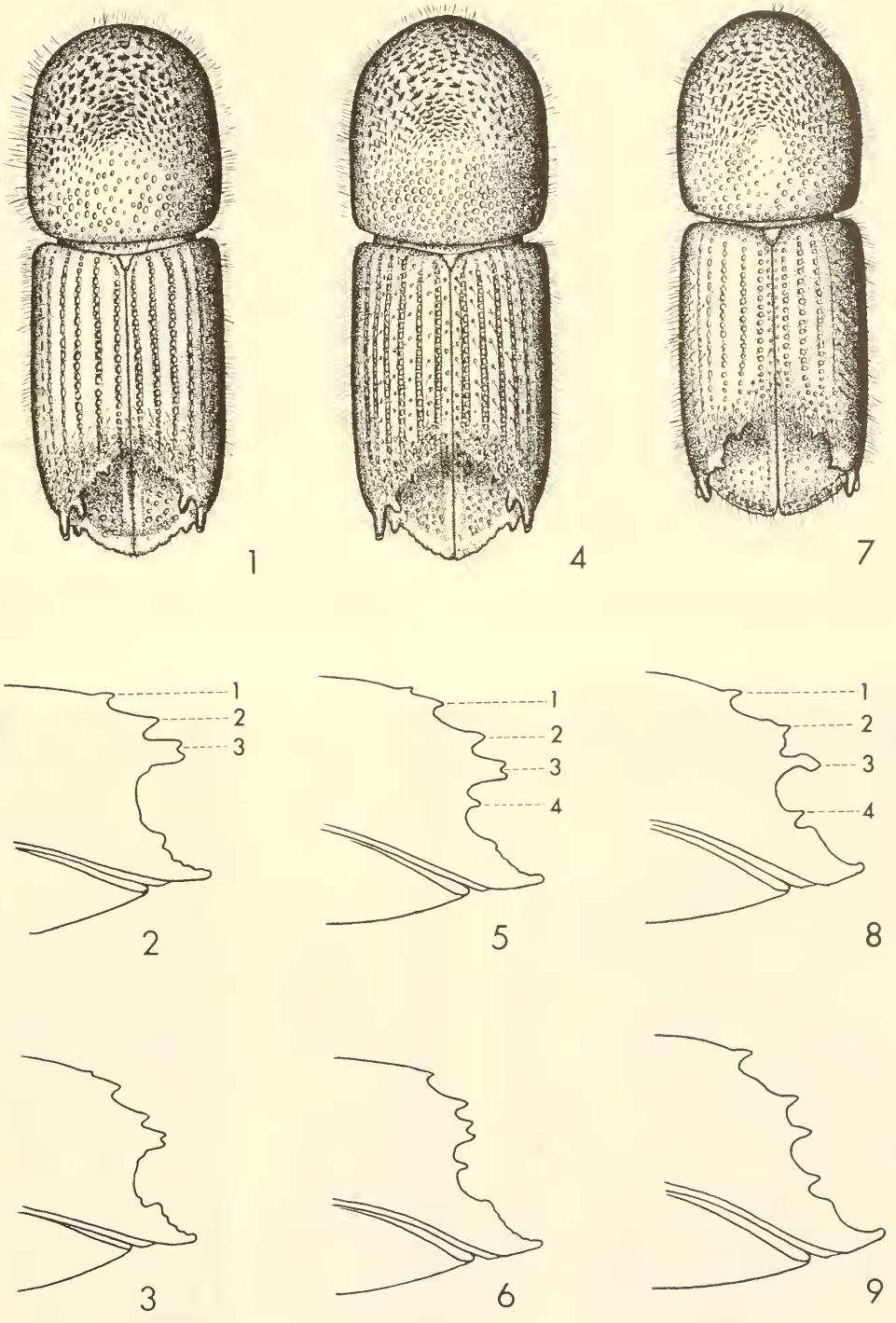



Fig. 167. *Ips* spp.: 1–2, *emarginatus*, male, 3, same, female; 4–5, *knausi*, male, 6, same, female; 7–8, *integer*, male, 9, same, female. (After Hopping 1963:1204.)

row of granules a major rounded tubercle on median line. Vestiture fine, long, sparse.

Pronotum 1.1 times as long as wide; outline essentially as in *perturbatus*; posterior areas smooth, shining, punctures rather large, close, deep.

Elytra 1.6 times as long as wide; outline essentially as in *perturbatus* except posterior margin obtusely subangulate; striae 1 moderately, others weakly impressed, punctures rather small, deep, close; interstriae twice as wide as striae, smooth, shining, impunctate except near declivity. Declivity broadly, deeply excavated, much as in allied species; spine 1 rather small, in line with striae 2; spine 2 conspicuously larger than 1, in line with striae 3; spine 3 enlarged, laterally compressed, apically emarginate, longer than 2; spine 4 usually obsolete although occasionally present in rudimentary form; subapical margin strongly produced, its summit undulating slightly; surface of declivital face dull. Vestiture confined to sides, base, and margins of declivity.

FEMALE.— Similar to male except declivital spine 3 somewhat smaller.

DISTRIBUTION.— S British Columbia and E Montana to Baja California.

CANADA: **British Columbia**: Aspen Grove, Merritt in Midday Valley, Kingsvale, Spious Creek, Summerland, Vancouver. USA: **California**: Numerous records from the following counties: Alpine, Calaveras, El Dorado, Glenn, Humboldt, Kern, Lassen, Los Angeles, Madera, Mariposa, Modoc, Mono, Nevada, Placer, Plumas, San Bernardino, Shasta, Siskiyou, Trinity, Tulare, Tuolumne. **Idaho**: Boise, Cascade, Centerville, Idaho City, Kooskia, Moscow, Priest River, Smiths Ferry, Troy, Warm Lake. **Montana**: Columbia Falls, Flathead Lake, Hamilton, Kila (Sedan), Nelson, Pine Grove, St. Regis, Sula. **Oregon**: Ashland, Baker, Cold Springs, Ft. Rock, Grant Co., Grants Pass, Hidaway, Joseph, Klamath Co., Minam N.F., Sisters, Wallo Mt. in Baker Co. **Washington**: Columbia Co. MEXICO: **Baja California**: San Pedro Martín Mt.

HOSTS.— *Pinus jeffreyi, P. monticola, P. ponderosa*, less common in *P. contorta*, and rare in other conifers.

BIOLOGY.— The base and stumps of mature, dying, or cut trees are usually selected for attack. The egg galleries are longitudinal, parallel, and may extend more than 1 m from the nuptial chamber. They may be connected by transverse tunnels. Larval mines are short, with pupation occurring close to the egg gallery. Chamberlin (1958) indicates that a

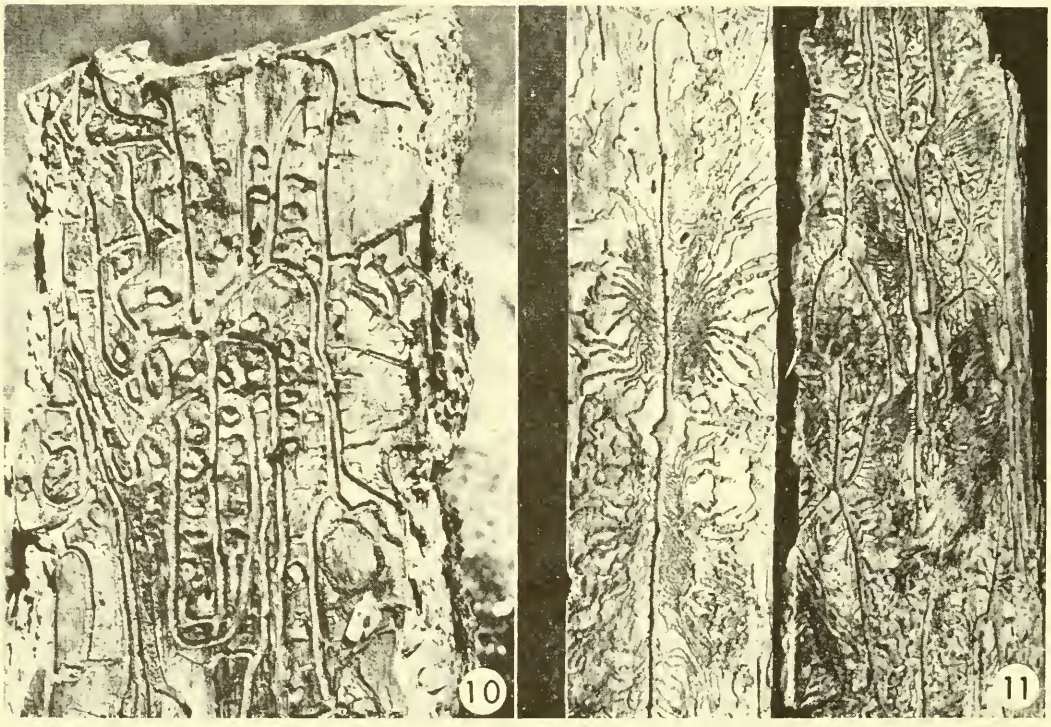



Fig. 168. *Ips* spp., galleries: 10, *emarginatus*; 11, *integer*. (After Hopping 1963:1205.)

generation may be completed in about 10 weeks.

NOTES.— The one female remaining in the LeConte collection, labeled Type No. 1024, is here designated as the lectotype of *emarginatus* LeConte. The original description implies that there were other syntypes. The lectotype and 323 other specimens were used in preparing the above treatment.

### 26. *Ips knausi* Swaine
Fig. 167

*Ips knausi* Swaine, 1915, Canadian Ent. 47:355 (Holotype, male; Cloudcroft, New Mexico; Canadian Nat. Coll., 9305)

DIAGNOSIS.— This species is distinguished from *emarginatus* LeConte by the presence of interstrial punctures, by the presence of spine 4 on the elytral declivity, and by the distribution.

MALE.— Length 4.9–6.4 mm, 2.7 times as long as wide; color dark brown to almost black.

Frons and pronotum as in *emarginatus*.

Elytra as in *emarginatus* except interstriae finely, uniseriately punctured to base, lower point on declivital spine 3 usually slightly longer than upper point; spine 4 almost always present.

FEMALE.— Similar to male except major epistomal tubercle smaller; spine 3 on declivity smaller, sometimes appearing as two separate denticles.

DISTRIBUTION.— S Nevada and E South Dakota to Arizona and New Mexico.

USA: **Arizona**: Chiricahua Mts., Crook N.F., Flagstaff, Huachuca Mts., Jacobs Lake, Kaibab N.F., Santa Catalina Mts., Tucson. **Colorado**: Allens Park, Bailey, Colorado N.F., Estes N.P., Electra Lake near Durango, Evergreen, Jones Ranch near Durango, Las Animas, Lyons, Pine River in La Plata Co., Uncompahgre N.F., Vallecito in La Plata Co., Williams. **Nevada**: Austin. **New Mexico**: Cloudcroft, Lincoln N.F., Ruidosa. **South Dakota**: Black Hills, Elmore. **Utah**: Panguitch.

HOST.— *Pinus ponderosa*.

BIOLOGY.— Evidently similar to *emarginatus*.

NOTES.— The above treatment was based on 141 specimens, several of which were compared to the holotype.

### 27. *Ips calligraphus* (Germar)
Fig. 169

*Bostrichus calligraphus* Germar, 1824, Insectorum species novae aut minus cognitae, descriptionibus illustratae, p. 461 (Syntypes?; Kentucky; presumably in the Berlin Museum).

*Bostrichus exesus* Say, 1826, J. Acad. Nat. Sci. Philadelphia 5:255 (Syntypes; presumably Pennsylvania; evidently lost); LeConte, 1876, Proc. Amer. Philos. Soc. 15:363. *Synonymy*

*Tomicus praemorsus* Eichhoff, 1868, Berliner Ent. Zeitschr. 11:401 (Syntypes?; Amerique boreali; presumably lost with Hamburg Mus.); Eichhoff, 1876, Stettiner Ent. Zeit. 37:378. *Synonymy*

*Tomicus interstitialis* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:273 (Holotype, male; Jamaica; Brussels Mus.); Hopping, 1965, Canadian Ent. 97:803. *Synonymy*

*Ips ponderosae* Swaine, 1925, Canadian Ent. 57:197 (Holotype, male; Coconino N.F., Arizona; Canadian Nat. Coll., 1377); Hopping, 1965, Canadian Ent. 97:803. *Synonymy*

DIAGNOSIS.— The six pairs of spines on the elytral declivity distinguish this species from all other American *Ips*.

MALE.— Length 3.8–5.9 mm, 2.7 times as long as wide; color dark reddish brown.

Frons broadly convex, weakly impressed above epistoma; surface shining, rather coarsely, closely granulate below upper level of eyes, more sparsely granulate above and intermixed with obscure punctures, a major median tubercle equal distance between epistomal margin and upper level of eyes, another smaller major median tubercle on epistoma; epistoma with a transverse row of tubercles. Vestiture of fine, long, sparse hair.

Pronotum 1.2 times as long as wide; sides feebly arcuate on basal two-thirds, rather narrowly rounded in front; summit indefinite, well in front of middle; anterior slope rather coarsely asperate; posterior areas smooth, shining, punctures very fine on disc, slightly larger toward lateral margins. Disc glabrous; fine, long hair moderately abundant on remaining areas.

Elytra 1.6 times as long as wide; sides almost straight and parallel on basal two-thirds, declivital spines 3, 5, and 6 interrupting outline, transverse subapical margin one-third as wide as declivity; striae 1 moderately, others feebly impressed, punctures moderately small, deep; interstriae almost twice as wide as striae, smooth, shining, punctures fine, sparse on anterior half. Declivity broadly, deeply excavated as in allied species; spine 1 small, pointed, slightly mesad of striae 2, spine 2 in line with striae 2, moderately large, somewhat pointed but with elevated enlarged base extending from near its apex to

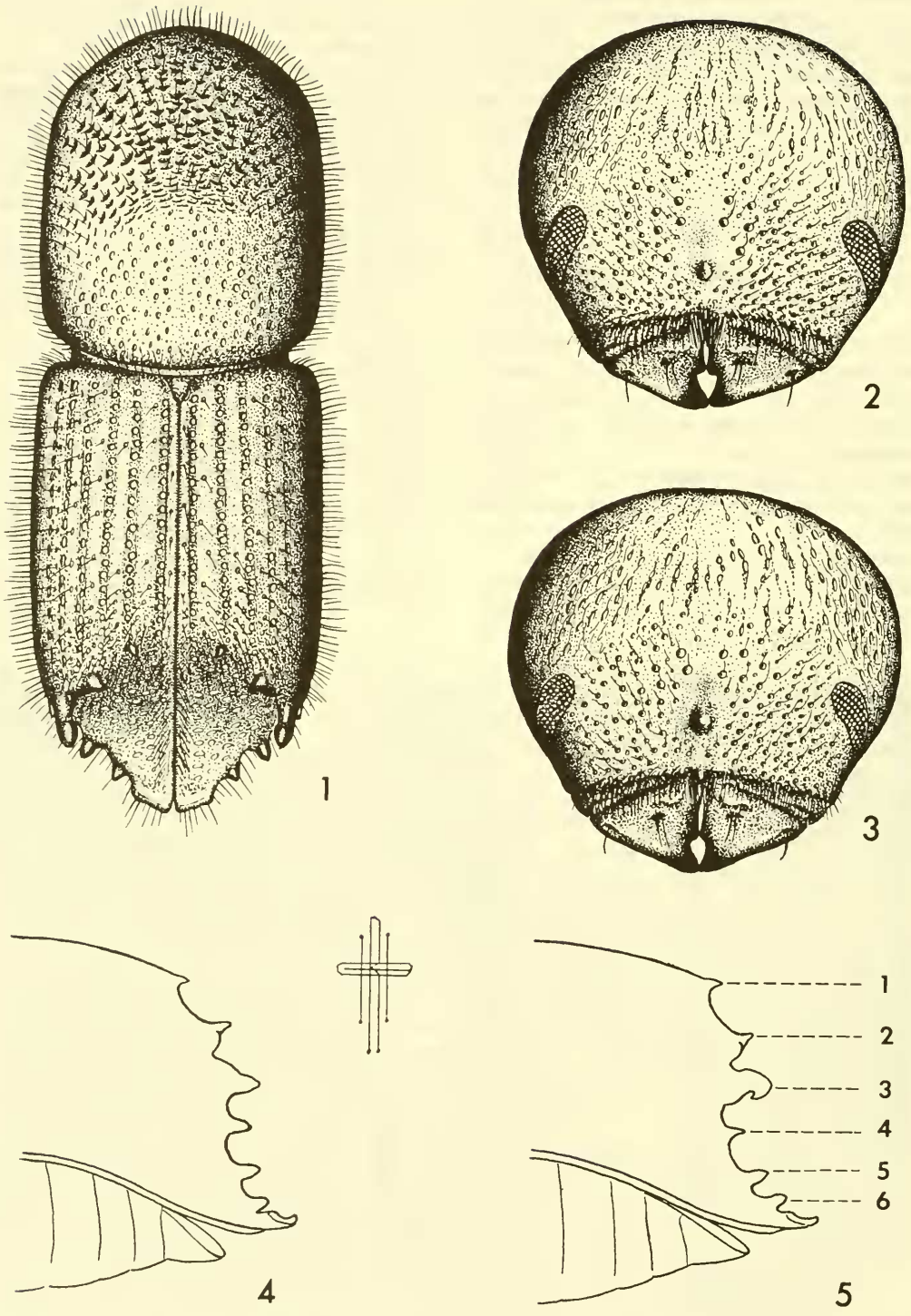



Fig. 169. *Ips calligraphus*: 1, 3, 5, male; 2, 4, female. (After Hopping 1965:804.)

base of spine 3; spine 3 large, capitate, tip bent ventrad; spine 4 rather small, pointed, spine 5 conical, in position occupied by lateral extremity of elevated subapical margin; spine six usually basally subcontiguous with subapical margin; subapical margin short, about one-third as wide as distances between third spines; face of concavity essentially as in *perturbatus*. Vestiture of fine, long hair, more abundant on sides and declivity.

FEMALE.— Similar to male except declivital spines, particularly 3, slightly smaller.

DISTRIBUTION.— California and Quebec to Jamaica and Honduras.

CANADA: Ontario, Quebec. USA: Alabama, Arizona, Arkansas, California, Colorado, Delaware, District of Columbia, Florida, Georgia, Indiana, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, West Virginia, Wisconsin, Wyoming. MEXICO: Chiapas, Hidalgo, Jalisco, Mexico, Michoacán, Sinaloa. CENTRAL AMERICA: Guatemala, British Honduras, Honduras, Nicaragua. OTHER COUNTRIES: Bahama Islands, Dominican Republic, Jamaica.

HOSTS.— *Pinus caribaea*, *P. echinata*, *P. elliottii*, *P. michoacana*, *P. montezumae*, *P. occidentalis*, *P. oocarpa*, *P. ponderosa*, *P. pseudostrobus*, *P. resinosa*, *P. rigida*, *P. strobus*, *P. taeda*.

BIOLOGY.— The habits apparently are about as in *integer*.

NOTES.— The above treatment was based on the type series of *ponderosae*, on the holotype of *interstitialis*, and on more than 1,000 other specimens. The name *calligraphus* was based on the series of Hopkins, Blackman, Eggers, and Swaine.

Lanier (1972) divided this species into *interstitialis* (Mexico, Central America, and one Arizona series) and *calligraphus* (USA) with different subspecies of the latter in the eastern and western areas. Using the characters employed by Lanier, I am neither able to confirm his results, nor am I able to find other characters that subdivide this species. His hybridization results must be evaluated and interpreted as any other taxonomic character. Until considerably more information is available only one species should be recognized.

### 28. *Ips grandicollis* (Eichhoff)

Fig. 170–171

*Tomicus grandicollis* Eichhoff, 1868 (January), Berliner Ent. Zeitschr. 11:402 (Syntypes?; Amerique boreali; presumably lost with Hamburg Mus.)

*Tomicus cacographus* LeConte, 1868 (September), Trans. Amer. Ent. Soc. 2:162 (Lectotype, sex?; Illinois, lectotype bears orange disk; Mus. Comp. Zool., present designation); Blandford, 1898, Ent. News 9:6. *Synonymy*

*Tomicus cribricollis* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:273 (Holotype, male; Mexico; Brussels Mus.); Wood, 1977, Great Basin Nat. 37:385. *Synonymy*

*Ips chagnoni* Swaine, 1916, Canadian Ent. 48:186 (Holotype, male; Montreal Island, Quebec; Canadian Nat. Coll. 9310); Hopping, 1965, Canadian Ent. 97:423. *Synonymy*

*Ips cloudcrofti* Swaine, 1924, Canadian Ent. 56:70 (Holotype, female; Cloudcroft, New Mexico; Canadian Nat. Coll., 699); Wood, 1957, Canadian Ent. 89:397. *Synonymy*

DIAGNOSIS.— This species is distinguished from *lecontei* Swaine by the presence of only one major frontal tubercle, which is placed on the median line well above the epistomal margin. It is somewhat variable geographically.

MALE.— Length 2.9–4.6 mm, 2.7 times as long as wide; color dark reddish brown.

Frons as in *calligraphus* (Germar) except lower, median, epistomal tubercle absent, all granules averaging slightly larger, not quite as abundant. Pronotum 1.26 times as long as wide; as in *calligraphus* except punctures on disc varying from moderately fine to rather coarse on disc, rather coarse in lateral areas.

Elytra 1.5 times as long as wide; outline about as in *calligraphus* except subapical margin wider, with fewer dentations; striae I moderately, others feebly impressed, punctures rather coarse, deep, close; interstriae about one and one-half times as wide as striae, smooth, shining, punctures fine to rather coarse, usually extending from declivity to base on 5–9, variable on 2–4 but almost always present at least on posterior fourth (see taxonomic notes below). Declivity essentially as in *calligraphus* except spine 1 on interstriae 2; spine 3 stout, blunt, with a distinct ventral hook at apex; spines 2, 4, and 5 in normal positions; subapical margin wider than *calligraphus*, ending laterally near base of spine 5. Anterior tibia usually with three teeth.

FEMALE.— Similar to male except major frontal tubercle evidently slightly smaller;

declivital spine 3 slightly smaller, devoid of ventral hook. Anterior tibia usually with four teeth.

DISTRIBUTION.— S Manitoba and S Quebec to Honduras and Florida; introduced into Australia.

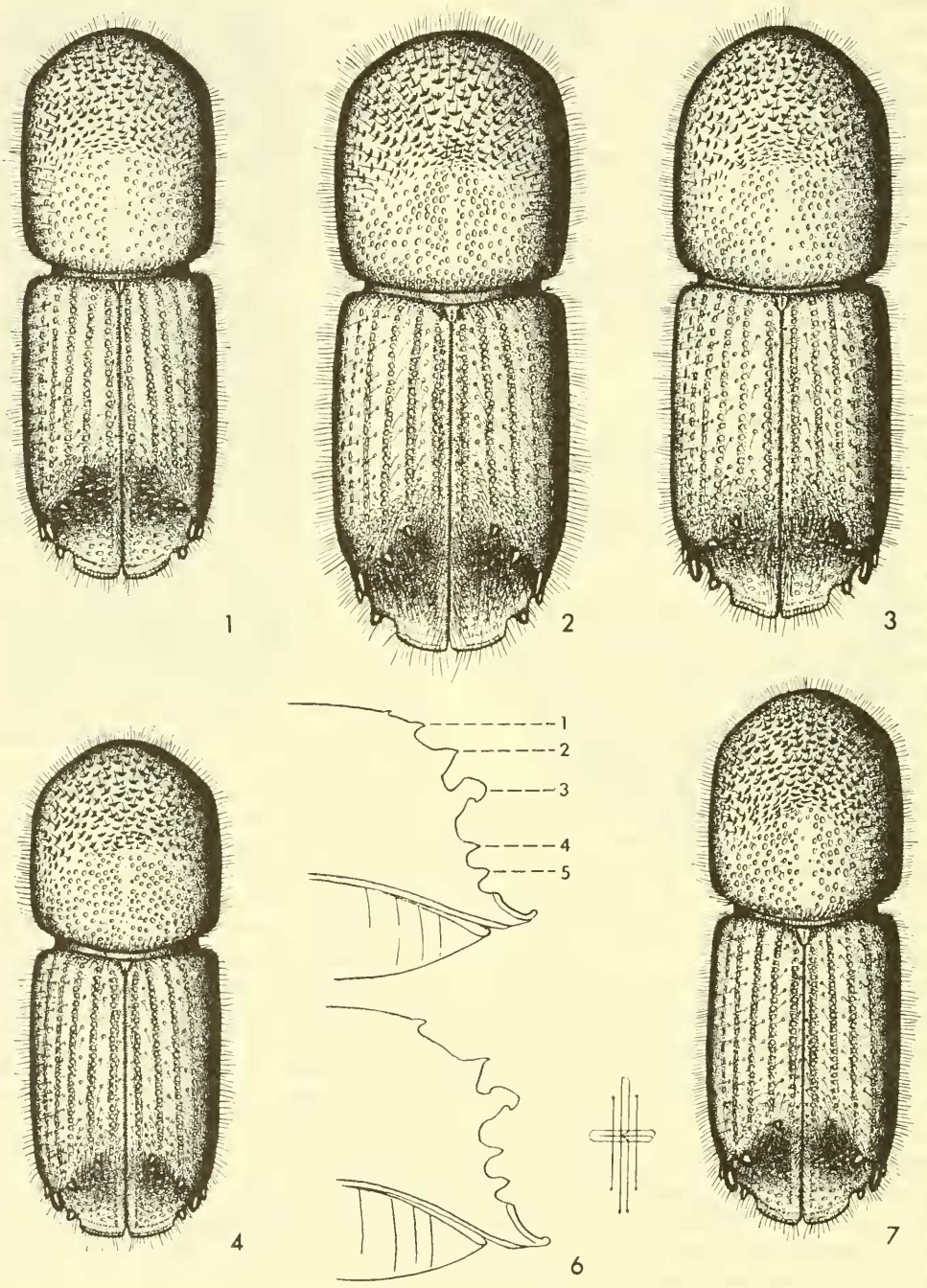



Fig. 170. *Ips* spp., dorsal and lateral aspects of male declivity: 1, 4, *grandicollis*; 2, *montanus*; 3, 5, *paraconfusus*; 6, *lecontei*. (After Hopping 1965:425.)

CANADA: Manitoba, Ontario, Quebec. USA: Alabama, Arkansas, Connecticut, District of Columbia, Florida, Georgia, Illinois, Indiana, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia, Wisconsin. MEXICO: Chiapas, Chihuahua, Durango, Hidalgo, Jalisco, Mexico, Michoacán, Morelos, Puebla, Sinaloa. CENTRAL AMERICA: Guatemala, Honduras, Nicaragua. OTHER COUNTRIES: Bahama Islands, Dominican Republic, Australia (introduced).

HOSTS.— *Pinus banksiana*, *P. caribaea*, *P. durangensis*, *P. echinata*, *P. montezumae*, *P. oocarpa*, *P. palustris*, *P. ponderosa*, *P. pseudostrobus*, *P. resinosa*, *P. rigida*, *P. strobiformis*, *P. sylvestris*, *P. taeda*, *P. tenuifolia*, *P. virginiana*.

BIOLOGY.— The habits evidently are very similar to *calligraphus* except that it is able to breed successfully in smaller limbs, as well as in larger material.

NOTES.— The above treatment was based on the type series of *cacographus*, *chagnoni*, and *cloudcrofti*, on the holotype of *cribricollis*, and on 1,334 other specimens. The first of two syntypes in the LeConte collection, labeled Type No. 1017, is here designated as the lectotype of *cacographus* LeConte.

There is distinct geographical variation in the number and position of punctures on discal interstriae 2–4. Specimens from eastern Canada and the northeastern United States rarely have any punctures on the anterior three-fourths; specimens in my series from Georgia are punctured to the middle of the disc; those from New Mexico to Honduras are sparsely punctured to the base at least on interstriae 3.

Males from a series from DeQueen, Arkansas, and others from Carapan, Michoacán, were dissected for study of the genitalic structures. In both series the apex of the aedeagus resembled Lanier's (1970:1154) Figure 37, of *grandicollis*, but the basal struts were short, as in his Figure 35, of *cribricollis*. Five males from each series gave aedeagus/struts ratios of 1.11–1.17 for the Arkansas specimens, and 1.10–1.17 for the Michoacán series. Evidently Lanier's *grandicollis* specimens were larger than normal; increased body size is often associated with proportionately longer struts. It should be noted that specimens from Canada and the Great Lakes area average slightly larger in size than those from the southern two-thirds of the range.

### 29. *Ips lecontei* Swaine
Figs. 170–171

*Ips lecontei* Swaine, 1924, Canadian Ent. 56:70 (Holotype, male; Arizona; Mus. Comp. Zool., 1025, second specimen in LeConte series of *confusus*)

DIAGNOSIS.— This species is distinguished from other American 5-spined *Ips* by the absence of a major median frontal tubercle in the male; it is replaced by a pair of submedian tubercles on the male epistoma.

MALE.— Length 4.0–4.7 mm, 2.6 times as long as wide; color very dark brown.

Frons broadly convex, weakly impressed above epistoma; surface shining, rather coarsely, moderately closely granulate to above upper level of eyes, granules above eyes gradually replaced by fine, deep punctures; central area often with a pair of transverse tubercles; epistoma bearing a row of tubercles, median pair conspicuously enlarged. Vestiture of fine, sparse, long hair.

Pronotum 1.2 times as long as wide; essentially as in *calligraphus* (Germar) except summit more distinct; posterior area smooth, shining, punctures small to moderately large, close, not larger in lateral areas.

Elytra 1.5 times as long as wide; outline as in *grandicollis* (Eichhoff); striae 1 moderately, others obscurely impressed, punctures moderately large, deep; interstriae almost twice as wide as striae, punctures fine, distinct, regular on posterior half, very sparse on anterior half of disc. Declivity as in *grandicollis*; spine 1 on lateral half of interstriae 2, spine 2 on interstriae 4; spine 3 large, with a dorsal hump on is basal half, a ventral notch and hook on its distal half; spines 4 and 5, declivital face, and subapical margin essentially as in *grandicollis* except lateral end of subapical margin with a feeble notch suggesting a sixth spine. Vestiture essentially as in allied species. Anterior tibia with three teeth.

FEMALE.— Similar to male except major frontal tubercles, particularly on epistoma, reduced in size; declivital spine 3 slightly smaller with dorsal hump and ventral notch usually less conspicuous; anterior tibia with four teeth.

DISTRIBUTION.— N Arizona and S New Mexico to Honduras.

USA: **Arizona**: Chiricahua Mts., Coconino N.F., Jerome, Prescott, Santa Rita Mts., Tonto N.F. **New Mexico**: Lake Roberts. MEXICO: **Chihuahua**: Mesa del Huracan, Olingas. **Durango**: El Salto. **Colima**: Colima. **Jalisco**: Mazamitla, Mt. Colima. HONDURAS: Buenos Aires in Cortez.

HOSTS.— *Pinus ponderosa* and *P. pseudostrobus*.

BIOLOGY.— Apparently about as in *calligraphus*.

NOTES.— The above treatment was based on the holotype and on 433 other specimens.

### 30. *Ips montanus* (Eichhoff)

Figs. 170–171

*Tomicus montanus* Eichhoff, 1880, Die Europäischen Borkenkäfer, p. 219 (Lectotype, female; California; U.S. Nat. Mus., present designation)

*Ips vancouveri* Swaine, 1916, Canadian Ent. 48:188 (Holotype, male; Quathiaski Cove, Vancouver Island, British Columbia; Canadian Nat. Coll., 9304); Wood, 1957, Canadian Ent. 89:398. *Synonymy*

DIAGNOSIS.— This species is distinguished from *paraconfusus* Lanier by the larger size, by the poorly developed or absent frontal fovea in both sexes, by the position of the major male median tubercle being much higher on the male frons, and by the host.

MALE.— Length 4.6–5.4 mm, 2.6 times as long as wide; color very dark brown.

Frons convex, a slight impression above epistoma; surface shining, rather coarsely granulate to well above eyes, gradually replaced above by small punctures; a coarse median tubercle with its upper margin at upper level of eyes; epistoma with a row of coarse tubercles except at median line; vestiture of fine, sparse, long hair.

Pronotum 1.13 times as long as wide; as in *lecontei* except punctures in posterior areas moderately coarse.

Elytra 1.5 times as long as wide; outline and disc about as in *lecontei*. Declivity much as in *lecontei* except spine 1 on median half of interstriae 3 (closer to spine 2 than to suture), other spines evidently slightly more slender, and subapical margin without a feeble notch near its lateral end. Anterior tibia with three teeth.

FEMALE.— Similar to male except frons with a shallow median fovea at upper level of eyes, a feeble major tubercle often between fovea and epistomal margin; granules on epistomal margin much smaller; declivital spine 3 slightly smaller, with dorsal hump and ventral notch less distinct; anterior tibia with four teeth.

DISTRIBUTION.— S British Columbia and W Montana to central California.

CANADA: **British Columbia**: Campbell River, Courtenay, Kaslo, Qualicum, Trinity Valley. USA: **California**: Avalanche Meadow in Tulare Co., Badger Flat in Lassen Co., Callihan, Caribou Lake in Siskiyou Co., Cisco, Deadfall Lakes in Siskiyou Co., Fallen Leaf Lake, Grassy Lake in Lassen Co., Kingvale, Klamath, Mt. Brewer, Old Soda Springs, Trinity Center, Weed, Yosemite. **Idaho**: Avery, Coeur d'Alene, Collins, Deception Creek Experimental Forest, Evansville, Kootenai, Nickle Plate Mt. in Kaniksu N.F., Pierce, Priest Lake, Priest River, Prichard, St. Joseph. **Montana**: Kootenai N.F. **Oregon**: Crater Lake, Lake of the Woods, Prospect, Willamette Pass. **Washington**: Metaline Falls, Mt. Rainier, Naches, Spokane Falls.

HOST.— *Pinus monticola*, uncommon in *P. albicaulis*, *P. balfouriana*.

BIOLOGY.— Apparently very similar to *paraconfusus*.

NOTES.— The above treatment was based on 288 specimens and on one female cotype from the original series.

Eggers (1933:20) examined the syntypic original series before the Hamburg Museum was destroyed and indicated that the specimens were labeled either "Cisco" (California) or "Cal." Schedl (pers. comm.) indicated that all specimens he saw in this series in the Hamburg Museum were labeled as cotypes. There is one female in the Swaine material at the Canadian National Collection (Wood 1957:398) bearing a small triangular blue-colored label, a rectangular label with the word "Cal.," apparently in Eichhoff's hand, a rectangular label with "14" in Eichhoff's hand, another "au confusus Lec.?" apparently written by E. A. Schwarz, and one "Tomicus montanus Eich., Type," written by E. A. Schwarz. This was species no. 14 in a series of more than 100 species sent to Schwarz by Eichhoff prior to 1896; it was borrowed by Swaine (pers. comm.) prior to 1920 for an intended revision of the genus. Because Eichhoff did not designate a type, this specimen, and others in his series, could have been no more than syntypes regardless of the "Type" label. Because the labels on this specimen are similar to those seen on other original Eichhoff type material of other species in the U.S.

National Museum and in the Eggers and Schedl collections, because part of the original series was from California, and because Swaine (pers. comm.) had borrowed several types for an intended revision of the genus about 1920, without returning them (as curator of the Swaine collection, I returned in 1955 to the USNM all except the Eichhoff type. I did not realize until 1974 that the Eichhoff type had also been borrowed from the USNM), I regard this specimen as a syntype and here designate it as the lectotype of *montanus* Eichhoff. A second specimen in the Canadian National Collection, labeled "Cisco, Julio '69," and "Ips montanus Eichhoff, mit type vergleichen, Eggers det.," is probably from the original series also, but there are no labels suggesting status as a cotype. The lectotype is to be returned to the U.S. National Museum.

### 31. *Ips paraconfusus* Lanier

Figs. 170–171

*Ips paraconfusus* Lanier, 1970, Canadian Ent. 102:1145 (Holotype, female; Avery, Calaveras Co., California; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *montanus* (Eichhoff), as noted in the above diagnosis for that species. It is distinguished from *confusus* (LeConte) with great difficulty by the small, often obscure punctures on the frons, by the larger, more broadly rounded median major tubercle immediately above the epistoma, and by other minor characters.

MALE.— Length 3.8–4.3 mm, 2.6 times as long as wide; color very dark brown.

Frons as in *montanus* except with a rather deep, median fovea at upper level of eyes, major median tubercle near, almost on epistomal margin. Pronotum and elytra as in *montanus*. Anterior tibia with three teeth.

FEMALE.— Similar to male except major median frontal tubercle absent, epistomal granules much smaller; frons and anterior area of pronotum with more abundant pubescence; declivital spine 3 slightly smaller, with its dorsal hump and ventral hook less distinct; anterior tibia with four teeth.

DISTRIBUTION.— SW Oregon, W Nevada, and California.

USA: **California** counties: Alameda, Butte, Calaveras, Contra Costa, Del Norte, El Dorado, Fresno, Glenn, Kern, Lake, Lassen, Los Angeles, Madera, Marin, Mariposa, Napa, Nevada, Placer, Plumas, Riverside, San Bernardino, San Diego, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Sierra, Siskiyou, Trinity, Tulare, Tuolumne. **Nevada**: Minden. **Oregon**: Ashland, Black Rock in Polk Co., Central Point, Corvallis, Grants Pass, Soda Creek.

HOSTS.— *Pinus attenuata, P. coulteri, P. jeffreyi, P. lambertiana*, and *P. ponderosa*; rarely in *P. contorta*.

BIOLOGY.— Unthrifty, fallen, or cut trees are usually selected for attack, although healthy trees have been killed under certain conditions. The longitudinal parental gallery systems usually include three to five elongate egg galleries in a rather broad tuning fork pattern. Larval mines are comparatively long. Chamberlin (1958) reports three to five generations per year. More detailed studies are reported by Cameron and Borden (1967), Chansler (1964), Gara (1963), Silverstein, Rodin, and D. L. Wood (1966), Strubble and Hall (1955), D. L. Wood (1963), D. L. Wood and Bushing (1963), and D. L. Wood and Vité (1961).

NOTES.— The above treatment was based on the female holotype and on about 1,200 other specimens. Literature prior to 1970 treated this species under the name *confusus*.

### 32. *Ips confusus* (LeConte)

*Tomicus confusus* LeConte, 1876, Proc. Amer. Philos. Soc. 15:364 (Lectotype, female; Southern California; Mus. Comp. Zool., 1025, present designation)

DIAGNOSIS.— This species is distinguished from *paraconfusus* Lanier by characters summarized in the above key and in the diagnosis of that species. It is not distinguishable by external characters from *hoppingi* Lanier.

MALE.— Length 3.5–4.2 mm, 2.6 times as long as wide; color very dark brown.

As in *paraconfusus* except frons usually devoid of punctures to well above eyes; major median frontal tubercle usually slightly smaller, more acutely pointed, declivital punctures slightly larger, more abundant, closer.

FEMALE.— Differing from male as in *paraconfusus*.

DISTRIBUTION.— S California and Colorado to Arizona and W Texas.

USA: **Arizona**: Chiricahua Mts., Flagstaff, Grand Canyon, Prescott, Seligmans, Sweetwater, Tucson, Walnut

Canyon, Williams, Window Rock. **California**: Backus, Chuchupate Ranger Station in Ventura Co., Coleville, Frazier Park in Kern Co., Gorman, Joshua Tree N.M., Mono Co., Mt. Pinos, Pinyon Flat in Palm Desert, Summerville, Valyermo, Ventura Co., Wrightwood. **Colorado**: Canyon City, Cortez, Colorado N.M., Crestone, Ft. Garland, Grand Junction, Mancos, Manitou, Mesa Verde N.P., Norwood, San Isabel N.F., Turkey Creek in El Paso Co., Uncompahgre N.F. **Nevada**: Austin, Summit, Baker, Charleston, Pequop Pass. **New Mexico**: Capitan, Cloudcroft, Corona, Datil Mts., Grants, Kingston, Lake Roberts, Lincoln N.F., Los Alamos,

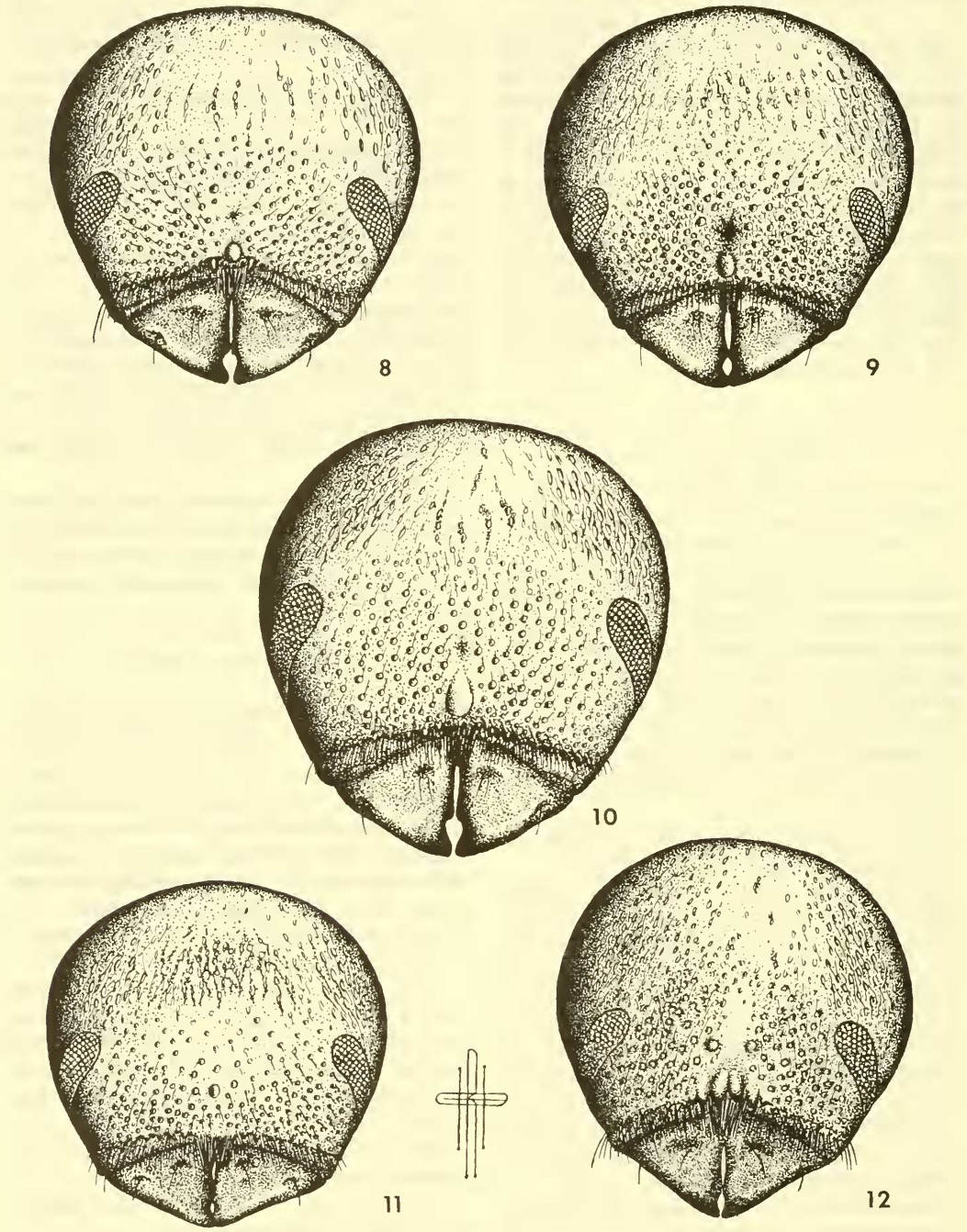



Fig. 171. *Ips* spp., male heads: 8, 11, *grandicollis*; 9, *paraconfusus*; 10, *montanus*; 12, *lecontei*. (After G. Hopping 1965:427.)

Magdalena, Ruidosa, Santa Fe. **Utah**: Beaver, Dave's Hollow in Dixie N.F., Gooseberry in Fish Lake N.F., La Sal Mts., Lofgreen, Mercur, Mt. Carmel, Panguitch, Parowan Canyon. **Texas**: Davis Mts. **Wyoming**: Atlantic City (one dead specimen in an incomplete tunnel in *Pinus flexilis* 50 miles from the nearest known *Pinus edulis*). MEXICO: **Baja California**: Tecate. **Chihuahua**: Mesa del Huracan.

HOSTS.— *Pinus edulis, P. monophylla,* and rarely in other hosts.

BIOLOGY.— Apparently as in *paraconfusus* except that egg galleries evidently average much shorter.

NOTES.— This species was based on three specimens, only one of which remains in the LeConte collection. That female, bearing the labels "Cala." and "Type No. 1025" and "dissected by Lanier," is here designated as the lectotype of *confusus*. The above treatment was based on the lectotype and on 233 other specimens.

The female pars stridens and the male genitalia are mentioned below under the presumed sibling species *hoppingi* Lanier.

### 33. *Ips hoppingi* Lanier

*Ips hoppingi* Lanier, 1970, Canadian Ent. 102:1145 (Holotype, female; 20 miles or 32 km S Chiricahua Nat. Mon., Arizona; Canadian Nat. Coll.)

DIAGNOSIS.— Lanier (1970) established this as a sibling species of *confusus* on the basis of its wider female pars stridens with narrower striations, and its comparatively longer struts on the male genitalia.

MALE.— Exactly as in *confusus* with the possible exception of the characters cited by Lanier.

FEMALE.— Differing from the male as in *confusus*.

DISTRIBUTION.— S Arizona and E Texas to Mexico and Hidalgo.

USA: **Arizona**: Ash Canyon, Huachuca Mts., Chiricahua N.M. **Texas**: Big Bend N.P. MEXICO: **Chihuahua**: Mesa del Huracán. **Hidalgo**: Zimapán. **Mexico**: Temaxcaltepec.

HOST.— *Pinus cembroides.*

BIOLOGY.— As in *confusus*.

NOTES.— This species was established on the basis of three characters, none of whose validity is fully established. In the male genitalia, Lanier's measurements of strut length/aedeagus length overlap even though series data were not presented separately; in Scolytidae generally strut length may be related as much to overall beetle size as it is to taxonomic difference. The differences in striations of the female pars stridens possibly may present a valid character, but Lanier presented a composite series in his data that confuses geographical variation with possible taxonomic differences. Although the karyotypes of these series may present valid specific differences, their validity as a taxonomic character is not yet fully established and must be verified by other workers. The attempted hybridization of *hoppingi* and *confusus*, based on five mated females, is suggestive of the validity of *hoppingi* but should be confirmed. Either *hoppingi* is a valid sibling species or else a synonym of *confusus*.

## Tribe DRYOCOETINI

Dryocoetoideae Lindemann, 1876, Bull. Soc. Imp. Nat. Moscou 51:165 (Type-genus: *Dryocoetes* Eichhoff, 1864)
Thamnurginae Nüsslin, 1911, Zeitschr. wissensch. Insektenbiol. 7:377 (Type-genus: *Thamnurgus* Eichhoff, 1864)
Taphrorychini Reitter, 1913, Wiener Ent. Zeit. 32(Beiheft):29 (Type-genus: *Taphrorychus* Eichhoff, 1878)

Anatomical features.— The frons is usually sexually dimorphic, with the male sometimes impressed (*Dendrocranulus*), the female is sometimes ornamented by setae (some *Dryocoetes*), the eye is sinuate to emarginate (or completely divided in one African genus), the antennal funicle is 4–5-segmented, the club is either obliquely truncate (*Dryocoetes*, *Coccotrypes*) or the sutures on the posterior face are very strongly displaced toward the apex, the pronotum is weakly to moderately declivous on the anterior face and asperate (smooth in one African genus), its lateral margins are rounded, the anterior coxae are contiguous, and the declivital sculpture is simple.

Biological features.— All are polygamous; American *Dryocoetes* are phloeophagous, the species of *Lymantor* are semixylophagous, the *Dendrocranulus* are stem borers in cucurbit vines, and the *Coccotrypes* may be either phloeophagous or spermophagous. All American *Coccotrypes* apparently have been introduced to America in historic times; *Lymantor* and *Dryocoetes* were derived from the Asian fauna rather recently, and *Dendrocranulus* from tropical America. *Dendrocranulus* is almost indistinguishable from some African *Xylocleptes*. *Coccotrypes* reproduces by consanguineous polygyny that apparently includes facultative arrhenotokous parthenogenesis. Eggs are usually placed in niches. Larval mines may be individual or communal.

Taxonomy.— Generic limits in this tribe have not been carefully studied. Because the overwhelming majority of species occur only in the Old World, no attempt was made to resolve the problem at this time.

### Genus *LYMANTOR* Lovendal

*Lymantor* Lovendal, 1889, Ent. Medd. 2:25 (Type-species: *Lymantor sepicola* Lovendal = *Tomicus coryli* Perris, monobasic)

Diagnosis.— This genus is distinguished by the 4-segmented antennal funicle, by the very strongly procurved, aseptate sutures of the antennal club, and by other characters included in the above generic key.

Description.— Length 1.5–1.9 mm, 2.8 times as long as wide; color reddish brown. Frons sexually dimorphic, sculpture simple. Eye oval, shallowly emarginate; finely granulate. Antennal scape elongate; funicle 4-segmented; club subcircular, moderately large, sutures strongly procurved, indicated only by setae, 1 reaching middle of club. Pronotum longer than wide, anterior third moderately declivous and finely asperate; margins rounded. Scutellum small. Elytral disc with strial and interstrial punctures confused; declivity steep, broadly convex. Vestiture hairlike. Tibiae rather broad, armed by several teeth on outer margin.

Distribution.— N North America and Europe; four species, one occurs in eastern Canada and the United States and one in Alaska.

Notes.— Schedl (1964:306) placed *Lymantor* in synonymy under the older genus *Triotemnus* Wollaston. Although I am acquainted with only half the species of *Triotemnus*, but with all the species of *Lymantor*, I see no real intergradation between the two groups in those characters that to me are quite significant. For this reason *Lymantor* is retained as a valid genus.

Key to the Species of *Lymantor*

1. Pronotum more slender, 1.25 times as long as wide, disc smooth and shining in both sexes; declivity more uniformly convex, punctures on striae and interstriae in rows, smaller, vestiture uniformly shorter; Alaska; 1.7–1.9 mm ..... 1. ***alaskanus*** **Wood**

– Pronotum less slender, 1.1 times as long as wide, male disc partly reticulate; declivital interstriae 2 distinctly impressed, punctures confused, more strongly granulate, vestiture longer, less regularly present; Michigan and Quebec to Kansas and Mississippi; *Acer*, etc.; 1.5–1.8 mm ..... 2. ***decipiens*** **(LeConte)**

### 1. *Lymantor alaskanus* Wood

*Lymantor alaskanus* Wood, 1978, Great Basin Nat. 38:399 (Holotype, male; Bonanza Creek, 30 miles southeast Fairbanks, Alaska; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *decipiens* (LeConte) by the larger size and more slender body, by the different male frons, by the smaller, less deeply impressed pronotal and elytral punctures, and by the different elytral declivity.

MALE.— Length 1.7–1.9 mm, 2.9 times as long as wide; color reddish brown.

Frons strongly convex from slightly below upper level of eyes to vertex, lower two-thirds of area below upper level of eyes transversely impressed (less strongly but much more extensively than in *decipiens*); surface shining, punctures rather fine, moderately close except very sparse on median fourth; vestiture fine, short, inconspicuous.

Pronotum 1.25 times as long as wide; outline about as in *decipiens* except sides more strongly converging posteriorly on posterior half; surface smooth, shining, punctures slightly finer, not as deep as in *decipiens*.

Elytra 1.8 times as long as wide, 1.8 times as long as pronotum; as in *decipiens* except discal punctures slightly smaller, much less strongly impressed, declivity more evenly convex, striae 1 and 2 not impressed, with punctures in rows, smaller than on disc, interstriae 1 much less strongly elevated, 2 not impressed, 2 and 3 each with a sparse row of very fine punctures, their upper margins much more feebly granulate, vestiture finer, shorter, more regularly present from base to apex.

FEMALE.— Similar to male except transverse frontal impression not as deep, upper area less strongly convex.

DISTRIBUTION.— Alaska.

ALASKA: Bonanza Creek, 30 miles SE Fairbanks, 18-VII-78, No. 51, sticky trap baited with Ipenol and alpha-pinene, R. A. Werner.

NOTES.— The above treatment was based on the type series of 19 specimens.

### 2. *Lymantor decipiens* (LeConte)

*Xylocleptes decipiens* LeConte, 1878, Proc. Amer. Philos. Soc. 17:624 (Holotype, female; Detroit; Mus. Comp. Zool., 1294)

DIAGNOSIS.— This species may be recognized from characters included in the above key.

FEMALE.— Length 1.5–1.8 mm, 2.8 times as long as wide; color reddish brown.

Frons rather strongly, transversely impressed from epistoma almost to upper level of eyes, convex above; a slight median elevation at upper level of eyes; surface finely punctured, most punctures finely subgranulate; vestiture hairlike, inconspicuous except small epistomal brush.

Pronotum 1.1 times as long as wide; widest at middle, sides moderately arcuate, converging equally anteriorly and posteriorly, rather broadly, equally rounded on anterior and posterior margins; anterior third moderately declivous and armed by numerous, small asperities; posterior areas smooth, with moderately abundant minute points and rather sparse, coarse, deep punctures. Glabrous except near margins.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; discal punctures confused, rather coarse, deep, separated by one or two diameters of a puncture. Declivity rather steep, broadly convex, somewhat flattened; punctures of striae 1 and 2 in rows, smaller than on disc; interstriae 1 weakly elevated, 2

broadly, weakly impressed, punctures on 1–3 feebly granulate. Vestiture hairlike, sparse and short on disc, moderately long and apparently more abundant on declivity.

MALE.— Similar to female except frontal impression much smaller, not as deep, frontal punctures rather coarse.

DISTRIBUTION.— Michigan and Quebec to Kansas and Mississippi.

CANADA: **Ontario**: Toronto. **Quebec**: Laniel, La Trappe, St. Etienne. USA: **Iowa**: Ames. **Kansas**: Lawrence. **Kentucky**: Morehead. **Maine**: Monmouth. **Massachusetts**: Framingham, Petersham. **Michigan**: Detroit. **Minnesota**: Duluth. **Mississippi**: Iuka, Trimcane Swamp. **New Jersey**: Lahaway. **New York**: Axton, Ithaca, Syracuse. **Pennsylvania**: Clark's Valley, Dauphin, Pocono Lake. **Virginia**: Rosslyn. **West Virginia**: "Hopk. W. Va. 7113" and "7123."

HOSTS.— *Acer rubrum*, *A. saccharinum*, *A.* sp., *Hamamelis virginiana*, *Rhus typhina*, *Salix* sp.

BIOLOGY.— These polygynous beetles attack only small, completely dead, dry branches of living maple trees and seedlings, rarely in other hosts. The entrance tunnel extends through the bark to a point within the wood where two to four egg galleries radiate, usually following the grain of the wood. There is little or no nuptial chamber. The egg galleries may have short branches leading either deeper into the wood or to the surface of the sapwood. The eggs are deposited in niches and the short larval tunnels are transverse. Whether or not the adults and larvae utilize the dark fungal growth in their nutrition has not been determined.

NOTES.— The above treatment was based on the holotype and on 33 other specimens.

## GENUS *DENDROCRANULUS* SCHEDL

*Dendrocranulus* Schedl, 1937, Arch. Inst. Biol. Veg. Río de Janeiro 3:165 (Type-species: *Dendrocranulus tardus* Schedl, subsequent designation by Schedl, 1938, Archiv. Naturgesch., n.s., 7(2):169)

DIAGNOSIS.— This genus is distinguished with some difficulty from the Old World *Xylocleptes* Ferrari by the less strongly procurved, much less distinct sutures of the antennal club, by a different type of frontal sculpture, and by the much more conservative sculpture of the elytral declivity.

DESCRIPTION.— Length 1.2–2.7 mm, 2.5–3.0 times as long as wide; color light yellowish brown to very dark reddish brown. Frons usually dimorphic, male feebly impressed to strongly excavated, female flattened to convex; female often with abundant vestiture. Eye oval, emarginate; finely granulate. Antennal scape elongate; funicle 5-segmented; club rather small, subcircularly flattened, with two obscure, moderately procurved sutures indicated by setae. Pronotum longer than wide; finely to coarsely asperate on anterior half, punctured to asperate behind; summit poorly defined; basal and lateral margins rounded. Scutellum small. Elytra elongate, striate; declivity convex to broadly excavated, devoid of denticles. Tibiae rather broad, armed by a series of marginal teeth.

DISTRIBUTION.— Central United States to Argentina; about 30 species are known; 23 occur from Utah, Kansas, and Florida to Panama.

BIOLOGY.— These species infest unthrifty, overmature, or recently cut stems of various representatives of the Cucurbitaceae. The attack evidently is initiated by the male at a leaf node, where an entrance tunnel and small nuptial chamber are formed. Evidently at least some species are polygynous; others may be monogamous. The fibrous nature of the host, the longitudinal, elongate egg galleries, and the very short life cycle have made this and other items in behavior difficult to determine.

NOTES.— The status of this genus might be questioned. None of the American species exhibit the structure of the male declivity found in related European and African genera, nor do any of them have sutures of the antennal club as well defined as in *Xylocleptes*. In spite of the closeness of the two groups, I prefer to maintain them as separate genera.

### Key to the Species of *Dendrocranulus*

1. Posterolateral margin of elytra acutely elevated from apex to interstriae 7, declivital face convex to moderately flat ..... 2

— Posterolateral margin of elytra rounded, declivital face convex to broadly concave ..... 5

2(1). Discal punctures on pronotum largely replaced by granules; Nayarit to Honduras; 1.2–1.5 mm ..... 1. ***consimilis*** **Wood**

— Discal punctures on pronotum clearly impressed ..... 3

3(2). Elytral declivity rather strongly convex, striae 2 and 3 straight to their apices; Costa Rica; 1.7–2.0 mm ..... 2. ***limus*** **Wood**

— Elytral declivity somewhat flattened, striae 2 and 3 curve toward suture near apex ..... 4

4(3). Pronotal and elytral punctures smaller, not as deep; elevated posterolateral margin of declivity short, sharply defined only near apex; Costa Rica; 1.4–1.5 mm ..... 3. ***tardulus*** **Wood**

— Pronotal and elytral punctures coarse, deep; posterolateral margin of declivity longer and acutely elevated; Honduras to Costa Rica; 1.9–2.0 mm ..... 4. ***tardus*** **Schedl**

5(1). Declivity usually steeper, more narrowly convex, lateral margins more gradually rounded in both sexes, if impressed, interstriae 1 elevated and impression not extending lateral from interstriae 3 in either sex; female frons usually much more strongly pubescent, male frons devoid of excavation or prominent tubercle on vertex ..... 6

— Declivity often more gradual, more broadly convex to shallowly concave, at least in male, impression often extending from suture to striae 4, if convex, male frons strongly impressed and armed by a median elevation on vertex; female frons sparsely pubescent; male mandible usually with inner cusp directed cephalad ..... 14

6(5). Pronotal disc clearly, rather deeply punctured over at least median half ..... 7

— Pronotal disc with transverse or flat, rounded granules, occasionally with a few punctures near median line ..... 12

7(6). Smaller, more slender, at least 2.7 times as long as wide ..... 8

— Larger, stouter, less than 2.5 times as long as wide ..... 17

8(7). Pronotal surface rather strongly reticulate, discal punctures not accompanied by an elevation; male frons feebly impressed; Costa Rica; 1.3–1.4 mm ..... 5. ***pumilus*** **Wood**

— Pronotal surface shining, obscurely subreticulate, most discal punctures accompanied by an elongate, transverse, low elevation; male frons strongly, transversely impressed from epistoma to upper level of eyes ..... 9

9(8). Declivital interstriae punctured, devoid of granules; strial punctures small, rather deep; male frons more strongly impressed, with a large, shining, impunctate area on lower half; Honduras; 1.2–1.3 mm ..... 6. ***vinealis*** **Wood**

— Declivital interstriae 1–3 each with a row of fine granules; strial punctures very small, shallow; male frons somewhat less strongly impressed, impunctate area much smaller, lateral areas with fine granules; Costa Rica; 1.5–1.7 mm ..... 7. ***vicinalis*** **Wood**

10(7). Pronotal disc obscurely reticulate; declivital setae on interstriae 1 and 2 stout, distinctly shorter than distance between rows; male frons reticulate, punctured; female frons moderately convex, reticulate, rather coarsely punctured, with rather sparse, long, fine hair; Costa Rica; 1.7–2.1 mm ..... 8. ***securus*** **Wood**

– Pronotal disc shining, not at all reticulate; male frons shining, with subaciculate sparse rows of fine granules; female frons very finely punctured, with moderately to very abundant, long, fine hair ..... 11

11(10). Pronotum shining; declivity only slightly impressed; female frons feebly convex, with very fine, long, moderately abundant hair; Chiapas to Honduras; 1.8–2.0 mm ..... 9. ***maurus*** **(Blandford)**

– Pronotum partly reticulate in posterolateral areas; declivity rather strongly impressed; female frons slightly impressed, with abundant, long, rather coarse, yellow hair; Honduras to Costa Rica; 2.1–2.8 mm ..... 10. ***costaricensis*** **Schedl**

12(6). Larger; interstrial setae on disc and lateral areas of declivity very fine, slender; vestiture on female frons long, sparse; male frons shallowly impressed, a low median elevation above upper level of eyes; Panama; 1.8–2.3 mm ..... 11. ***fulgidus*** **Wood**

– Smaller; interstrial setae on disc and declivity moderately to very coarse, slightly flattened, male frons evenly convex ..... 13

13(12). Female frons convex, with a few minute granules, sparsely pubescent; elytral declivity less strongly, more narrowly impressed; Costa Rica; 1.5–1.7 mm ..... 12. ***schedli*** **Wood**

– Female frons somewhat flattened, finely punctured, with abundant, long fine pubescence; elytral declivity more strongly, broadly impressed; Honduras to Costa Rica; 1.4–1.7 mm ..... 13. ***vicinus*** **Wood**

14(5). Male declivity feebly, broadly impressed to broadly convex, frons strongly impressed and with a prominent median elevation on vertex; female declivity usually more strongly convex than male, frons moderately convex ..... 15

– Male declivity broadly sulcate to rather strongly, broadly concave, male frons less strongly impressed, median elevation absent (except moderately to weakly developed in *knausi*); female declivity usually similarly but usually less strongly impressed, interstriae 1 never elevated; female frons variable but usually somewhat similar to male ..... 17

15(14). Pronotal disc with coarse, subcrenulate granules, punctures obscurely evident only near median line, obsolete laterally; male frons below upper level of eyes almost flat, median elevation on vertex moderately developed, little if any higher at its lower end; Durango to Michoacán; 1.6–1.9 mm ..... 14. ***rudis*** **Wood**

– Pronotal disc with crenulations smaller, punctures clearly evident, obscure but usually present almost to lateral margins; male frons more strongly impressed, median elevation on vertex higher or projecting slightly at its lower end ..... 16

16(15). Pronotal disc subreticulate between crenulations, crenulations shorter, thicker, less acutely elevated, more regularly spaced; male frontal impression not as deep, more extensive, elevation on vertex blunt; Panama; 1.5–2.0 mm ..... 15. ***confinis*** **Wood**

– Pronotal disc shining, crenulations longer, thinner, more acutely elevated, surface appearing more wrinkled; male frontal excavation deeper, less extensive, elevation on vertex acute; Utah and S California to Michoacán and Morelia; *Cucurbita*; 1.5–2.2 mm ..... 16. ***cucurbitae*** **(LeConte)**

17(14). Elytral declivity narrower, rather broadly bisulcate, sutural interstriae as strongly elevated as lateral convexities; average size smaller ..... 18

– Elytral declivity broad to very broad, moderately to very strongly impressed, lateral convexities distinctly higher than suture, interstriae 1 usually not elevated; average size larger ..... 22

18(17). Pronotum rather strongly reticulate over entire surface, asperities on anterior half small, rather widely separated, punctures small, most of them subgranulate; interstrial setae rather coarse, blunt; Costa Rica; 1.5–1.8 mm ..... 17. ***declivis*** **Schedl**

— Pronotum rather coarsely asperate and shining on anterior half, rather coarsely punctured or asperate and either shining or partly, obscurely reticulate on anterior half; interstrial setae more slender ..... 19

19(18). Larger, stouter; pronotum 1.15 times as long as wide; pronotal and elytral punctures larger, deeper; discal striae as wide as interstriae; pronotum shining, entirely devoid of reticulation; declivital strial and interstrial punctures very small; female frons with moderately abundant pubescence; Guatemala; 2.3–2.5 mm ..... 21. ***limbatus*** **(Blandford)**

— Smaller, more slender; pronotum 1.2 times as long as wide; pronotal and elytral punctures smaller; discal interstriae one and one-half times as wide as striae ..... 20

20(19). Interstrial setae on disc longer, very fine, pointed, on declivity each seta one and one-half times as long as distance between rows, spaced within a row by distances half as great as between rows; strial setae in posterolateral areas fine, more than half as long as interstrial setae; body slender, 3.0 times as long as wide; Veracruz to Costa Rica 1.7–2.0 mm ..... 18. ***macilentus*** **(Blandford)**

— Interstrial setae about as on declivity, blunt, those on declivity as long as distance between rows, spaced within a row by distances slightly less than their length; strial setae very short, almost obsolete; body stouter, about 2.6 times as long as wide ..... 21

21(20). Pronotum at least partly reticulate on posterior half in marginal areas or near punctures; transverse granules on pronotal disc finer, not reaching posterior margin; elytral punctures averaging slightly smaller; Veracruz and Honduras to Guadaloupe; 1.7–1.9 mm ..... 19. ***guatemalensis*** **(Hopkins)**

— Pronotum shining, devoid of reticulation; transverse granules on pronotal disc coarser, more widely distributed; elytral punctures averaging slightly larger; Florida to Cuba and Jamaica; 1.6–1.7 mm ..... 20. ***carbonarius*** **(Ferrari)**

22(17). Interstriae about as wide as striae, strial and interstrial punctures coarse, of equal size and spacing; pronotal disc shining, punctures coarse, deep; vestiture fine, very long; New Mexico and Kansas to Chihuahua; 1.7–2.3 mm ..... 22. ***knausi*** **(Hopkins)**

— Interstriae about twice as wide as striae, punctures smaller, more widely spaced; pronotal disc at least partly reticulate in lateral areas, punctures smaller; vestiture much shorter; Honduras to Costa Rica; 2.0–2.9 mm ..... 23. ***diversus*** **Wood**

### 1. *Dendrocranulus consimilis* Wood

*Dendrocranulus consimilis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):23 (Holotype, male; Los Corchos, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *limus* Wood by the smaller size, by the more slender form, and by the shorter interstrial setae on the declivity.

MALE.— Length 1.2–1.5 mm, 2.5 times as long as wide; color yellowish brown.

Frons convex, with a slight transverse impression on lower half; surface shining, closely, deeply, rather coarsely punctured at sides and above, becoming almost impunctate on median fourth of lower half; vestiture of fine, sparse, long hair uniformly distributed.

Pronotum 1.2 times as long as wide, sides on more than posterior two-thirds subparallel, feebly arcuate, anterior margin broadly rounded; anterior third moderately

declivous, finely asperate, asperities decreasing in size but attaining base in lateral areas; disc shining, rather coarsely punctured, most punctures partly granulate; surface on posterior half very slightly subreticulate. Vestiture of sparse hair.

Elytra 1.6 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on more than basal two-thirds, abruptly, very broadly rounded behind; striae not impressed, punctures rather small; interstriae almost smooth, twice as wide as striae, punctures uniseriate, almost as large as those of striae. Declivity very steep, transversely flattened between interstriae 3, longitudinally slightly convex; posterolateral margin from suture to about interstriae 3 subacutely elevated; striae 1 and 2 distinctly impressed; interstriae 1 weakly elevated, 2 very slightly depressed, punctures of 2 and 3 finely granulate, obscurely granulate in lateral areas. Vestiture of rows of minute, obscure, recumbent, strial hair and rows of erect interstrial bristles; each bristle about one and one-third times as long as distance between rows or between bristles within a row, except shorter, slightly more than half as long on declivital interstriae 1 and 2.

FEMALE.— Similar to male except frons more broadly, evenly convex, with frontal pubescence about twice as abundant.

DISTRIBUTION.— Nayarit to Honduras.

MEXICO: Nayarit: Los Corchos, 10-VII-65, 7 m, No. 207, climbing vine, S. L. Wood. HONDURAS: La Lima, 5-V-64, 200 m, No. 579 in *Cayaponia microdonta*, No. 580 in *Sicydum tamnifolium*, S. L. Wood.

HOSTS.— *Cayaponia microdonta, Sicydum tamnifolium.*

BIOLOGY.— Specimens were taken from broken stems of climbing vines.

NOTES.— The above treatment was based on the type series of 42 specimens and on 8 other specimens.

### 2. *Dendrocranulus limus* Wood

*Dendrocranulus limus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):38 (Holotype, male; Río Damitas in the Dota Mts., San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the closely allied *tardus* Schedl by the rather strongly convex elytral declivity, by the less strongly elevated posterolateral margin of the declivity, and by the more widely spaced strial punctures.

MALE.— Length 1.7–2.0 mm, 2.7 times as long as wide, color light reddish brown.

Frons weakly convex, surface reticulate and rather coarsely, not deeply punctured, reticulation and punctures reduced toward center on lower half; vestiture rather sparse, consisting of fine, long hair.

Pronotum 1.2 times as long as wide; sides of middle third almost straight and parallel, posterior angles broadly rounded, anterior angles arcuately converging toward broadly rounded anterior margin; dorsal profile arcuate from base, a little more strongly declivous on anterior third; surface shining, with few points, punctures rather coarse, deep, separated by distances equal to width of a puncture, lateral margin of each puncture very finely asperate, tubercles becoming larger laterally. Vestiture hairlike, inconspicuous except laterally and in asperate area.

Elytra 1.6 times as long as wide, 1.3 times as long as pronotum; sides straight and parallel on slightly more than basal two-thirds, broadly rounded behind, striae not impressed, punctures large, deep; interstriae slightly wider than striae, almost smooth, shining, punctures two-thirds as large as those of striae, spaced by one to two times diameter of a puncture. Declivity steep, distinctly convex; posterolateral margin acutely elevated from apex to interstriae 7; striae weakly impressed; interstriae weakly convex, punctures reduced and feebly granulate. Vestiture consisting of erect, interstrial bristles.

FEMALE.— Similar to male except frons bearing a rather dense fringe of long, yellow hair to well above eyes, except central area glabrous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Río Damitas, Dota Mts., San José, 18-II-64, 250 m, No. 441, vine, and 447 *Sechium edule*, S. L. Wood; Playón, Puntarenas, 22-II-64, 50 m, No. 454, cucurbit vine, S. L. Wood.

HOSTS.— *Sechium edule*, etc.

NOTES.— The above treatment was based on the type series of 43 specimens.

### 3. *Dendrocranulus tardulus* Wood

*Dendrocranulus tardulus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):37 (Holotype, male; Río Damitas in the Dota Mts., San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *tardus* Schedl by the smaller size, by the smaller, less strongly impressed pronotal punctures, and by the shorter costa on the posterolateral margin of the declivity.

MALE.— Length 1.4–1.5 mm, 3.0 times as long as wide; color light brown.

Frons convex above eyes, rather shallowly, transversely impressed below; surface shining, closely, subgranulately punctured; vestiture very fine, long, rather sparse, hairlike.

Pronotum 1.2 times as long as wide; widest just behind middle, sides moderately arcuate, rather broadly rounded in front; summit indefinite, well in front of middle; surface almost smooth, with a few minute points, punctures on disc rather coarse, close, separated by distances about equal to their diameters, becoming somewhat finely asperate in lateral areas. Vestiture consisting of rather sparse, erect hair.

Elytra 1.6 times as long as wide, 1.3 times as long as pronotum; sides almost straight and feebly dilated on basal two-thirds, then slightly narrowed to just before apex, and abruptly rounded to very broadly rounded, almost straight posterior margin; striae not impressed, punctures rather large, deep; interstriae slightly wider than striae, smooth and shining, punctures almost as large and deep as those of striae, separated by distances about equal to twice diameter of a puncture. Declivity steep, almost flat; posterolateral margin subacutely elevated from apex to interstriae 7, interstriae 2 almost flat, impressed, 1 and area lateral to 2 moderately elevated; strial and interstrial punctures somewhat smaller than on disc, those of interstriae very finely granulate. Vestiture consisting of erect, blunt, rather long, interstrial bristles.

FEMALE.— Similar to male except frons evenly convex and more closely pubescent; declivital interstriae 2 feebly if at all impressed, weakly convex, 1 and lateral areas less strongly elevated; vestiture finer.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Río Damitas, Dota Mts., San José, 18-II-64, 250 m, No. 448 in a vine, No. 447 in *Sechium edule*, S. L. Wood.

NOTES.— The above treatment was based on the type series of 12 specimens and on 25 other specimens.

### 4. *Dendrocranulus tardus* Schedl

*Dendrocranulus tardus* Schedl, 1937, Arch. Instit. Biol. Veg. Río de Janeiro 3:165 (Holotype, female?; La Caja, 8 km W San José, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *tardulus* Wood by the larger size, by the larger, deeper pronotal punctures, and by the longer costa on the ventrolateral margin of the elytral declivity.

MALE.— Length 1.9–2.0 mm, 2.6 times as long as wide; color reddish brown.

Frons as in *tardulus* except more nearly granulate. Pronotum as in *tardulus* except punctures on disc larger, closer, deeper, those in lateral areas each with a lateral subcrenulate granule.

Elytra as in *tardulus* except strial punctures slightly larger, deeper; declivity more broadly flattened, posterolateral margin subacutely elevated from suture to interstriae 7, a lower pseudocosta associated with it on 5 and 6, strial punctures larger, deeper.

FEMALE.— Essentially as in male.

DISTRIBUTION.— Honduras to Costa Rica.

HONDURAS: La Lima, Cortéz, 5-V-64, 200 m, No. 579, *Cayaponia macrodonta*, S. L. Wood. COSTA RICA: La Caja, 8 km W San José, San José.

HOST.— *Cayaponia macrodonta*.

NOTE.— The above treatment was based on a male in my collection that was compared directly to the female holotype. The holotype is 1.90 mm long, the male 2.05 mm.

### 5. *Dendrocranulus pumilus* Wood

*Dendrocranulus pumilus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):38 (Holotype, male; Río Damitas in the Dota Mts., San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species superficially resembles *consimilis* Wood, but it is distinguished by the absence of an acute ventrolateral margin of the elytral declivity, by the larger strial punctures, and by the absence of granules on the pronotal disc.

MALE.— Length 1.3–1.4 mm, 2.7 times as long as wide; color yellowish brown.

Frons convex, a slight transverse impression on lower half; surface obscurely reticulate, punctures fine, with small granules; vestiture sparse, hairlike.

Pronotum 1.2 times as long as wide; widest just behind middle, sides feebly arcuate, converging very slightly anteriorly, anterior

margin rather broadly rounded; finely asperate on anterior fourth; surface subreticulate, punctures rather coarse, close, not at all granulate. Vestiture hairlike, confined to areas near margins.

Elytra 1.9 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, then gradually narrowed to broadly rounded posterior margin; striae not impressed, punctures coarse, deep; interstriae equal to or slightly narrower than striae, punctures about two-thirds as large as those of striae and slightly less abundant. Declivity steep, flattened between striae 3; strial punctures almost as large and as deep as on disc; interstriae 1 moderately elevated, 2 impressed (at least medially), gradually ascending laterally to interstriae 3; interstrial punctures less abundant than on disc, not at all granulate. Vestiture consisting of rows of erect interstrial bristles.

FEMALE.— Similar to male except frontal impression feebly developed; elytral declivity weakly, more narrowly impressed.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Río Damitas, Dota Mts., San José, 18-II-64, 250 m, No. 446, vine, S. L. Wood.

NOTES.— The above treatment was based on the holotype and allotype and on 13 other specimens.

### 6. *Dendrocranulus vinealis* Wood

*Dendrocranulus vinealis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):24 (Holotype, male; La Lima, Cortéz, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the closely allied *pumilus* Wood by the shining pronotal disc, by the subcrenulate granules accompanying each puncture on the pronotal disc, and by the much more strongly impressed male frons.

MALE.— Length 1.2–1.3 mm, 2.7 times as long as wide; color very dark brown.

Frons convex above upper level of eyes, strongly, transversely impressed below that level; surface smooth and shining, with moderately fine, subgranulate punctures in convex area, almost impunctate in impressed area; vestiture of sparse hair.

Pronotum outline as in *pumilus*, anterior area more coarsely asperate; surface shining, punctures moderately coarse, deep, rather close, each with a low lateral, subcrenulate, transverse granule. Vestiture confined to margins, sparse, hairlike.

Elytra outline about as in *pumilus*; striae not impressed, punctures small, moderately deep; interstriae smooth, twice as wide as striae, punctures slightly smaller than those of striae, rather widely spaced. Declivity steep, rather broadly flattened; strial punctures deeper, slightly larger than on disc, interstriae 1 weakly elevated, 2 weakly depressed, punctures not at all granulate; ventrolateral margin rounded. Vestiture of interstrial rows of flattened bristles, each bristle slightly longer than distance between rows or within a row.

DISTRIBUTION.— Honduras.

HONDURAS: La Lima, Cortéz, 5-V-64, 200 m, No. 579, *Cayaponia microdonta*, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 2 male specimens.

### 7. *Dendrocranulus vicinalis* Wood

*Dendrocranulus vicinalis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):24 (Holotype, male; Río Damitas, Dota Mts., San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *vinealis* Wood by the much smaller strial and interstrial punctures, by the more gradual elytral declivity, and by the interstrial granules on the declivity.

MALE.— Length 1.5–1.7 mm, 2.9 times as long as wide, color yellowish brown.

Frons as in *vinealis* except impression not as abrupt, impunctate area much smaller, small granules more conspicuous in lateral areas. Pronotum as in *vinealis* except discal punctures slightly smaller, granules not as slender. Elytra as in *vinealis* except strial and interstrial punctures smaller, very shallow; punctures on declivital interstriae 1–3 replaced by small granules.

FEMALE.— Similar to male except frontal impression not as strong, sculpture finer, vestiture finer, more abundant but not as conspicuous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Río Damitas, Dota Mts., San José, 18-II-64, 250 m, Nos. 440, 441, climbing vine, S. L. Wood.

NOTES.— The above treatment was based on the type series of three specimens.

### 8. *Dendrocranulus securus* Wood

*Dendrocranulus securus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):25 (Holotype, male; Río Damitas, Dota Mts., San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *maurus* (Blandford) by the partly reticulate posterolateral areas of the pronotum, by the reticulate, more finely punctured frons, and by the shorter, stout setae on declivital interstriae 1 and 2.

MALE.— Length 1.7–2.1 mm, 2.5 times as long as wide; color reddish brown.

Frons convex, a shallow, transverse impression from epistoma to upper level of eyes; surface reticulate, punctures moderately fine, deep, close, not at all granulate, less abundant near median line on lower half; vestiture sparse, hairlike.

Pronotum 1.1 times as long as wide; widest well behind middle, sides moderately arcuate on posterior half, feebly constricted one-third length from anterior margin, anterior margin rather narrowly rounded; asperities small, abundant; surface of disc and lateral areas subreticulate, punctures rather small, deep, a low, transverse, rounded granule lateral to each puncture. Vestiture fine, sparse, hairlike.

Elytra 1.5 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on less than basal two-thirds, posterior margin straight on median half; striae not impressed, punctures rather small, deep, close; interstriae almost smooth, twice as wide as striae, punctures fine, uniseriate, rather widely, regularly spaced. Declivity steep; striae 1 weakly impressed; interstriae 1 weakly elevated; interstrial punctures minutely granulate; central half flattened, broadly convex in all marginal areas as in *maurus*. Vestiture of rows of minute, recumbent, strial hair, and rows of erect interstrial bristles; each bristle almost as long as distance between rows and between bristles within a row, slightly shorter and coarser than in *maurus*.

FEMALE.— Similar to male except frontal impression less distinct, vestiture very slightly more abundant.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Río Damitas, Dota Mts., San José, 18-II-64, 250 m, No. 446, vine, S. L. Wood; Playón, Puntarenas, 22-II-64, 50 m, Nos. 454, 455, vine, S. L. Wood; Turrialba, Cartago, 9-III-64, 700 m, No. 460, vine, S. L. Wood.

NOTES.— The above treatment was based on the type series of 28 specimens.

### 9. *Dendrocranulus maurus* (Blandford)

*Dryocoetes maurus* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):191 (Holotype, female; El Tumbador, San Marcos, Guatemala; British Mus. Nat. Hist.)

*Dendrocranulus huehuetanus* Schedl, 1940, An. Esc. Nac. Cienc. Biol., Mexico 1:344 (Lectotype, male; Huehuetán, Chiapas, Mexico; Schedl Coll., designated by Wood, 1974, Great Basin Nat. 34:280). *Synonymy*

DIAGNOSIS.— This species is distinguished from the very closely allied *securus* Wood by the shining, more granulate frons, by the complete absence of reticulation on the pronotum, and by the slightly longer, more slender interstrial setae.

MALE.— Length 1.8–2.0 mm, 2.6 times as long as wide; color dark brown.

Frons as in *securus* except transverse impression slightly deeper, surface smooth, shining, punctures in lateral areas finely granulate. Pronotum as in *securus* except entirely devoid of reticulation. Elytra as in *securus* except interstrial granules on declivity very slightly larger; elytral bristles finer, distinctly longer.

FEMALE.— Similar to male except frons planoconvex, finely punctured, with pubescence fine, long, much more abundant.

DISTRIBUTION.— Chiapas to Honduras.

MEXICO: **Chiapas**: Huehuetán. **Veracruz**: 13 km N Sontecomapan, 20-VI-69, J. M. Campbell. GUATEMALA: El Tumbador, San Marcos, G. C. Champion. HONDURAS: La Lima, Cortéz, 5-V-64, 200 m, No. 579, *Cayaponia microdonta*, S. L. Wood.

HOST.— *Cayaponia microdonta*.

NOTES.— The above treatment was based on the holotypes of *maurus* and *huehuetanus* and on seven other specimens that were compared directly to the type.

### 10. *Dendrocranulus costaricensis* Schedl

*Dendrocranulus costaricensis* Schedl, 1939, Archiv Naturgesch. 7:171 (Holotype, male; Turrialba, Cartago, Costa Rica; Eggers, Coll., apparently on loan to Schedl)

DIAGNOSIS.— This species is distinguished from the very closely related *maurus* (Blandford) by the larger size, by the reticulation on

the posterolateral areas of the pronotum, by the more strongly impressed elytral declivity, and by the more abundant frontal vestiture of the female.

MALE.— Length 2.1–2.8 mm, 2.6 times as long as wide; color yellowish to reddish brown.

Frons as in *maurus* except summit on median area of vertex not as high. Pronotum as in *maurus* except granules on median discal area smaller, and posterolateral areas partly reticulate. Elytra as in *maurus* except declivity more strongly impressed in central area; on declivity sutural interstriae moderately elevated, striae 1 and median side of interstriae 2 impressed, gradually ascending to striae 3. Vestiture as in *securus* but slightly shorter on declivity.

FEMALE.— Similar to male except frons planoconvex, with a tuft of abundant, long, yellow hair from epistoma to vertex.

DISTRIBUTION.— Honduras to Costa Rica.

HONDURAS: La Lima, Cortéz, 5-V-64, 200 m, No. 579, *Cayaponia microdonta*. COSTA RICA: Puerto Viejo, Heredia, 12-III-64, 70 m, No. 483, vine; Río Damitas, Dota Mts., San José, 18-II-64, 250 m, Nos. 440, 446, 448, vines; Playón, Puntarenas, 22-II-64, 50 m, No. 455, cucurbit vine; Pandora, Limón, 23-VIII-63, 50 m, No. 148, cucurbit vine. All by me.

HOSTS.— *Cayaponia microdonta*, etc.

NOTES.— The above treatment was based on Schedl's male holotype of *costaricensis* and on 103 other specimens. Although the holotype was to have been deposited in the Eggers Collection, according to the original description, it is in the Schedl Collection, apparently on loan.

### 11. *Dendrocranulus fulgidus* Wood

*Dendrocranulus fulgidus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):25 (Holotype, male; Volcán de Chiriquí, near Cerro Punta, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the closely allied *maurus* (Blandford) by the discal granules on the pronotum, by the narrower elytral declivity, by the more strongly impressed male frons, and by the more coarsely punctured female frons, with less abundant vestiture.

MALE.— Length 1.8–2.3 mm, 2.8 times as long as wide; color dark reddish brown, elytra lighter.

Frons as in *maurus* except transverse impression distinctly deeper, median summit on vertex slightly higher. Pronotum as in *maurus* except granules extend to impunctate median line; posterolateral areas reticulate. Elytra as in *maurus* except more slender, declivity narrower, strial punctures much smaller, not as deep, interstriae 2 more distinctly impressed, surface brightly shining; granules as in *maurus*; declivital setae on interstriae 1 and 2 very short, less than half as long as on 3 or on disc.

FEMALE.— Similar to male except frons planoconvex, more coarsely punctured on lateral thirds than in female *maurus*, vestiture fine, long, slightly less abundant than in female *maurus*.

DISTRIBUTION.— Panama.

PANAMA: Cerro Punta, Chiriquí, Panama, 11-I-64, 1800 m, Nos. 378, 408, 418, cucurbit vine, S. L. Wood.

NOTES.— The above treatment was based on the type series of 99 specimens.

### 12. *Dendrocranulus schedli* Wood

*Dendrocranulus cucurbitae* Schedl, 1939 (nec. LeConte, 1879), Arb. Morph. Tax. Ent. Berlin-Dahlem 6:45 (Syntypes: Hamburgfarm on Río Raventazón, Limón, Costa Rica; Deutschen Ent. Inst. and Schedl Coll.)

*Dendrocranulus schedli* Wood, 1966, Great Basin Nat. 26:23 (Replacement name)

DIAGNOSIS.— This species is almost indistinguishable from *vicinus* Wood except for secondary sexual characters on the frons. In this species the male frons is distinctly, transversely impressed on the lower half; the female frons lacks this impression and the frontal vestiture is sparse. In *vicinus* the male frons is as the female frons of *schedli* and the female frons is somewhat flattened, rather coarsely punctured, and with a brush of abundant, fine, hairlike setae.

MALE.— Length 1.5–1.7 mm, 3.0 times as long as wide; color yellowish to reddish brown.

Frons convex, moderately, transversely impressed on lower half; surface shining, punctures rather fine, moderately deep, finely granulate, somewhat more finely sculptured in median half of impressed area; vestiture of sparse, long hair.

Pronotum 1.2 times as long as wide; sides almost straight and parallel on basal half, rather broadly rounded in front; rather finely asperate on anterior third, changing to low, oval, rounded granules and extending to base;

some granules near median line accompanied by small, deep punctures; surface shining. Vestiture confined to marginal areas, sparse.

Elytra 1.9 times as long as wide; sides almost straight and parallel on basal three-fourths, rather broadly rounded behind; striae not impressed, punctures small, moderately deep; interstriae almost smooth, twice as wide as striae, punctures about half as large as those of striae. Declivity rather steep, narrowly flattened; striae 1 and 2 weakly impressed, interstrial punctures replaced by fine granules, interstriae 2 weakly impressed; marginal areas broadly convex. Vestiture of rows of fine, very short, recumbent strial hair, and rows of erect, interstrial bristles; each bristle slightly longer than distance between rows or between bristles within a row, each very slightly flattened on its apical half.

FEMALE.— Similar to male except transverse frontal impression absent.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Río Damitas, Dota Mts., San José, 18-II-64, 250 m, No. 440, vine, S. L. Wood; Turrialba, Cartago, 9-III-64, 700 m, No. 458, vine, S. L. Wood.

NOTES.— The above treatment was based on my male that was compared to Schedl's male syntype and on 14 other specimens.

### 13. *Dendrocranulus vicinus* Wood

*Dendrocranulus vicinus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):25 (Holotype, female; La Lima, Cortéz, Honduras; Wood Coll.)

DIAGNOSIS.— See the diagnosis of *schedli* Wood, above, and the following description.

MALE.— Length 1.4–1.7 mm, 3.0 times as long as wide; color yellowish to reddish brown.

Frons as in female *schedli*. Pronotum as in *schedli* except granules in median area of disc slightly larger and evidently never associated with punctures. Elytra as in *schedli* except striae 1 and 2 and interstriae 2 usually less strongly impressed.

FEMALE.— Similar to male except frons more broadly convex, more closely punctured, punctures not at all granulate, ornamented by a tuft of long, fine, abundant, yellow hair.

DISTRIBUTION.— Honduras to Costa Rica.

HONDURAS: La Lima, Cortéz, 5-V-64, 200 m, No. 579, *Cayaponia microdonta*, S. L. Wood; La Ceiba, Atlántida, 29-V-49, at light, E. C. Becker. COSTA RICA: Tapantí, Cartago, 17-VIII-63, 1300 m, No. 103, *Polakowskia tacaco*, S. L. Wood; Turrialba, Cartago, 9-III-64, 700 m, No. 458, cucurbit vine, S. L. Wood; Pandora, Limón, 23-VIII-63, 50 m, No. 148, cucurbit vine, S. L. Wood.

HOSTS.— *Cayaponia microdonta*, *Polakowskia tacaco*, etc.

NOTES.— The above treatment was based on the type series of 26 specimens and on 5 other specimens.

This species is virtually identical to *schedli* except for the secondary sexual characters of the frons. Because both were taken from the same vine, No. 548, at Cartago, it indicates that sibling species or else dimorphic females of one species are represented. One female of *vicinus* and seven specimens of *schedli* were in that sample.

### 14. *Dendrocranulus rudis* Wood

*Dendrocranulus rudis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):26 (Holotype, male; 19 km E Carapan, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is allied to *cucurbitae* (LeConte), but it is distinguished by the slightly larger rugae on the pronotal disc, with the punctures obscure to obsolete, and by the less deeply excavated male frons with the median elevation on the vertex less well developed.

MALE.— Length 1.6–1.9 mm, 2.8 times as long as wide; color very dark brown.

Frons somewhat flattened, transversely impressed from epistoma to upper level of eyes, weakly ascending above; median elevation on summit rather well developed, highest at its dorsal extremity, gradually descending below; surface smooth, with an occasional fine puncture or minute granule; vestiture sparse, hairlike.

Pronotum 1.2 times as long as wide; widest just behind middle, sides rather strongly arcuate on posterior two-thirds, rather narrowly rounded in front; anterior third rather coarsely asperate, low, transverse crenulations continuing to base, some crenulations in median area associated with obscure punctures. Vestiture fine, long, moderately abundant.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal three-fourths, very broadly rounded behind; striae not impressed, punctures rather small, moderately impressed,

spaced by about two diameters of a puncture; interstriae smooth, twice as wide as striae, equal in size and spacing to those of striae. Declivity steep, broadly flattened; striae 1 and 2 feebly impressed; interstriae 1 weakly elevated, 2 weakly impressed, lateral areas about as high as suture; interstrial punctures not granulate. Vestiture of rows of fine, short, recumbent strial hair, and rows of erect interstrial bristles; each bristle rather slender, about one and one-fourth times as long as distance between rows, slightly shorter on declivital interstriae 1 and 2.

FEMALE.— Sinnilar to male except frons rather coarsely punctate-granulate, granules mostly arranged in rugae, vertex devoid of median elevation; declivity more nearly convex, impressions and elevations obscure.

DISTRIBUTION.— Durango to Michoacán.

MEXICO: **Durango**: 5 km W El Salto, 7-VI-65, 2600 m, No. 32, cucurbit vine, S. L. Wood. **Michoacán**: 19 km E Carapan, 18-VI-65, 2300 m, No. 75, cucurbit vine, S. L. Wood.

NOTES.— The above treatment was based on the type series of 53 specimens.

### 15. *Dendrocranulus confinis* Wood

*Dendrocranulus confinis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):26 (Holotype, male; Volcán de Chiriquí, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the very closely related *cucurbitae* (LeConte) by the subreticulate pronotal surface between crenulations on the disc, and by the slightly shallower, more extensive frontal excavation of the male.

MALE.— Length 1.5–2.0 mm, 2.7 times as long as wide; color very dark reddish brown, pronotum black in some specimens.

Frons as in *cucurbitae* but very slightly less strongly excavated, impression extending higher in lateral areas, median projection on vertex equal in size. Pronotum as in *cucurbitae* except discal punctures slightly larger, surface subreticulate, evidently less irregular. Elytra as in *cucurbitae* except discal punctures very slightly larger.

FEMALE.— Similar to male except frons broadly convex, a slight transverse impression just above epistoma; surface subreticulate, punctures rather small, shallow, vestiture sparse; declivity more evenly convex, interstriae 2 not as strongly impressed.

DISTRIBUTION.— Panama.

PANAMA: Volcán de Chiriquí, near Cerro Punta, Chiriquí, 11-I-64, 1800 m, No. 378, cucurbit vine, S. L. Wood.

NOTES.— The above treatment was based on the type series of 40 specimens.

### 16. *Dendrocranulus cucurbitae* (LeConte)

Fig. 172

*Xylocleptes cucurbitae* LeConte, 1879, Bull. U.S. Geol. Survey 5:519 (Holotype, female; Utah; Mus. Comp. Zool.)

*Xylocleptes californicus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:44 (Holotype, female; Pomona, California; U.S. Nat. Mus., 7610); Wood, 1973, Great Basin Nat. 33:176. *Synonymy*

*Xylocleptes venturina* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:44 (Holotype, female; Ventura Co., California; U.S. Nat. Mus., 7611); Wood, 1973, Great Basin Nat. 33:176. *Synonymy*

*Xylocleptes punctatus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:44 (Holotype, female; Mesilla, New Mexico; U.S. Nat. Mus., 7421); Wood, 1973, Great Basin Nat. 33:176. *Synonymy*

DIAGNOSIS.— This species is distinguished from *confinis* Wood by the more deeply, less extensively excavated male frons, with the median elevation on the vertex more acute, by the absence of reticulation on the pronotal disc, and by other characters noted in the above treatment of *confinis*.

MALE.— Length 1.5–2.2 mm, 2.7 times as long as wide; color very dark brown.

Frons transversely excavated from emarginate epistomal margin to well above upper level of eyes, convex on vertex, with median area of vertex acutely elevated at upper margin of excavation; surface of excavated area smooth, brightly shining, almost impunctate; glabrous except at margins.

Pronotum as in *rudis* except punctures larger, deeper, crenulations smaller; devoid of reticulation.

Elytra as in *rudis* except strial punctures slightly larger, declivity flatter; vestiture similar but very slightly longer.

DISTRIBUTION.— New Mexico, S Utah, and S California to Morelia.

USA: **Arizona**: Bonita. **California**: Azusa, Desert Center, Laguna, Martinez, Newton, Pomona Mts., Pasadena, Playa del Rey, Sierra Madre, Ventura Co. **New Mexico**: Mesilla. **Utah**: St. George. MEXICO: **Chihuahua**: 100 km NE Meoqui. **Mexico**: San Miguel Tlaixpan, 4-I-80, *Sechium edulis*, T. H. Atkinson. **Michoacán**: Lombardia, 1-XI-80, S-141, *Luffa acutangula*, T. H. Atkinson. **Morelia**: Cuernavaca, 6-XII-79, T. H. Atkinson.

HOSTS.— *Cucurbita digitata*, *C. foetidissima*, *Echinocystis macrocarpa*, *Luffa acutangula*.

NOTES.— The above treatment was based on the holotypes of *cucurbitae*, *californicus*, *venturina*, and *punctatus* and on 169 other specimens.

### 17. *Dendrocranulus declivis* Schedl

*Dendrocranulus declivis* Schedl, 1937, Arch. Instit. Biol. Veg. Río de Janeiro 3:166 (Holotype, female; Turrialba, Cartago, Costa Rica; Schedl Coll.)

DIAGNOSIS.— The broadly impressed, subconcave male elytral declivity and the reticulate pronotal disc distinguish this species from the preceding species.

MALE.— Length 1.5–1.8 mm, 2.7 times as long as wide; color very dark brown.

Frons broadly convex, with a slight transverse impression between epistoma and upper level of eyes; surface almost smooth, punctures moderately coarse, obscurely arranged into subaciculate rows except central third impunctate; vestiture sparse, hairlike.

Pronotum 1.1 times as long as wide; widest near base, sides rather weakly arcuately converging to rather narrowly rounded anterior margin; asperities on anterior third very small; posterior areas reticulate, finely punctured, a minute granule associated with each puncture. Vestiture sparse, fine, hairlike.

Elytra 1.6 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; striae not impressed, punctures rather small, moderately deep, close; interstriae smooth, twice as wide as striae, punctures small, uniseriate. Declivity rather steep, broadly, subconcavely impressed; interstriae 1 weakly elevated, 2 broadly impressed, lateral areas gradually ascending to 4, 4 very slightly higher than 1, lateral elevations continued toward suture near apex; punctures on interstriae 2 and upper part of 3 replaced by small granules. Vestiture of rows of very fine, recumbent, short, strial hair, and rows of erect, interstrial bristles; each bristle about as long as distance between rows or between bristles within a row.

FEMALE.— Similar to male except frontal impression poorly developed, impunctate area greatly reduced in size; elytral declivity

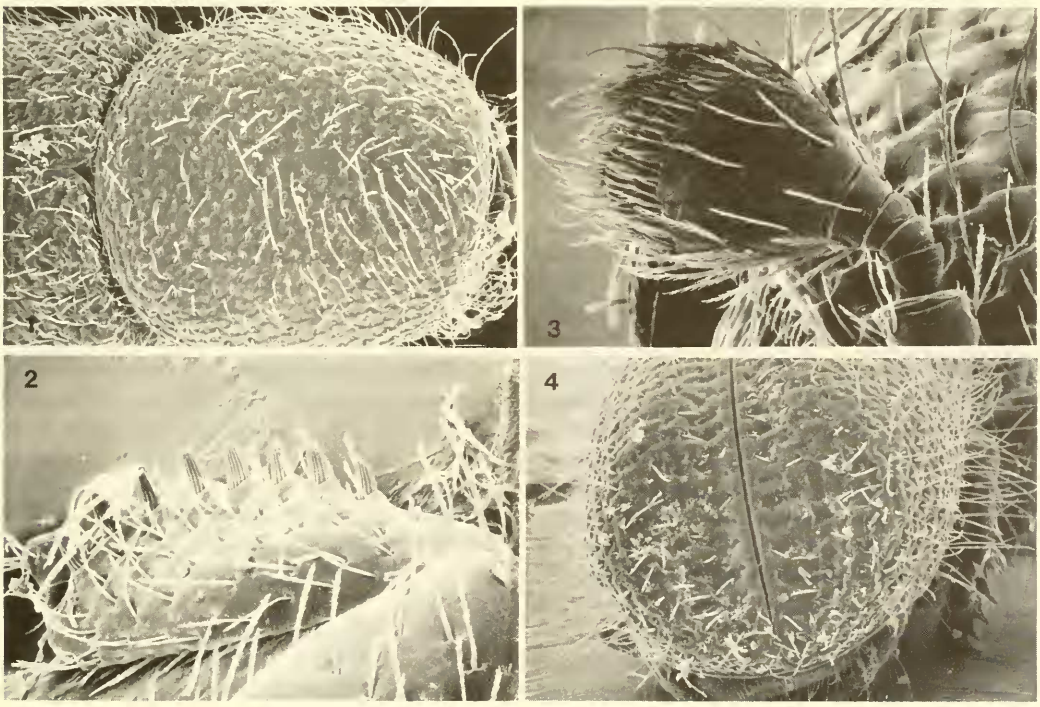



Fig. 172. *Dendrocranulus cucurbitae*: 1, anterior half of male; 2, female protibia; 3, female antenna; 4, male declivity.

narrower, impression not as deep, interstrial granules smaller, some obsolete.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Río Damitas, Dota Mts., San José, 18-II-64, 250 m, No. 427, *Sechium edule*; Tapantí, Cartago, 17-VIII-63, 1300 m, No. 103, *Potakowskia tacaco*; Turrialba, Cartago, 9-III-64, 700 m, No. 457, *Sechium edule*; Guápiles, Limón, 22-VIII-66, 100 m, No. 114, cucurbit vine; Pandora, Limón, 23-VIII-63, 50 m, No. 148, cucurbit vine; all by me.

HOSTS.— *Potakowskia tacaco*, *Sechium edule*, etc.

NOTES.— The above treatment was based on the holotype and on 84 other specimens.

### 18. *Dendrocranulus macilentus* (Blandford)

*Dryocoetes macilentus* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):190 (Lectotype, female; Jalapa, Veracruz, Mexico; British Mus. Nat. Hist., designated by Wood, 1973, Great Basin Nat. 33:176)

*Dendrocranulus grossopunctatus* Schedl, 1937, Arch. Instit. Biol. Veg. Río de Janeiro 3:166 (Holotype, female; San Isidro de Coronado, San José, Costa Rica; Schedl Coll.); Wood, 1973, Great Basin Nat. 33:176. *Synonymy*

DIAGNOSIS.— Only the female is known. It is distinguished by the very slender body form and by the fine, long interstrial setae.

FEMALE.— Length 1.7–2.0 mm, 3.0–3.1 times as long as wide; color very dark brown, almost black.

Frons about as in male *declivis*, except transverse impression stronger.

Pronotum 1.25 times as long as wide; widest just behind middle, sides weakly arcuate on posterior two-thirds, rather narrowly rounded in front; anterior third rather coarsely asperate, rather finely, deeply punctured in discal area, each puncture associated with a small, low, rounded, transverse granule, these granules much larger in lateral areas. Vestiture of fine, moderately long hair, much more abundant than in allied species.

Elytra 1.85 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal three-fourths, broadly rounded; striae not impressed, punctures small, moderately deep; interstriae twice as wide as striae, smooth, punctures uniseriate, almost as large as those of striae. Declivity essentially as in female *declivis* except strial punctures slightly larger, deeper, interstriae 2 more distinctly impressed, interstrial granules obsolete. Interstrial setae very slender, at least one and one-half times as long as distance between rows.

DISTRIBUTION.— Veracruz and Costa Rica.

MEXICO: Veracruz: Jalapa, Hoege. COSTA RICA: San Isidro de Coronado, San José, 17-I-29, 1400–1500 m, F. Nevermann; Tapantí, Cartago, 24-X-63, 1300 m, No. 244 vine, S. L. Wood.

NOTES.— The above treatment was based on the lectotype of *macilentus*, on the holotype of *grossopunctatus*, and on my female that was compared to both types. All three specimens are females of an unusually slender form. The strial punctures are very slightly smaller in my specimen than in the specimens of Blandford and Schedl. Until additional material is available, including males, that provides characters for distinguishing two populations these names will be considered synonyms.

### 19. *Dendrocranulus guatemalensis* (Hopkins)

*Xylocleptes guatemalensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:44 (Holotype, female; Panzos, Guatemala; U.S. Nat. Mus., 7612)

*Dendrocranulus parallelus* Schedl, 1938, Archiv Naturgesch. 7:172 (Holotype, sex?; Trois Riviéres, Guadeloupe; U.S. Nat. Mus., 60353); Wood, 1976, Great Basin Nat. 36:348. *Synonymy*

DIAGNOSIS.— This species is somewhat similar to *rudis* Wood, but it is distinguished by the less extensively impressed male frons, with the summit on the vertex higher but more broadly rounded, by the punctured pronotal disc, and by the more strongly impressed elytral declivity.

MALE.— Length 1.7–1.9 mm, 2.9 times as long as wide; color very dark brown.

Frons transversely impressed on lower half, almost flat on median half of lower half, surface smooth and shining on impressed area, impunctate except laterally, subreticulate and rather coarsely punctured on convex area; summit on vertex broadly rounded, moderately high.

Pronotum as in *confinis* Wood except granules in discal area greatly reduced, surface brightly shining. Elytra as in *declivis* Schedl.

FEMALE.— Similar to male except frons convex, impression obscure; elytral declivity less strongly impressed.

DISTRIBUTION.— Veracruz to Honduras and Guadeloupe Island.

MEXICO: Veracruz: Lago Catemaco: 16-VI-69, D. E. Bright. HONDURAS: La Lima, Cortez, 5-V-64, 200 m, No. 579, *Cayaponia microdonta*, S. L. Wood; La Ceiba, Atlantida, 20-V-49, at light, E. C. Becker. GUADELOUPE. Trois Riviéres.

HOST.— *Cayaponia microdonta*.

NOTES.— The above treatment was based on my female that was compared to the type of *parallelus*, on the holotype of *quatemalensis*, and on eight other specimens.

### 20. *Dendrocranulus carbonarius* (Ferrari)

*Xylocleptes carbonarius* Ferrari, 1867, Die Forst- und Baumzuctschädlichen Borkenkäfer, p. 41 (Holotype, male; Cuba; Vienna Mus.)

*Xylocleptes floridensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:43 (Holotype, female; Biscayne Bay, Florida; U.S. Nat. Mus.); Wood, 1973, Great Basin Nat. 33:176. *Synonymy*

*Xylocleptes anonae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:43 (Holotype, female; Florida; U.S. Nat. Mus.); Wood, 1973, Great Basin Nat. 33:176. *Synonymy*

DIAGNOSIS.— This species is distinguished from *quatemalensis* (Hopkins) by the much less strongly impressed male frons, which bears fine granules and whose summit on the vertex is broadly rounded, by the larger granules of the pronotal disc, and by the slightly larger punctures on the elytral declivity.

MALE.— Length 1.6–1.7 mm, 2.8 times as long as wide; color very dark brown.

Frons shallowly, transversely impressed on lower half, broadly convex above, without a definite elevation on vertex; surface shining, with isolated, moderately close granules in impressed area, intermixed with punctures above; vestiture sparse.

Pronotum about as in *confinis* Wood except reticulation absent. Elytra as in *quatemalensis* except declivital punctures slightly larger, deeper, granules obsolete.

FEMALE.— Similar to male except frons more evenly convex, granules largely replaced by punctures.

DISTRIBUTION.— S Florida to Cuba and Jamaica.

USA: **Florida**: Biscayne Bay, 17-V, Hubbard and Schwarz; "Florida," 14-V, *Anona* (error?), E. A. Schwarz. CUBA: Cayamas, 3-II, E. A. Schwarz. JAMAICA: Bright (pers. comm.) saw specimens from Porus, 23-II-37, Chapin and Blackwelder (at the U.S. Nat. Mus.).

NOTES.— The above treatment was based on the holotypes of *carbonarius*, *floridensis*, and *anonae* and on 12 other specimens. Hopkins reported one series of this species from *Anona*. Because this genus occurs exclusively in Cucurbitaceae, Hopkins's host record must have been accidental or in error.

### 21. *Dendrocranulus limbatus* (Blandford)

*Dryocoetes limbatus* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):190 (Lectotype, male; Volcán de Agua, Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished from *macilentus* (Blandford) and *quatemalensis* (Hopkins) by the larger size, by the stouter, more coarsely punctured pronotum, by the strial punctures being coarse on the elytral disc but very fine on the declivity, and by the moderately pubescent female frons.

MALE.— Length 2.3–2.5 mm, 2.6 times as long as wide; color very dark brown, elytra dark reddish brown.

Frons of lectotype visible only to upper level of eyes, almost flat, epistomal margin very weakly elevated; surface smooth, shining, with very small, isolated, setiferous granules uniformly distributed; vestiture of fine, moderately long, uniformly distributed hair.

Pronotum 1.15 times as long as wide; widest slightly behind middle, sides moderately arcuate, converging on anterior third, rather narrowly rounded in front; indefinite summit on basal third; anterior half rather coarsely asperate; posterior third coarsely, deeply punctured, with transverse lines between punctures accompanied by weak calluses; surface shining, with no indication of reticulation. Vestiture of fine long hair.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, slightly narrowed, then very broadly rounded behind; striae not impressed, punctures rather coarse, deep; interstriae smooth, shining, very slightly wider than striae, punctures deep, coarse, superficially appearing almost as large as those of striae. Declivity steep, flat, longitudinally, very feebly concave transversely; impression extending to median area of interstriae 3, interstriae 1 weakly elevated, 2 impressed, 3 slightly higher than 1; strial punctures greatly reduced, minute on lower half of 1, interstrial punctures very minutely granulate; lateral margins rounded. Vestiture

of fine, long interstrial setae; shorter on declivity, setae about as long as distance between rows (except largely obsolete on 2).

FEMALE.— Similar to male except granules on frons slightly larger, frontal vestiture more abundant, longer, particularly on upper half; declivital impression not as distinct.

DISTRIBUTION.— Guatemala.

GUATEMALA; Volcán de Agua, 8500–10500 ft (2600–3200 m), G. C. Champion.

NOTES.— The above treatment was based on four of five syntypes remaining in the British Museum (Natural History). The first of these four syntypes is here designated as the lectotype of *limbatus* Blandford.

### 22. *Dendrocranulus knausi* (Hopkins)

*Xylocleptes knausi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:44 (Holotype, female; Ashland, Kansas; U.S. National Mus., 7613)

DIAGNOSIS.— This species has the male elytral declivity much more strongly, broadly impressed than any of the preceding species; it differs from *diversus* Wood by the larger strial and interstrial punctures, which are subequal in size to one another, and by other characters summarized in the above key.

MALE.— Length 1.7–2.3 mm, 2.5 times as long as wide; color dark reddish brown.

Frons rather strongly, transversely impressed from epistoma to upper level of eyes; upper area convex, with subaciculate rugae to upper margin of impressed area, impressed area mostly smooth, shining, a few small granules and a short, indefinite, subcarinate, median, longitudinal elevation just above epistoma; summit on vertex, with a short, rather strongly elevated, median carina; vestiture sparse.

Pronotum 1.2 times as long as wide; widest well behind middle, sides on posterior two-thirds rather sharply arcuate, a weak constriction on anterior third, rather narrowly rounded in front; finely asperate on anterior third, rather coarsely, deeply punctured behind, each puncture bearing a minute granule on its lateral margin. Vestiture of fine, long, moderately abundant hair.

Elytra 1.8 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal three-fourths, very broadly rounded to subemarginate behind; strial punctures coarse, deep; interstriae as wide as striae, smooth, punctures almost as large as those of striae and equally spaced. Declivity steep, broadly, shallowly concave; sutural interstriae weakly elevated, 2 impressed, ascending laterally to 4, at 4 distinctly higher than at suture; punctures slightly smaller than on disc, devoid of granules. Vestiture of fine, long, hair, each two or more times as long as distance between interstrial rows, about half as long on declivity.

FEMALE.— Similar to male except frontal impression and elevations less well developed, surface granulate-punctate to epistoma; elytral declivity more narrowly, less strongly impressed, interstriae 1 less distinctly elevated.

DISTRIBUTION.— New Mexico and Kansas to Chihuahua.

USA: **Kansas**: 5 miles (8 km) S Waldo, Russell Co., 1952; Ashland, 8-V-08, wild gourd, W. Knaus; Garden City, Chittenden no. 2429. **New Mexico**: 8 mi (13 km) NE Portales, 30-VII-53, *Cucurbita*, S. L. Wood. **Oklahoma**: Woodward, 30-VII-53, *Cucurbita*, S. L. Wood; "Oklahoma," 27-III-67, pumpkin stems, C. E. Langston. MEXICO: **Chihuahua**: 40 km SE Chihuahua, 27-VII-53, *Cucurbita*, S. L. Wood.

HOSTS.— *Cucurbita pepo*, *C.* sp.

NOTES.— The above treatment was based on the holotype of *knausi* and on 21 other specimens.

### 23. *Dendrocranulus diversus* Wood

*Dendrocranulus diversus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):37 (Holotype, male; Puerto Viejo, Limón, Costa Rica; Wood Coll.)

MALE.— Length 2.0–2.9 mm, 2.5 times as long as wide; color very dark brown.

Frons convex above eyes, rather strongly, transversely impressed from upper level of eyes to epistoma; epistomal margin broadly emarginate, upper tooth on mandibles projecting anteriorly and partly filling this emargination; surface reticulate almost to epistomal margin, rather closely, deeply punctured, many punctures granulate; vestiture consisting of rather long, sparse hair.

Pronotum 1.1 times as long as wide; widest just behind middle, sides strongly arcuate from base to rather narrowly rounded anterior margin; posterior surface almost smooth and shining, punctures moderately large, deep, close, each puncture with a very minute lateral granule (almost imperceptible at

center), granules increasing in size laterally. Vestiture bristlelike, almost entirely limited to lateral and asperate areas.

Elytra 1.3 times as long as wide, 1.2 times as long as pronotum; sides arcuately narrowed from level of declivital base to level of sutural apex, posterior margin straight or feebly, broadly emarginate over about two-thirds of elytral width; striae 1 feebly, others not impressed, punctures small, close, rather deep; interstriae about twice as wide as striae, surface obscurely etched by minute points and lines, punctures slightly smaller than those of striae and about half as numerous. Declivity rather abrupt, steep, broadly, shallowly concave; posterolateral margin obtusely rounded, strongly elevated from apex to interstriae 4, conspicuously higher than 1; interstriae 1 weakly elevated, 2 wider and impressed, all interstriae with a median row of fine granules; striae 1, 2, and 3 with punctures rather strongly impressed. Vestiture consisting of interstrial rows of erect bristles.

FEMALE.— Similar to male except frons less strongly impressed, granules reduced, more strongly reticulate; elytral declivity narrower, less strongly impressed.

DISTRIBUTION.— Honduras to Costa Rica.

HONDURAS: La Lima, 5-V-64, 200 m, No. 579, *Cayaponia microdonta*. COSTA RICA: Puerto Viejo, Limón, 12-III-64, 70 m, No. 483, vine; Pandora, Limón, 23-VIII-63, 50 m, No. 148, vine; Turrialba, Cartago, 9-III-64, 700 m, No. 460, vine; Río Damitas, Dota Mts., San José, 18-II-64, 250 m, No. 446, vine; Playón, Puntarenas, 22-II-64, 50 m, No. 459, cucurbit vine. All taken by me.

HOSTS.— *Cayaponia microdonta*, etc.

NOTES.— The above treatment was based on the type series of 39 specimens and 11 other specimens.

## GENUS *DRYOCOETES* EICHHOFF

*Anodius* Motschulsky, 1860, *in* Schrenck, Reisen und Forschungen in Amur-Lande 2:155 (Type-species: *Bostrichus autographus* Ratzeburg, subsequent designation by Wood, 1974, Bull. Zool. Nomencl. 31:232); Internat. Comm. Zool. Nomencl., 1979, Bull. Zool. Nomencl. 36:149. *Name suppressed*

*Dryocoetes Eichhoff*, 1864, Berliner Ent. Zeitschr. 8:38 (Type-species: *Bostrichus autographus* Ratzeburg, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:121); Internat. Comm. Zool. Nomencl., 1979, Bull. Zool. Nomencl. 36:149. *Name conserved*

*Dryocoetinus Balachowsky*, 1949, Faune de France 50:180 (Type-species: *Bostrichus villosus* Fabricius, original designation); Schedl, 1958, Tidj. Ent. 101:143. *Synonymy*

DIAGNOSIS.— In the North American fauna this genus is distinct and easily recognized by antennal, tibial, and elytral characters presented in the key to genera, and by the exceedingly broad oral region.

DESCRIPTION.— Length 1.7–4.4 mm, 2.3–2.6 times as long as wide; color dark reddish brown.

Frons broadly convex, punctate to granulate; vestiture hairlike, rather sparse except moderately to exceedingly dense in females of some species; oral region unusually broad. Eye oval, emarginate. Antennal scape elongate; funicle 5-segmented, club obliquely truncate, basal area corneous. Pronotum 1.0–1.3 times as long as wide, rather evenly arched from anterior to posterior margin; anterior area finely to coarsely asperate, asperities reaching base laterally in most species, reaching median area in some. Elytra weakly to strongly striate, declivity convex to flattened, conservatively sculptured. Vestiture hairlike. Meso- and metathoracic tibiae rather slender, abruptly narrowed on less than apical one-fifth, armed on lateral and apical margins by three to seven socketed teeth.

DISTRIBUTION.— North America, Asia, Europe, and Africa; about 90 species have been named, although most of them have been transferred to other genera; 7 species occur in North America.

BIOLOGY.— The lower bole of standing, unthrifty trees is usually selected for attack, except *betulae* evidently prefers limbs of its host. The beetles are polygynous and phloeophagous, with the parental galleries of a radiate type that do not score the wood. Larval mines are entirely in the phloem, rather short, and wander indiscriminantly. Evidently from one to two years is required to complete a life cycle. They may pass the winter as larvae or adults. Parent adults may produce more than one brood.

NOTES.— This genus apparently originated in the eastern hemisphere and migrated to North America in comparatively recent

geologic times. The hosts of all seven North American species are typical of the northern coniferous forest. With the exception of *sechelti* and *caryi* each species is more closely related to an Asian species than to any American species. One species, *autographus*, is considered to be the same species on both continents, although minute anatomical differences are evident.

Several closely related groups that occur in Africa and in the Indo-Malayan region are doubtfully distinct from *Dryocoetes*. A thorough worldwide study of the *Dryocoetini* is needed.

Key to the Species of *Dryocoetes*
(Modified from Bright 1963)

1. Larger, 2.8–4.4 mm; pronotum widest at or near middle, sides rather strongly arcuate, 1.0–1.1 times as long as wide ..... 2
— Smaller, 1.7–3.1 mm; pronotum either widest at base or sides weakly arcuate, subparallel, 1.1–1.3 times as long as wide ..... 4

2(1). Female frons sparsely pubescent, small median area smooth, impunctate; male frons more sparsely pubescent, surface distinctly granulate; elytral declivity almost evenly convex, interstriae 1 very feebly elevated; pronotum rather finely asperate on anterior half and sides, disc rather coarsely, deeply punctured; spruce forests of North America south to New Mexico and North Carolina, etc.; *Picea*, *Pinus*, etc.; 2.8–4.4 mm ..... 1. ***autographus*** **(Ratzeburg)**
— Female frons with dense, conspicuous pubescence; elytral declivity steeper, interstriae 1 distinctly elevated, 2 broadly impressed; pronotum rather coarsely asperate over more than anterior half ..... 3

3(2). Female frons very finely granulate, vestiture moderately dense, very fine, shortest setae on lower half twice as long as width of eye, longer above; disc on posterior third of pronotum punctured; discal interstriae less than twice as wide as striae, strial punctures coarse, punctures on interstriae 3 uniseriate; British Columbia and Newfoundland to Louisiana and Florida; *Betula*, rarely other hosts; 2.8–3.8 mm ..... 2. ***betulae*** **Hopkins**
— Female frons densely, finely punctured, not at all granulate, vestiture dense, fine, longest setae about equal in length to width of eye, shorter below; pronotum asperate or subasperate to base; discal interstriae about three times as wide as striae, strial punctures rather small, punctures on interstriae 3 confused; British Columbia and Alberta to Arizona and New Mexico; *Abies lasiocarpa*, rare in other *Abies* and *Picea*; 3.2–4.3 mm ..... 3. ***confusus*** **Swaine**

4(1). Declivital striae 1 deeply impressed, punctures large, deep, declivital interstriae 1 strongly elevated, uniseriately granulate; discal striae wider than interstriae, strial punctures coarse, deep; pronotum 1.2–1.3 times as long as wide, with sides parallel on basal two-thirds; Quebec to Arkansas and North Carolina; *Picea*; 2.2–2.4 mm ..... 4. ***granicollis*** **(LeConte)**
— Declivital striae 1 impression and punctures about as on 2, declivital interstriae 1 only slightly elevated, granules feebly developed or absent; discal striae distinctly wider than interstriae, strial punctures smaller, not as deep; pronotum 1.1–1.2 times as long as wide, widest behind middle ..... 5

5(4). Female frons with moderately long, abundant pubescence, male frons sparsely pubescent; declivity more strongly flattened; pronotum less strongly arched along median line, disc more finely punctured, granules appearing smaller and more widely spaced; Alaska and New Mexico to Newfoundland and North Carolina; *Picea*, rarely other hosts; 2.3–3.1 mm ..... 5. ***affaber*** **(Mannerheim)**

— Female frons only slightly more pubescent than male; elytral declivity more strongly convex on longitudinal axis; pronotal disc more coarsely punctured, granules appearing closer, slightly larger, general surface of disc on some specimens appearing subgranulate; smaller ..... 6

6(5). Interstriae on disc twice as wide as striae, striae 1 on declivity weakly impressed, its punctures small, rather shallow, declivital interstriae 1 weakly elevated; British Columbia and Montana to Utah and Colorado; *Abies lasiocarpa*; 1.6–2.2 mm ..... 6. ***sechelti*** **Swaine**

— Interstriae on disc as wide as striae, striae 1 on declivity impressed, its punctures rather coarse, deep, declivital interstriae 1 distinctly elevated; Alaska and Quebec to Wyoming and North Carolina; *Picea*; 1.9–2.3 mm ..... 7. ***caryi*** **Hopkins**

### 1. *Dryocoetes autographus* (Ratzeburg)
Fig. 173

*Bostrichus autographus* Ratzeburg, 1837, Die Forstinsekten 1:160 (Syntypes; presumably Germany; apparently lost with the Hamburg Museum)

*Dryocoetes autographus*: Eichhoff, 1864, Berliner Ent. Zeitschr. 8:39

*Bostrichus septentrionis* Mannerheim, 1843, Moskov. Obshch. Isp. Prirody, Otd. Biol. Biul. (Bull. Soc. Imp. Nat. Moscou) 16(2):298 (reprint p. 126) (Syntypes; Sitka Island, Alaska; lost?, not at Helsinki Mus.); Eichhoff, 1876, Stett. Ent. Zeit. 37:378 (Synonymy); Bright, 1963, Ann. Ent. Soc. Amer. 56:108. *Synonymy*

*Bostrichus semicasteneus* Mannerheim, 1852, Moskov. Obshch. Isp. Prirody, Otd. Biol. Biul. (Bull. Soc. Imp. Nat. Moscou) 25(2):358 (reprint p. 76) (Holotype, sex?; Sitka Island, Alaska; Helsinki Mus.); LeConte, 1868, Trans. Amer. Ent. Soc. 2:161. *Synonymy*

*Bostrichus victoris* Mulsant and Rey, 1853, Opusc. Ent. 2:91 (Syntypes?; Faillefeu, Basses-Alpes, France; not located); Bedel, 1888, Ann. Soc. Ent. France, hors serie, 6:416. *Synonymy*

*Dryocoetes americanus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:51 (Holotype, female; Cheat Bridge, Randolph County, West Virginia; U.S. Nat. Mus., 7632); Bright, 1963, Ann. Ent. Soc. Americ. 56:108. *Synonymy*

*Dryocoetes pseudotsugae* Swaine, 1915, Canadian Ent. 47:360 (reprint p. 5) (Lectotype, female; Stanley Park, Vancouver Island, British Columbia; Canadian Nat. Coll., 9293, designated by Bright, 1967, Canadian Ent. 99:674); Bright, 1963, Ann. Ent. Soc. Amer. 56:108. *Synonymy*

DIAGNOSIS.— This species is distinguished from other American representatives of the genus by the larger size, by the punctured, nonasperate pronotal disc, by the more evenly convex elytral declivity, and by the sculpture and vestiture of the female frons.

MALE.— Length 2.8–4.4 mm, 2.5 times as long as wide; color rather dark reddish brown.

Frons broadly convex from epistoma to vertex; surface smooth, shining, with moderately coarse, rather close, deep punctures, their margins feebly granulate at least in lateral areas; vestiture of very sparse, long hair; epistomal brush wide, conspicuous.

Pronotum 1.1 times as long as wide; widest at middle, sides evenly, strongly arcuate from base to rather narrowly rounded anterior margin; anterior two-fifths and lateral areas to base finely asperate, remaining area coarsely, deeply, closely punctured; a smooth, shining, impunctate median line on posterior half usually present. Vestiture confined to marginal areas, of long hair.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures rather coarse, deep; interstriae smooth, shining, as wide as striae, punctures moderately fine, deep, uniseriate. Declivity steep, broadly convex; sculpture about as on disc; interstrial punctures finely granulate or not; interstriae 1 feebly elevated. Vestiture of rows of fine, short, strial hair; and rows of much longer, rather fine, interstrial hair.

FEMALE.— Similar to male except frons with a weak, transverse impression just below middle (variable), impunctate at center, remaining area with sparse granules; interstrial punctures on declivity finely granulate.

DISTRIBUTION.— North American coniferous forests south to New Mexico and North Carolina, and northern Europe and Asia.

ALASKA: Numerous localities. CANADA: Alberta, British Columbia, Labrador, Manitoba, New Brunswick, Newfoundland, Northwest Territories, Quebec,

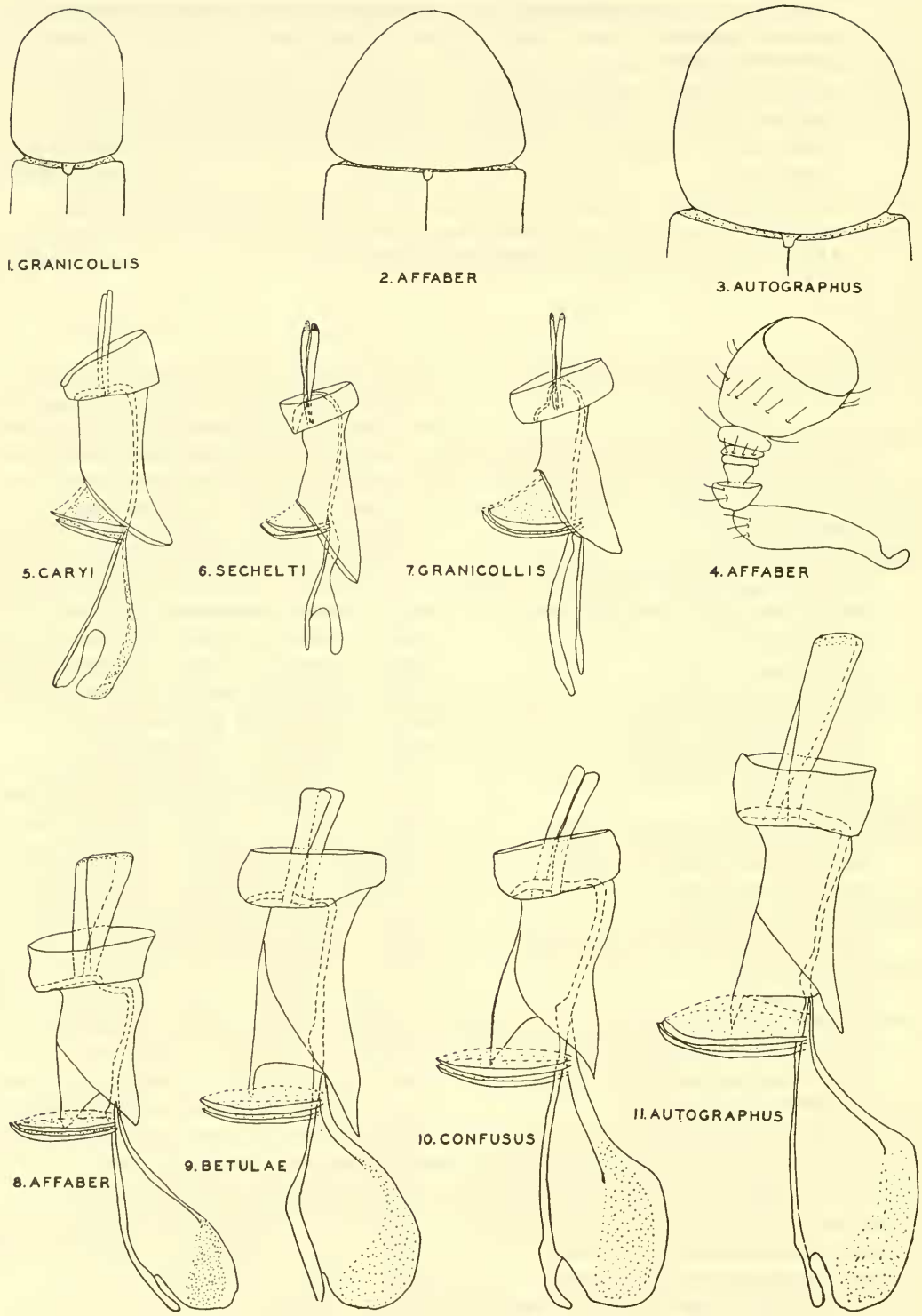



Fig. 173. *Dryocoetes* spp., pronotum, antenna, and male genitalia: 1, 7, *granicollis*; 2, 4, 8, *affaber*; 3, 11, *autographus*; 5, *caryi*; 6, *sechelti*; 9, *betulae*; 10, *confusus*. (After Bright 1963:112.)

Saskatchewan, Yukon Territory. USA: California, Colorado, Idaho, Maine, Michigan, Minnesota, Montana, Nevada, New Hampshire, New Mexico, New York, North Carolina, Oregon, Pennsylvania, South Dakota, Tennessee, Utah, Virginia, Washington, West Virginia, Wisconsin, Wyoming.

HOSTS.— *Abies* sp., *Picea engelmannii, P. glauca, Pinus contorta, P. monticola, P. strobus, Pseudotsuga menziesii, Tsuga heterophylla.*

BIOLOGY.— Essentially as described for the genus. They occur most commonly in the stumps and large roots of standing, dying trees.

NOTES.— The syntypes of *autographus* evidently were destroyed. The above treatment was based on specimens compared by Eggers to them prior to their destruction, on a Mannerheim female of *septentrionis* in the Canadian National Collection, on the holotypes of *semicastaneus* and *americanus*, and on the lectotype of *pseudotsugae*. The Mannerheim collection does not contain a specimen of *septentrionis*. Because Mannerheim regarded it as only a variety of *semicastaneus*, it is possible that the type was sent to LeConte because his 1852 treatment of the species lists LeConte, not Mannerheim, as its author. In all, 1,107 American and 35 European specimens were examined.

The American specimens tend to have the frons more sparsely granulate, the strial punctures slightly larger and not as deep, and the elytral declivity slightly more convex than the European material. The differences are slight, variable, and not suitable for statistical analysis; therefore, I prefer to follow Bright (1963) and recognize only one species.

### 2. *Dryocoetes betulae* Hopkins
Fig. 173

*Dryocoetes eichhoffi* Hopkins, 1894 (nec. Ferrari, 1867), Canadian Ent. 26:279 (reprint p. 5) (Syntypes; evidently eastern United States; U.S. Nat. Mus.)

*Dryocoetes betulae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:50 (Holotype, female; Grant County, Virginia; U.S. Nat. Mus., 7630). *Replacement name*

*Dryocoetes liquidambaris* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:51 (Holotype, female; Virginia Beach, Virginia; U.S. Nat. Mus., 7631); Blackman, 1922, Mississippi Agric. Expt. Sta. Tech. Bull. 11:120. *Synonymy*

DIAGNOSIS.— This species is distinguished from *autographus* (Ratzeburg) by the more finely, more closely granulate male frons, by the very different sculpture and pubescence of the female frons, by the more coarsely and extensively asperate pronotum, and by the more strongly impressed elytral declivity, with the interstrial granules much more conspicuous.

MALE.— Length 2.8–3.8 mm, 2.4 times as long as wide; color dark reddish brown.

Frons sexually dimorphic; male as in *autographus* except much more closely granulate.

Pronotum 1.06 times as long as wide; as in *autographus* except widest slightly behind middle, asperities larger, asperate area extending two-thirds of pronotum length from anterior margin in median area, to base in lateral areas.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; as in *autographus* except declivity more flattened due to interstriae 2 being broadly, moderately impressed, 1 distinctly and 3 feebly elevated; declivital interstrial granules distinctly larger.

FEMALE.— Similar to male except frons less strongly convex, surface finely, very closely granulate, punctures not evident, ornamented by a rather dense brush of fine, long hair from epistoma to vertex, length of hair near epistoma twice as long as width of eye, three times as long near vertex.

DISTRIBUTION.— British Columbia and Newfoundland to Louisiana and Florida.

CANADA: Alberta, British Columbia, Newfoundland, New Brunswick, Ontario, Quebec. USA: District of Columbia, Florida, Louisiana, Maine, Michigan, Mississippi, Montana, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Virginia, Vermont, West Virginia, Washington.

HOSTS.— *Betula lenta, B. lutea, B. papyrifera*; less common in *Fagus grandifolia, Liquidambar styraciflua,* etc.

BIOLOGY.— Essentially as described for the genus. It may attack stumps and the bole and limbs of recently cut and unthrifty trees.

NOTES.— The above treatment was based on the holotypes of *betulae* and *liquidambaris* and on 344 other specimens.

### 3. *Dryocoetes confusus* Swaine
Fig. 173

*Dryocoetes confusus* Swaine, 1912, Canadian Ent. 44:351 (Holotype, female; Colorado, 18, Cornell U. lot 302, sub. 35; Cornell Univ. Coll.)

*Dryocoetes abietis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:52 (Holotype, female; Lake MacDonald, Montana; U.S. Nat. Mus., 7628); Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):131. *Synonymy*

DIAGNOSIS.— This species is distinguished from the closely allied *betulae* by the much smaller strial punctures, by the strongly confused punctures on discal interstriae 3, and by the finely, densely punctured female frons, with a more dense, shorter brush of hair.

MALE.— Length 3.2–4.3 mm, 2.3 times as long as wide; color rather dark reddish brown.

Frons much as in *autographus* but not as wide, punctures smaller, almost devoid of granules; mandibles not as elongate.

Pronotum 1.1 times as long as wide; as in *betulae* except asperate area extending to base in median area.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; striae 1 feebly, others not impressed, punctures small, deep; interstriae smooth, shining, three to four times as wide as striae, punctures deep, only slightly smaller than those of striae, moderately confused on 2, strongly confused on 3. Declivity essentially as in *betulae* except interstriae 2 slightly more strongly impressed, 1 more strongly elevated; granules moderately coarse.

FEMALE.— Similar to male except frons weakly convex, surface densely, very finely punctured, devoid of granules, vestiture of dense brush of reddish hair, hair length near epistoma slightly shorter than width of eye, distinctly longer near vertex.

DISTRIBUTION.— British Columbia and Alberta to Arizona and New Mexico.

CANADA: **Alberta**: Jasper Park, Lesser Slave Lake. **British Columbia**: Hope Summit, Lorna, Mt. Apex, Stanley Park, Terrace, Trinity Valley. USA: **Arizona**: Flagstaff, San Francisco Mts. **Colorado**: Aspen, Newcastle, Norwood, Rabbit Ears Pass, Ridgeway, Rifle. **Idaho**: Coeur d'Alene, Lakeview, Riggins. **Montana**: Big Hole Co., Glacier, Phillipsburg. **New Mexico**: Coyote, Sandia Mts. **Oregon**: Gold Lake in Willamette N.F., Silver Creek, Sumpter, Tollgate. **Utah**: Brighton, Cedar Breaks N.M., La Sal Mts., Logan Canyon, Logan Dry Canyon, Manti N.F., Mirror Lake in Summit Co., Monticello. **Wyoming**: Wapati, Yellowstone N.P.

HOSTS.— *Abies lasiocarpa*; less commonly in *A. amabilis*, *A. concolor*, and *Picea engelmannii*.

BIOLOGY.— Essentially as described for the genus. The lower bole of standing trees is usually selected for attack. Evidently this species is moderately aggressive and capable of killing overmature or unthrifty trees. Most commonly the attack is made on one side or area of the bole, then successive generations girdle the remaining area over more than one season. Less commonly, cut or fallen trees are attacked by this species.

NOTES.— The above treatment was based on the holotypes of *confusus* and *abietis* and on 318 other specimens.

### 4. *Dryocoetes granicollis* (LeConte)

Fig. 173

*Xyleborus granicollis* LeConte, 1868, Trans. Amer. Ent. Soc. 2:162 (Holotype, sex?; Sullivan County, Pennsylvania; Mus. Comp. Zool., 1018)

*Dryocoetes granicollis*: LeConte, 1876, Proc. Amer. Philos. Soc. 15:643

DIAGNOSIS.— This species is distinguished from the allied *sechelti* Swaine and *caryi* Hopkins by the elongate pronotum that has straight subparallel sides, by the very strongly impressed declivital striae 2 that have unusually large punctures, and by the strongly elevated, subserrate declivital interstriae 2.

MALE.— Length 2.2–2.4 mm, 2.6 times as long as wide; color reddish brown.

Frons broadly convex above, almost flat below; surface obscurely reticulate, finely granulate-punctate; vestiture sparse, fine, long.

Pronotum 1.2 (female 1.3) times as long as wide; sides almost straight and parallel on basal two-thirds; rather finely asperate on anterior two-thirds and sides, fine punctures subasperate on posterior discal area. Vestiture fine, hairlike, long on marginal areas, short on disc.

Elytra 1.6 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal three-fourths, very broadly rounded behind; striae distinctly, others feebly if at all impressed, punctures very coarse, deep; interstriae slightly narrower than striae, smooth, shining, punctures fine, uniseriate, a few of them obscurely subgranulate. Declivity steep, bisulcate; striae 1 very deeply, broadly impressed, punctures unusually large, much larger than on other striae; interstriae 1 rather abruptly, strongly

elevated, its height about equal to 2 and 3, each interstriae with a uniseriate row of fine granules. Vestiture of rows of fine, short, strial hair; and rows of much longer, rather coarse, interstrial hair.

FEMALE.— Similar to male except frons with pubescence more abundant (about twice that of male), pronotum more elongate, and declivital granules distinctly larger.

DISTRIBUTION.— Quebec to Arkansas and North Carolina.

CANADA: **Quebec**: Chelsea, Gaspé. USA: **Arkansas**: Senton Co. **District of Columbia**: Washington. **Kentucky**: Noble. **Louisiana**: Tallulah. **Missouri**: Dent Co. **New Jersey**: Orange Mt. **New York**: Jamaica. **North Carolina**: Tryon. **Ohio**: Wooster. **Pennsylvania**: Arendtsville, Germantown, Pen Mar, Sullivan Co. **Virginia**: Falls Church, Grover Camp.

HOSTS.— *Picea glauca*, etc.

BIOLOGY.— Evidently as described for the genus. Specimens were removed from the lower bole of a small dying spruce about 20 cm in diameter. *Castanea* and *Juglans* have been recorded as hosts, but these records have not been confirmed.

NOTES.— The above treatment was based on the holotype and on 56 other specimens.

### 5. *Dryocoetes affaber* (Mannerheim)

Figs. 173, 174

*Bostrichus affaber* Mannerheim, 1852, Moskov. Obshch Isp. Prirody, Otd. Biol. Biul. (Bull. Soc. Imp. Nat. Moscow) 25(2):359 (reprint, p. 77) (Holotype, female; Sitka Island, Alaska; Helsinki Mus.)

*Dryocoetes affaber*: LeConte, 1876, Proc. Amer. Philos. Soc. 15:361

*Dryocoetes pubescens* Swaine, 1912, Canadian Ent. 44:350 (Holotype, female; Colorado, Cornell U. lot 302, sub. 37; Canadian Nat. Coll., 9291); Bright, 1963, Ann. Ent. Soc. Amer. 56:111. *Synonymy*

*Dryocoetes piceae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:51 (Holotype, female; Cranesville, West Virginia; U.S. Nat. Mus., 7627); Bright, 1963, Ann. Ent. Soc. Amer. 56:111. *Synonymy*

DIAGNOSIS.— Contrary to what might be expected from the above key, this species is much more closely allied to *confusus* Swaine than to other American species, but it is distinguished by the smaller size, by the uniseriate punctures on discal interstriae 3, by the less strongly impressed elytral declivity, and by the different vestiture on the female frons. It is much more closely allied to *pini* Niijima, from Japan.

MALE.— Length 2.3–3.1 mm, 2.6 times as long as wide; color yellowish to reddish brown.

Frons as in *granicollis* LeConte.

Pronotum 1.1 times as long as wide; essentially as in *confusus*.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; outline as in *granicollis*; striae not impressed, punctures small, deep; interstriae smooth, shining, twice as wide as striae, punctures slightly smaller than those of striae, rather deep, uniseriate. Declivity steep, very broadly convex; interstriae 2 weakly impressed, 1 moderately elevated; interstrial granules rather small. Vestiture essentially as in *confusus*.

FEMALE.— Similar to male except frons finely, closely punctured, with a moderately dense brush of rather long hair from epistoma to vertex, each hair slightly greater in length than width of eye; declivital interstriae 2 less strongly impressed, 1 less strongly elevated.

DISTRIBUTION.— Alaska and Newfoundland to New Mexico and North Carolina.

ALASKA: Numerous localities. CANADA: Alberta, British Columbia, Manitoba, Newfoundland, New Brunswick, Ontario, Quebec, Saskatchewan, Yukon Territory. USA: Arizona (Hannagan Camp, Greenlee Co.), Colorado, Idaho, Maine, Michigan, Minnesota, New Hampshire, New Mexico, New York, North Carolina, Oregon, Pennsylvania, Utah, South Dakota, Tennessee, Washington, West Virginia, Wisconsin.

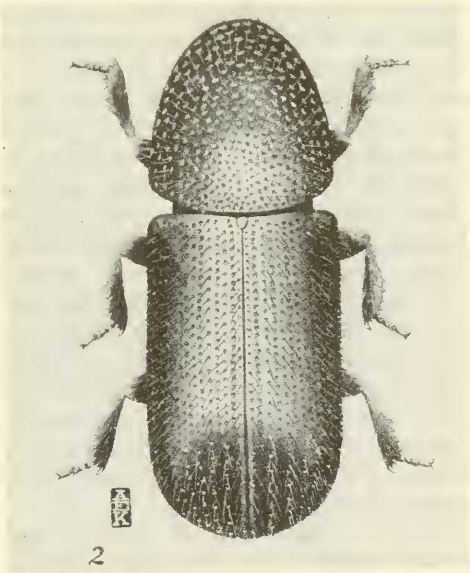



Fig. 174. *Dryocoetes affaber*, female. (After Swaine 1925:pl. VI.)

HOSTS.— *Picea engelmannii, P. glauca, P. mariana, P. rubra, P. sitchensis*; rare in *Abies fraseri, Pinus monticola, P. strobus,* and other conifers.

BIOLOGY.— Essentially as described for the genus. This species attacks unthrifty, cut, fallen, and injured trees, particularly the lower bole, but stumps and limbs are also infested.

NOTES.— The above treatment was based on the holotypes of *affaber, pubescens,* and *piceae,* and on 1,709 other specimens.

### 6. *Dryocoetes sechelti* Swaine
Fig. 173

*Dryocoetes sechelti* Swaine, 1915, Canadian Ent. 47:359 (Lectotype, female?; Sechelt, British Columbia, Canadian Nat. Coll., 9292, designated by Bright, 1967, Canadian Ent. 99:674.)

DIAGNOSIS.— This species is distinguished from the very closely allied *caryi* Hopkins by the narrower discal striae and by the weakly impressed declivital interstriae 1 with its much smaller punctures.

MALE.— Length 1.6–2.2 mm, 2.6 times as long as wide; color reddish brown.

Frons broadly convex, with median line obtusely elevated on lower half; surface obscurely subreticulate, rather coarsely, deeply punctured; vestiture of fine, sparse, long hair.

Pronotum 1.1 times as long as wide; widest near base, sides weakly arcuate, converging slightly toward rather narrowly rounded anterior margin; finely asperate to base, rather coarse punctures intermixed with small asperities on median area on basal third. Vestiture of moderately abundant, fine, long hair.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; outline as in *affaber* (Mannerheim); striae 1 weakly, others not impressed, punctures rather small, deep; interstriae smooth, shining, twice as wide as striae, punctures two-thirds as large as those of striae, deep, uniseriate. Declivity steep, broadly convex; interstriae 1 moderately elevated; striae 1 normal, similar to 2; interstrial punctures feebly granulate toward base. Vestiture as in other species, of rows of strial and interstrial hair.

FEMALE.— Similar to male except frontal vestiture slightly more abundant; declivital interstrial granules very slightly larger and more widely distributed.

DISTRIBUTION.— British Columbia and Montana to Utah and Colorado.

CANADA: **British Columbia**: Lorna, 3-VII-24, *Abies lasiocarpa,* R. Hopping; Sechelt. USA: **Colorado**: Newcastle, 1-VIII-44, *Picea engelmannii,* C. L. Massey; Uncompagre N.F., 13-VIII-54, *P. engelmannii,* R. Sluss. **Montana**: Glacier N.P., 23-VIII-23, J. C. Evenden; West Yellowstone, 12-VII-72, G. Lasch. **Oregon**: Santiam Pass, 19-VII-46, *Pinus contorta* (accidental?), S. L. Wood; Suttle Lake, 1-VIII, *Abies lasiocarpa.* **Utah**: Geyser Pass in La Sal Mts., 300 m, V. M. Tanner; Logan Canyon, 24-VII-46, *A. lasiocarpa,* S. L. Wood; Logan Dry Canyon, 16-VI-46, *A. lasiocarpa,* S. L. Wood.

HOSTS.— *Abies lasiocarpa.*

BIOLOGY.— Essentially as described for the genus. Specimens were taken from the lower bole of standing, dying trees 20–25 cm in diameter.

NOTES.— The above treatment was based on the lectotype of *sechelti* and on 47 other specimens.

### 7. *Dryocoetes caryi* Hopkins
Fig. 173

*Dryocoetes caryi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:50 (Holotype, male; Camp Caribou, Maine; U.S. Nat. Mus., 7629)

DIAGNOSIS.— This species is distinguished from *sechelti* Swaine as indicated in the above diagnosis and from *granicollis* (LeConte) by the stouter pronotum, by the slightly smaller strial punctures, by the less strongly impressed striae 1 with smaller punctures, and by the less strongly elevated interstriae 1.

MALE.— Length 1.9–2.3 mm, 2.6 times as long as wide; color reddish brown.

Frons and pronotum as in *sechelti.* Elytra as in *sechelti* except strial punctures larger; discal interstriae as wide as striae; declivital striae 1 very slightly deeper than 2, its punctures slightly larger than those of 2; declivital granules slightly larger.

FEMALE.— Similar to male except frontal vestiture very slightly more abundant; granules on elytral declivity slightly larger.

DISTRIBUTION.— Alaska and Quebec to Wyoming and North Carolina.

ALASKA: Homer, 25-VII-45, *Picea,* J. C. Chamberlin; Seward, 31-VIII-56, *Picea lutzii,* G. L. Downing. CANADA: **Alberta**: Crowsnest, 3-VII-51, No. A2039, *P. glauca.* **British Columbia**: Lorna, 3-VII-24, *P. engelmannii,* R. Hopping; Trinity Valley, 4-VII-54, *P. engelmannii.* **Quebec**: Chelsea, 17-V-54, *P. glauca,* S. L. Wood; Gaspé, 12-VIII-32, *P. glauca,* E. B. Watson. USA:

Maine: Caribou, 25-V-00, *Picea*, A. Cary; Maine Agricultural Experiment Station, 10-IX-14, M. W. Blackman. New York: Cranberry Lake, 25-VI-15, M. W. Blackman. North Carolina: Cherokee, 19-VII-51, *P. rubra*, S. L. Wood. Wyoming: Laramie, 8-VIII-47, P. B. Lawson.

HOSTS.— *Picea engelmannii*, *P. glauca*, and *P. rubra*.

BIOLOGY.— As in *sechelti*.

NOTES.— The above treatment was based on the holotype and on the 36 other specimens. Variations in this species and in *sechelti* are such that when more material is available for study it may become necessary to place the name *sechelti* in synonymy.

## GENUS *COCCOTRYPES* EICHHOFF

*Coccotrypes* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:57, 308 (Type-species: *Bostrichus dactyliperda* Fabricius, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:118)

*Peocilips* Schaufuss, 1897, Berliner Ent. Zeitschr. 42:110 (Type-species: *Poecilips sannio* Schaufuss, monobasic); Wood, 1973, Great Basin Nat. 33:171. *Synonymy*

*Cryphaloides* Formenek, 1908, Ent. Blätt. 4:91 (Type-species: *Cryphaloides donisthorpei* Formenek = *Bostrichus carpophagus* Hornung, monobasic); Schedl, 1962, Mitt. Münchner Ent. Ges. 52:95. *Synonymy*

*Thamnurgides* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:45 (Type-species: *Thamnurgides persicae* Hopkins = *Coccotrypes advena* Blandford, original designation); Schedl, 1938, Ent. Berichten 10:9. *Synonymy*

*Spermatoplex* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:48 (Type-species: *Spermatoplex rhizophorae* Hopkins, original designation); Schedl, 1952, Ent. Blätt. 47–48:160. *Synonymy*

*Dendrurgus* Eggers, 1923, Zool. Meded. 7:144 (Type-species: *Dendrurgus rhizophorae* Eggers = *Spermatoplex rhizophorae* Hopkins, present designation); Eggers, 1927, Treubia 9:390. *Synonymy*

DIAGNOSIS.— This genus is distinguished from *Dryocoetes* Eichhoff by the less extensive corneous part of the antennal club, by the more gradual, more narrowly convex elytral declivity, by the convergently aciculate frons, by the pronounced sexual dimorphism, and by the habits.

DESCRIPTION.— Length 1.2–2.5 mm, 2.1–2.5 times as long as wide; color reddish brown to almost black; pronounced sexual dimorphism, males much smaller, deformed, flightless.

Frons broadly convex, convergently aciculate; vestiture sparse, hairlike. Eye elongate, shallowly emarginate; finely granulate. Antennal scape elongate; funicle 5-segmented; club more or less obliquely truncate, with or without sutures on posterior face. Pronotum variable, weakly to strongly arched, asperate to smooth. Elytra smooth, shining, striate; declivity convex, simple. Tibiae moderately slender, essentially as in *Dryocoetes*.

DISTRIBUTION.— Essentially circumtropical, but transported through commerce to all parts of the world; more than a hundred nominate species exist in the literature, but there is a great deal of synonymy and confusion of names; eight occur in North and Central America.

BIOLOGY.— Most species infest large seeds, although a few forms are phloeophagous. The females mate with sibling males in the brood tunnels then emerge to seek a new host. The female enters the seed and constructs a short cave-type tunnel in which eggs are deposited in clusters. Larval development is very rapid. The larvae usually extend or enlarge the parental tunnel, often consuming the entire contents of the seed. Evidently more than one generation can develop in one fruit. Some species are exclusively phloeophagous and apparently many other spermophagous species can survive periods of stress in bark.

NOTES.— *Coccotrypes* and *Poecilips* have been recognized as separate genera on the basis of the sculpture and degree of convexity of the pronotum. The extremes within the group are strikingly different from one another in general appearance as well as in habits; however, the variation is so great and intergradation between the groups is so complete I see no hope of recognizing more than one genus on either a morphological or biological basis. The literature indicates considerable confusion among taxonomists as to the generic placement of their species. The only possible means of separating them I see is the presence or absence of strial hair; in other groups this is not a reliable character.

Most of the American species have been introduced from the Eastern Hemisphere, and I suspect, when the world fauna is thoroughly known, all of them will fall into this category.

The classification and nomenclature of this genus are chaotic and desperately in need of a comprehensive study.

Key to the Species of *Coccotrypes* (females only)

1. Strial setae entirely obsolete, interstrial bristles rather coarse; pronotum usually much more broadly convex both longitudinally and transversely, its anterior margin more broadly rounded and devoid of serrations ..... 2

— Rows of strial setae conspicuously present between rows of longer, fine, interstrial hair; pronotum more strongly, narrowly convex both longitudinally and transversely, its anterior margin more narrowly rounded and partly serrate ..... 4

2(1). Pronotum smooth, shining, entirely devoid of asperities, punctures fine, deep, a few of them with one margin minutely granulate; sides of pronotum on anterior third converging rather abruptly; S Florida and Antilles Islands to Surinam, Hawaii to Indonesia, etc.; fruit or phloem of many hosts; 1.4–2.0 mm ..... 1. ***advena*** **Blandford**

— Anterior half of pronotum finely asperate, devoid of punctures in asperate area; sides on anterior third of pronotum broadly rounded; larger species ..... 3

3(2). Pronotal asperities fine, more widely spaced, minute to almost obsolete on basal third; surface on posterior half of pronotum etched, subreticulate, shining; strial punctures rather coarse, striae almost as wide as interstriae; S Florida, Veracruz, etc.; *Rhizophora mangle* fruit; 2.2–2.5 mm ..... 2. ***rhizophorae*** **(Hopkins)**

— Pronotal asperities moderately coarse, close, extending to base, surface between asperities smooth, shining; strial punctures small, interstriae twice as wide as striae; Florida, Antilles Islands, Costa Rica to Panama, N South America, Java to India; fruit or phloem of many hosts; 1.7–2.3 mm ..... 3. ***cyperi*** **(Beeson)**

4(1). Body slender, 2.5 times as long as wide; strial hair erect, almost as long as those of interstriae, both very fine; strial and interstrial punctures equally small, each with a fine granule on anterolateral margin; Cuba to Puerto Rico; *Eutrepe globosa*; 1.3 mm ..... 4. ***robustus*** **Eichhoff**

— Body stouter, 2.1–2.2 times as long as wide; strial hair semirecumbent, shorter and finer than interstrial hair; strial punctures never with granules on margin ..... 5

5(4). Pronotal asperities small, rather sparse, those at summit averaging less than twice as long (transversely) as thick, those at summit as high as those on anterior slope ..... 6

— Pronotal asperities larger, closer, those at summit at least four times as long (transversely) as thick, higher on anterior slope than at summit ..... 7

6(5). Smaller; interstrial bristles blunt, their apices often slightly flattened, each bristle only slightly longer than distance between interstrial rows; strial punctures small, very shallow, spaced within a row by two to three diameters of a puncture; Costa Rica to Brazil, etc.; 1.2 mm ..... 5. ***aciculatus*** **Schedl**

— Larger; interstrial bristles pointed, each about twice as long as distance between interstrial rows; strial punctures shallowly impressed, separated by distances equal to diameter of a puncture; Florida, Honduras, Hawaii to Ceylon; 1.7–2.3 mm ..... 6. ***distinctus*** **(Motschulsky)**

7(5). Smaller; mature color dark brown to almost black; strial punctures very slightly smaller, shallow; interstrial granules on disc averaging smaller, more widely spaced; interstrial setae on declivity shorter, each only slightly longer than distance between rows; almost cosmopolitan; in palm fruits; 1.5–1.9 mm ..... 7. ***carpophagus*** **(Hornung)**

– Larger; mature color reddish brown; strial punctures slightly larger, very slightly deeper; interstrial granules averaging slightly larger, closer; interstrial setae on declivity longer, each almost twice as long as distance between rows; almost cosmopolitan; in palm fruits; 1.8–2.3 mm ..... 8. ***dactyliperda*** **(Fabricius)**

### 1. *Coccotrypes advena* Blandford

*Coccotrypes advena* Blandford, 1894, Trans. Ent. Soc. London 1894:100 (Holotype, female; Nagasaki, Japan; British Mus. Nat. Hist.)

*Thamnurgides persicae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:45 (Holotype, female; Honolulu, Hawaii; U.S. Nat. Mus., 7614); Wood, 1973, Great Basin Nat. 33:174. *Synonymy*

*Thamnurgides setosus* Beeson, 1929, Insects of Samoa, Coleopt. 4:228 (Holotype, female; Fagasa, Tutuila, Samoa; British Mus. Nat. Hist.); Schedl, 1961, Rev. Ent. Moçambique 4:728. *Synonymy*

*Thamnurgides cubanus* Eggers, 1934, Ent. Blätt. 30:79 (Holotype, female; Cuyajabas, Sierra Rosario, Cuba; U.S. Nat. Mus., 60195); Wood, 1960, Insects of Micronesia 18(1):48. *Synonymy*

*Poecilips nuciferus* Schedl, 1938, Ent. Berichten 10:10 (Syntypes; Paramaribo, Surinam); Schedl, 1961, Rev. Ent. Moçambique 4:738. *Synonymy*

*Thamnurgides vicarius* Beeson, 1939, Indian For. Rec. 5:285 (Holotype, female; Samsing, Kalimpong, Bengal, India; Dehra Dunn); Schedl, 1961, Rev. Ent. Moçambique 4:728. *Synonymy*

*Poecilips niger* Schedl, 1939, J. Fed. Malaya St. Mus. 18:345 (Syntypes; Malaya); Wood, 1960, Insects of Micronesia 18(1):48. *Synonymy*

*Poecilips subnitidus* Schedl, 1954, Philippine J. Sci. 83:147 (Holotype, female; Buitenzorg, Java; Schedl Coll.); Schedl, 1961, Rev. Ent. Mocambique 4:728. *Synonymy*

DIAGNOSIS.— Among American species this one is distinguished by characters summarized in the above key. It is distinguished from the African *sannio* Schaufuss by the longer, more slender interstrial bristles, particularly on the declivity, and by the much smaller, almost obsolete granules on the anterior half of the pronotum.

FEMALE.— Length 1.4–2.0 mm, 2.2 times as long as wide; mature color very dark brown.

Frons broadly convex, rather weakly, convergently aciculate on lower third, sparse, fine, granulate punctures above, shining, subreticulate toward vertex; median line broadly, rather indistinctly elevated; vestiture of sparse, fine, long hair.

Pronotum 1.06 times as long as wide; widest just behind middle, sides moderately arcuate, converging rather strongly on anterior third, rather narrowly rounded in front; surface smooth and brightly shining to subreticulate (variable in series), finely, rather sparsely punctured, most punctures on anterior half minutely granulate, asperities absent. Vestiture sparse, of fine, long hair.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; sides almost straight on basal half, slightly wider near base of declivity, narrowly rounded behind; striae 1 feebly, others not impressed, punctures moderately large, rather shallow; interstriae smooth, shining, about one and one-half times as wide as striae, punctures fine, uniseriate, minutely granulate on their anterior margins. Declivity rather steep, broadly convex; sculpture as on disc. Vestiture of rows of interstrial bristles only; each bristle slightly longer than distance between rows or between bristles within a row; each bristle slender, either slightly flattened on its apical fourth or not.

DISTRIBUTION.— Florida, Cuba to Surinam, and Hawaii to India.

Specimens have not been reported from North or Central America (except Florida); however, because it is well established in the Antilles, in Surinam, and in Hawaii, it may soon become established in Central America, Mexico, or on the Gulf of Mexico coast in the USA. One series taken at Coral Gables, Florida, may have been from a breeding population.

HOSTS.— Numerous tropical trees having large seeds.

BIOLOGY.— This species breeds in bark and fruits of its hosts.

NOTES.— The above treatment was based on the holotypes of *advena*, *persicae*, *setosus*, *nuciferus*, *vicarius*, and *cubanus*, on syntypes of *niger*, and on about 300 other specimens. Schedl (1963:267) listed *subnitidus* as a synonym of this species; I have not seen authentic specimens to confirm his observations. Schedl also treated *sannio* Schaufuss and *bambesianus* Eggers as synonyms of this species. Cotypes or syntypes of both were examined and I agree that they are synonyms of one another, but they are distinct from *advena*.

### 2. *Coccotrypes rhizophorae* (Hopkins)
Fig. 175

*Spermatoplex rhizophorae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:48 (Holotype, female; Miami, Florida; U.S. Nat. Mus. 7626)

*Dendrurgus rhizophorae* Eggers, 1923 (nec Hopkins, 1915), Zool. Meded. Roy. Mus. Nat. Hist. Leiden 7:149 (Syntypes; Insel Saleyer and Moeara Antjol, Sumatra)

*Poecilips rhizophorae*: Schedl, 1952, Ent. Blätt. 47–48:160. *Synonymy*

*Thamnurgides nephelii* Eggers, 1936, Tijdschr. Ent. 79:84 (Holotype, female; Buitenzorg, Java; British Mus. Nat. Hist.); Kalshoven, 1958, Tijdschr. Ent. 101:176. *Synonymy*

DIAGNOSIS.— This species is distinguished from other American representatives of the genus as indicated in the above key.

FEMALE.— Length 2.2–2.5 mm (male 1.6 mm), 2.4 times as long as wide; color reddish brown.

Frons essentially as in *advena* Blandford.

Pronotum 1.07 times as long as wide; outline about as in *advena*; surface shining, subreticulate; slightly more than anterior half with fine, low, isolated, transverse asperities; posterior area with sparse, minute punctures, most of them minutely granulate or subasperate (see taxonomic notes). Vestiture of sparse, fine, long hair.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae weakly impressed, punctures moderately large, rather deep; interstriae smooth, shining, very slightly wider than striae, punctures uniseriate, fine, most of them finely granulate. Declivity rather gradual, broadly convex, more narrowly convex toward apex; sculpture as on declivity except striae 1 slightly more strongly impressed. Vestiture of rows of erect interstrial bristles; each bristle as long as distance between rows, or between bristles within a row; each bristle very slightly flattened on its apical third.

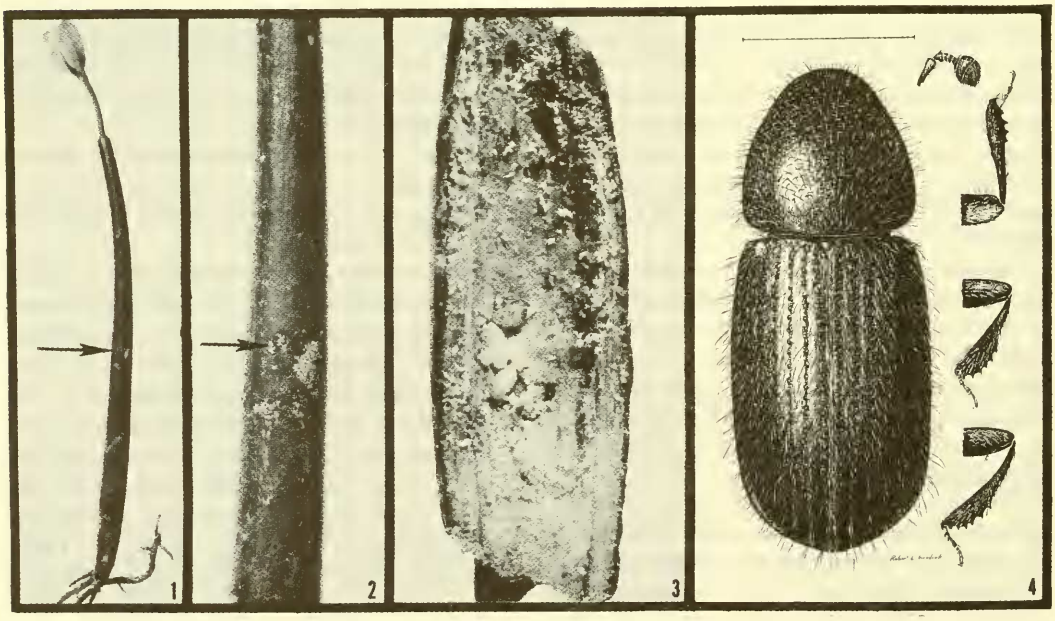



Fig. 175. *Coccotrypes rhizophorae*: 1–3, damage to seedling; 4, female. (Woodruff 1970:1.)

DISTRIBUTION.— S Florida, Veracruz, Galapagos Islands, and Indonesia.

USA: **Florida**: Homestead, 19-VII-39, P. B. Lawson; La Belle, 16-VII-39, P. B. Lawson; Little River, 22-VIII-18, *Rhizophora mangle*; Key West, 20-VII-39, P. B. Lawson; Miami, 4-IX-70. MEXICO: **Veracruz**: Mandinga, 12-III-80, T. H. Atkinson. GALAPAGOS ISLANDS: Albermarle Isl., 4–14-III-06, F. X. Williams.

HOSTS.— *Rhizophora mangle*.

BIOLOGY.— The viviparous seeds of the host are attacked soon after they fall to the ground (Woodruff 1970).

NOTES.— The above treatment was based on the holotype of *rhizophorae* (Hopkins), on 2 syntypes and 2 "homotypes" of *rhizophorae* (Eggers), and on 93 other specimens. One cotype and one other specimen of *nephelii* (Eggers) were also examined. The pronotal disc of *rhizophorae* (Eggers) is smooth, shining, rather coarsely, deeply punctured, and devoid of granules. Under ordinary circumstances it would be placed in a species different from that of Hopkins; however, the two specimens of *nephelii* are almost exactly intermediate between the two. All three agree completely in all other characters. In the absence of adequate Indonesian material, and in view of the similar habits, I reluctantly follow the synonymy proposed by Schedl and add *nephelii* as another synonym.

### 3. *Coccotrypes cyperi* (Beeson)

*Thamnurgides cyperi* Beeson, 1929, Insects of Samoa, Coleoptera 4(4): 230 (Holotype, female, Apia, Samoan Islands, British Mus. Nat. Hist.)

*Thamnurgides indicus* Eggers, 1936, Ann. Mag. Nat. Hist. (10) 17:631 (Holotype, female; Sakalaspur, Mysore, India; British Mus. Nat. Hist.); Wood, 1978, Great Basin Nat. 38:397. *Synonymy*

*Xyleborus conspeciens* Schedl, 1936, Archiv. Inst. Biol. Veg. Río de Janeiro 3:110 (Holotype, female; locality not given, presumably Brazil; Schedl Coll.); Wood, 1973, Great Basin Nat. 33:179. *Synonymy*

*Dryocoetes insularis* Eggers, 1940 (nec. Eggers, 1940:129), Arb. Morph. Tax. Ent. Berlin-Dahlem 7:127 (Syntypes; Guadeloupe and Martinique); Schedl, 1962, Caribbean J. Sci. 2:63. *Synonymy*

*Coccotrypes insularis* Eggers, 1940 (nec. Eggers, 1940:127), Arb. Morph. Tax. Ent. Berlin-Dahlem 7:129 (Lectotype, female; Trois-Rivières, Guadeloupe; U.S. Nat. Mus., 60612, designated by Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:15); Schedl, 1962, Caribbean J. Sci. 2:63. *Synonymy*

*Dryocoetes subimpressus* Eggers, 1940, Arb. Morph. Tax. Ent. Berlin-Dahlem 7:127 (Holotype, female; Trois Rivières Guadeloupe; deposited in Eggers Collection, apparently on loan to Schedl); Wood, 1977, Great Basin Nat. 37:384. *Synonymy*

*Poecilips caraibicus* Schedl, 1952, Dusenia 3:345 (Replacement name for *Dryocoetes insularis* Eggers)

*Poecilips eggersi* Schedl, 1952, Dusenia 3:347 (Replacement name for *Coccotrypes insularis* Eggers)

DIAGNOSIS.— This species is distinguished from other American representatives of the genus by characters summarized in the above key.

FEMALE.— Length 1.7–2.3 mm (males 1.1–1.2 mm), 2.3 times as long as wide; rather dark reddish brown.

Frons broadly convex, convergently, rather finely aciculate from epistoma to upper level of eyes, with fine, rather deep punctures interspersed, rugose-reticulate above; vestiture of sparse, fine hair.

Pronotum 1.08 times as long as wide; outline as in *advena* Blandford; surface smooth, shining, rather closely, somewhat coarsely asperate to base, those on posterior half decreasing in size, a few punctures interspersed near base of disc. Vestiture of sparse, fine hair; usually abraded.

Elytra 1.4 times as long as wide, 1.4 times as long as pronotum; outline about as in *rhizophorae*; striae not impressed, punctures small, rather shallow; interstriae smooth and shining, twice as wide as striae, punctures uniseriate, fine, minutely granulate. Declivity rather steep, convex; sculpture as on disc. Vestiture of rows of erect, blunt, interstrial bristles; each bristle about one and one-half times as long as distance between rows or between bristles within a row; each very slightly flattened at extreme tip.

MALE.— Similar to female except much smaller, callow, more strongly convex, usually somewhat deformed, eyes reduced or absent.

DISTRIBUTION.— Florida, Costa Rica to Panama, Antilles Islands to Surinam, Java to India.

USA: **Florida**: Coral Gables, 6-III-56, in imported bird seed, C. F. Downing. **Louisiana**: 10-VIII-34, *Persea americana* seed from Honduras. COSTA RICA: San José, San José, 16-II-38, *Prionia capaifera* seeds, F. Nevermann; Finca La Lola, Limón, 22-VI-63, *Theobroma cacao*, J. L. Saunders; Pandora, Limón, 23-VIII-63, 50 m, No. 189, *Cynometra hemitobophylla*, S. L. Wood; Dominical, 9-XII-63, 3 m, No. 294, legume tree, S. L. Wood. PANAMA: Barro Colorado Island, Canal Zone, 27-XII-63, No. 346, *Entada giga*, S. L. Wood; Limón Bay, Canal Zone, 30-XII-63, 3 m, No. 357, fallen fruit, S. L. Wood. OTHER COUNTRIES: Puerto Rico, Surinam,

Martinique, Guadeloupe, Trinidad, Brazil, Hawaiian Islands, Fiji, Tahiti, Indonesia, India, French Indo-China.

HOSTS.— *Eugenia* sp., *Mangifera indica, Mammea americana, Orbignya oleifera, Cynometra hemitobophylla, Persea americana, Phytelephas macrocarpa, Pronia copaifer, Theobroma cacao,* etc.

BIOLOGY.— This species breeds in large seeds of fallen fruit; it is also capable of reproducing in bark. Browne (1961) records it from nine host species in Malaya. New attacks are made by females. Field observations indicate the habits in fruit are as described for the genus. Several males, so recently emerged they were entirely white and almost totally unsclerotized, were observed to mate repeatedly with sibling females in the brood galleries.

NOTES.— The above treatment was based on the holotypes of *cyperi, indicus* and *conspeciens,* to the lectotype of *Coccotrypes insularis,* and to two syntypes of *Dryocoetes insularis.* This species was evidently introduced to America from the Indo-Malayan area prior to 1915. The earliest known American specimens were taken at San José, Costa Rica, 6-V-15.

### 4. *Coccotrypes robustus* Eichhoff

*Coccotrypes robustus* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:58, 313 (Syntypes?; Cuba; presumably lost with Hamburg Mus.)

*Coccotrypes cylindricus* Schedl, 1949, Tijdschr. Ent. 91:116 (Holotype, female; Crucos, Cuba; Schedl Coll.); Wood, 1975, Great Basin Nat. 35:393. *Synonymy*

DIAGNOSIS.— This species is distinguished from other species of this genus known to me by the slender body form, by the very minute strial granules, and by the fine strial hair that is almost as long as the equally fine interstrial hair.

FEMALE.— Length 1.3 mm, 2.5 times as long as wide; color dark brown.

Frons broadly convex, convergently aciculate from epistoma to upper level of eyes, a few fine, obscure punctures in upper areas; vestiture of sparse, fine hair of moderate length. Antennal club 1.5 times as long as wide.

Pronotum 1.1 times as long as wide; widest just behind middle, sides moderately arcuate, converging on anterior half to rather narrowly rounded anterior margin; asperate to base, asperities rather fine, close, those on posterior third associated with fine, shallow, obscure punctures; surface between asperities smooth, shining; median line obscurely developed. Vestiture of very fine, rather abundant, moderately long hair.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; striae not impressed, punctures small, shallow, those on 1 and 2 with anterolateral margins slightly elevated forming obscure, fine, granules; interstriae four times as wide as striae, smooth, shining, punctures fine, uniseriate, close, each with a small granule on anterolateral margin, granules equal in diameter to strial punctures. Declivity steep, broadly convex; sculpture essentially as on disc. Vestiture of rows of fine, erect, strial and interstrial hair of equal length and appearance; each hair slightly longer than width of an interstriae on disc, slightly longer on declivity.

DISTRIBUTION.— Cuba and Puerto Rico.

Not recorded from Mexico or Central America, although appropriate hosts apparently occur there.

HOSTS.— *Eutrepe globosa.*

BIOLOGY.— This species has been reared from the fruits of its host.

NOTES.— The above treatment was based on 2 females of *robustus* that were compared by Hopkins to a syntype, on the holotype of *cylindricus,* and on 18 other specimens. This is the only American member of this genus not known from some part of the Eastern Hemisphere. It will be most surprising if this actually is a native American species.

### 5. *Coccotrypes aciculatus* Schedl

*Coccotrypes aciculatus* Schedl, 1952, Dusenia 3:360 (Holotype, female; Hamburgfarm on Río Reventazon, Limon, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *distinctus* (Motschulsky) by the small size, by the more widely spaced strial punctures, and by the stouter, blunt, interstrial bristles.

FEMALE.— Length 1.2 mm, 2.0 times as long as wide; color reddish brown.

Frons essentially as in *robustus* Eichhoff.

Pronotum 1.0 times as long as wide; widest just behind middle, sides moderately arcuate, converging on anterior half to rather broadly

rounded, subserrate anterior margin; strongly convex, with indefinite summit slightly behind middle; asperities on anterior slope small, sparse, intermixed with sparse, fine, shallow punctures; small, sparse, subasperate granules in posterior area to base; surface smooth, shining; an obscure, raised, basal line indicated. Vestiture of rather sparse, blunt hair of moderate length.

Elytra 1.2 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on slightly more than basal half, rather broadly rounded behind; striae not impressed, punctures moderately small, distinct but very shallow, spaced within a row by about two to three diameters of a puncture; interstriae about twice as wide as striae, smooth, shining, punctures replaced by small, uniseriate, widely spaced granules. Declivity moderately steep, rather broadly convex; sculpture essentially as on disc. Vestiture of short, fine, strial hair and rows of erect, blunt, interstrial bristles, each bristle as long as distance between rows or between bristles within a row.

DISTRIBUTION.— Costa Rica to Panama, Brazil, New Guinea.

PANAMA: Barro Colorado Island, Canal Zone, XI-30, F. C. Lutz. OTHER COUNTRIES: Brazil; Schedl (1950:148, 1955:280) adds Hamburgfarm on Río Reventazón, Limón, Costa Rica (type locality), Brazil, and New Guinea.

NOTES.— The above treatment was based on a female from Barro Colorado Island identified by Schedl and on 55 other specimens. If Schedl's identifications of the specimens from Panama and New Guinea are accurate, it suggests that this species was introduced to America from another region, possibly from New Guinea or a neighboring area.

### 6. *Coccotrypes distinctus* (Motschulsky)

*Anodius distinctus* Motschulsky, 1866, Moskov. Obshch. Isp. Prirody, Otd. Biol. Biul. (Bull. Soc. Imp. Nat. Moscou) 31(1):401 (Holotype, female; published as "Des Montagues de Nura-Ellia," the specimen is labeled "Ceylon"; Zool. Inst. Acad. Sci. USSR, Moscow)

*Coccotrypes floridensis* Schedl, 1949, Tijdschr. Ent. 91:117 (Syntypes; Winter Park, Florida); Wood, 1969, Great Basin Nat. 29:117. *Synonymy*

DIAGNOSIS.— This species is distinguished from *aciculatus* Schedl by the larger size, by the more deeply impressed, more closely spaced strial punctures, and by the longer, more slender, pointed interstrial setae.

FEMALE.— Length 1.7–2.3 mm (male 1.3 mm), 2.2 times as long as wide; color reddish brown.

Frons essentially as in *robustus* Eichhoff, but usually with median line more prominently raised.

Pronotum as in *aciculatus* Schedl except minute asperities very slightly more numerous, none of asperities more than twice as long (transversely) as thick (longitudinally); setae finer, slightly longer.

Elytra 1.2 times as long as wide, 1.3 times as long as pronotum; outline about as in *aciculatus*; striae not impressed, punctures rather small, distinctly impressed, separated within a row by diameter of a puncture; interstriae about three times as wide as striae, smooth, shining, punctures replaced by small, widely spaced, uniseriate granules. Declivity rather steep, convex; sculpture as on disc. Vestiture of rows of semirecumbent strial hair, each half as long as distance between rows; and rows of fine, pointed, erect interstrial bristles, each bristle slightly longer than distance between rows or between bristles within a row.

MALE.— Similar to female except much smaller (1.3 mm), slightly deformed, characters usually imperfectly developed; no two males exactly alike.

DISTRIBUTION.— Florida, Honduras, Hawaii to Ceylon.

USA: **Florida**: Apopka, 3-IX-58, Neanthebella palm seeds, Van Pelt; Coconut Grove, VII-60, *Coccothrinus* seeds; Gainesville, VII-60, *Phoenix sylvestris*; Hilliard, 6-VIII-39, R. H. Beamer; La Belle, 16-VII-39, R. H. Beamer; Miami Beach, 6-VII-56, *Phoenix canariensis*, L. J. Daigle; Melbourne, 9-VII-51, at light, S. L. Wood; Winter Park, 24-X-46, palm seed, H. Y. Gouldman. HONDURAS: La Ceiba, 29-V, 26-VIII-49, at light, E. C. Becker. OTHER COUNTRIES: Puerto Rico, British Guiana, Hawaii, Micronesia, and Ceylon.

HOSTS.— *Coccothrinus* sp., *Phoenix* spp., etc.

BIOLOGY.— This species breeds in a wide variety of palm seeds.

NOTES.— The female holotype of *distinctus* was examined, but specimens were not at hand for direct comparison to it. The above treatment was based on syntypes of *floridensis* and on 73 other specimens. This is the species treated by me prior to 1970 as *carpophagus* (Hornung); the erroneous

identification was based on the specimens from Guam incorrectly reported by Schedl (1942:148) as *carpophagus*.

7. *Coccotrypes carpophagus* (Hornung)

*Bostrichus carpophagus* Hornung, 1842, Stettiner Ent. Zeit. 3:116 (Syntypes; intercepted in Germany from Betelnüssen of Ostindien origin)

*Coccotrypes pygmaeus* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:58, 310 (Syntypes; Madagascar; presumably lost in Hamburg Mus.); Schedl, 1959, Trans. Roy. Ent. Soc. London 111:486. *Synonymy*

*Coccotrypes integer* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:58, 311 (Syntype, female; Siam; one in U.S. Nat. Mus., others lost with Hamburg Mus.); Eggers, 1929, Wiener Ent. Zeit. 46:52. *Synonymy*

*Cryphaloides donisthorpei* Formanek, 1908, Ent. Blätt. 4:91 (Syntypes, females; Kew Gardens, London, England; British Mus. Nat. Hist.); Schedl, 1962, Mitt. Münchner Ent. Ges. 52:95. *Synonymy*

*Coccotrypes thrinacis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:46 (Holotype, female; Isle of Pines, Cuba; U.S. Nat. Mus., 7617); Schedl, 1964, Reichenbachia 2:216. *Synonymy*

*Coccotrypes bakeri* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:46 (Holotype, female; Havana, Cuba; U.S. Nat. Mus., 7619); Schedl, 1964, Reichenbachia 2:216. *Synonymy*

*Coccotrypes anonae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:46 (Holotype, female; Cuba; U.S. Nat. Mus., 7624); Schedl, 1950, Dusenia 1:145. *Synonymy*

*Coccotrypes hubbardi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:46 (Holotype, female; Montserrat, West Indies; U.S. Nat. Mus., 7620); Schedl, 1950, Dusenia 1:146. *Synonymy*

*Coccotrypes liberiensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:47 (Holotype, female; Mount Coffee, Liberia; U.S. Nat. Mus., 7615); Wood, 1975, Great Basin Nat. 35:392. *Synonymy*

*Coccotrypes rollinae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:47 (Holotype, female; Pará, Brazil; U.S. Nat. Mus. 7616); Schedl, 1950, Dusenia 1:145. *Synonymy*

*Coccotrypes nanus* Eggers, 1920, Ent. Blätt. 16:33 (Lectotype, female; Kamerun; U.S. Nat. Mus., 60717, designated by Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:21); Schedl, 1949, Tijdschr. Ent. 91:114. *Synonymy*

*Coccotrypes punctulatus* Eggers, 1951, Ent. Blätt. 45–46:151 (Holotype, female; Insel St. Thomas, Virgin Islands; deposited in Eggers Coll. but now apparently on loan to Schedl); Wood, 1975, Great Basin Nat. 35:392. *Synonymy*

DIAGNOSIS.— This species is distinguished from *dactyliperda* (Fabricius) by the smaller size, by the darker color, by the smaller average size of the strial punctures and of the interstrial granules on the elytral disc, and by the shorter interstrial bristles.

FEMALE.— Length 1.5–1.9 mm (males 1.2–1.3 mm), 2.2 times as long as wide; color very dark brown to almost black.

Frons broadly concave, weakly, transversely impressed on lower half; surface shining, rather coarsely, convergently aciculate from vertex to epistoma, a few fine, obscure punctures above; vestiture of sparse, fine, long hair.

Pronotum 1.05 times as long as wide; outline as in *distinctus*; anterior margin rather coarsely serrate; asperate to base, asperities moderately coarse, close, abundant, those behind summit longitudinal and about four to six times as long as thick; punctures not evident. Vestiture of rather sparse hair of moderate length.

Elytra 1.3 times as long as wide, 1.3 times as long as pronotum; outline as in *distinctus*; striae not impressed, punctures small, distinct, very shallow; interstriae smooth, shining, three to four times as wide as striae, punctures replaced by small, uniseriate granules. Declivity rather steep, broadly convex; sculpture as on disc. Vestiture of rows of short, recumbent strial hair, and rows of erect interstrial bristles, each bristle slender, blunt, very slightly longer than distance between rows or between bristles within a row.

MALE.— Similar to female except smaller (1.2–1.3 mm), slightly deformed, with characters poorly formed; usually no two specimens exactly alike.

DISTRIBUTION.— Cosmopolitan through commerce, but breeding only in tropical and subtropical areas where hosts grow.

USA: **District of Columbia**: Washington. **Florida**: Coconut Grove, VII-60, *Coccothrinax*, *Livistonia chinensis* and Sabal palmetto seeds. **New Jersey**: Short Hills, 19-IV-26, intercepted in seeds from Brazil, F. M. Schott. MEXICO: Veracruz. HONDURAS: La Lima, III-67, *Annona muricata* seeds. GUATEMALA: Guatemala. OTHER COUNTRIES: Bermuda, Cuba, Puerto Rico, Jamaica, Trinidad, British Guiana, Surinam, Grenada, Colombia, Brazil, Peru, Hawaii, France, England, Cameroons, Ceylon, India, Java, Guam, Australia.

HOSTS.— *Annona muricata*, *Coccothrinax* sp., *Livistonia chinensis*, *Sabal causiarum*, *Thrimax* sp., etc.

BIOLOGY.— This species breeds in large seeds. Evidently the habits are essentially as described for the genus.

NOTES.— The above treatment was based on the holotypes of *thrinacis*, *bakeri*, *anonae*, *hubbardi*, *rollinae*, *liberiensis* and *punctulatus*, on syntypes of *carpophagus* and *Cryphaloides donisthorpei*, and on more than

2,000 other specimens. Schedl and Eggers report the synonymy of *pygmaeus*, *integer*, and *nanus* with *carpophagus*; I have not verified their synonymy. Three "types" of *carpophagus* are in the Berlin Museum; all were examined. In all probability they are the only remaining syntypes of this species, but a lectotype was not selected.

*Coccotrypes pubescens* Schedl (1949:119) is known from one female taken at Sierra Bonilla, Cuba. Probably it is of *carpophagus*, but the interstrial setae are very slightly longer than normal and the strial setae are almost as long as those of the interstriae. I hesitate to place it in synonymy until more material from this area can be studied.

### 8. *Coccotrypes dactyliperda* (Fabricius)

*Bostrichus dactyliperda* Fabricius, 1801, Systema Eleutheratorum 2:387 (Syntypes; in date pits intercepted in Europe; Copenhagen Mus., Kiel Coll., one in Berlin Mus.)

*Bostrichus palmicola* Hornung, 1842, Stettiner Ent. Zeit 3:116 (Syntypes; intercepted in Germany); Balachowsky, 1949, Faune de France 50:182. *Synonymy*

*Coccotrypes laboulbenei* Decaux, 1890, Études sur les insects recueillis a l'exposition universal, Paris, 16 p. (Not seen); Bedel, 1891, L'Abbeille 27:155. *Synonymy*

*Coccotrypes eggersi* Hagedorn, 1904, Allg. Zeitschr. Ent. 9:449 (Syntypes; Ecuador; only known syntype in U.S. Nat. Mus., others evidently destroyed in Hamburg Mus.); Schedl, 1949, Tijdschr. Ent. 91:113. *Synonymy*

*Coccotrypes bassiavorus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:47 (Holotype, female; Washington, D.C.; U.S. Nat. Mus., 7618); Wood, 1975, Great Basin Nat. 35:392. *Synonymy*

*Coccotrypes moreirai* Eggers, 1928, Arch. Inst. Biol. 1:86 (Lectotype, female; Minas Garaes, Guaxupê, Brazil; U.S. Nat. Mus., 60613, designated by Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:21); Schedl, 1949, Tijdschr. Ent. 91:113. *Synonymy*

*Coccotrypes tanganus* Eggers, 1935, Rev. Zool. Bot. Afr. 27:307 (Holotype, female; Tanga, Tanga, Tanganyika; British Mus. Nat. Hist.); Schedl, 1949, Tijdschr. Ent. 91:113. *Synonymy*

DIAGNOSIS.— This species is distinguished from *carpophagus* (Hornung) by the larger size, by the lighter color, by the deeper and slightly larger strial punctures, and by the longer interstrial bristles.

FEMALE.— Length 1.8–2.3 mm, 2.3 times as long as wide; color reddish brown.

Frons as in *carpophagus*. Pronotum as in *carpophagus* except anterior margin less coarsely, less regularly serrate; asperities more numerous, each smaller in basal area but averaging as high or slightly higher.

Elytra 1.3 times as long as wide; as in *carpophagus* except strial punctures averaging very slightly larger, distinctly deeper, interstrial granules closer, averaging slightly larger; interstrial bristles more slender, pointed, each about one and one-half to two times as long as distance between rows, more closely spaced within a row.

DISTRIBUTION.— Cosmopolitan through commerce, but breeding only in tropical and subtropical areas where hosts grow.

USA: **Arizona**: Mesa, 6-VIII-60, at light, S. L. Wood; Tucson, 10-X-68. **California**: Los Angeles. **Texas**: Brownsville. MEXICO: **Baja California**: Rancho de la Ventana, Bahía de la Ventana, 19-XII-58, in flight, H. B. Leech. "Mexico." PANAMA: "Panama." OTHER COUNTRIES: Cuba, Colombia, Brazil, Ecuador, Venezuela, Hawaiian Islands, Australia, New Zealand, Indonesia, New Guinea, Malaya, India, Japan, Arabia, Sudan, Israel, France, Italy, Portugal.

HOSTS.— Date pits, etc.

BIOLOGY.— This species breeds mostly in the seeds of various palms, but many other large seeds are also attacked. It commonly infests buttons of vegetable ivory even when they are polished and painted. Large quantities of these buttons have been destroyed in warehouses in the Indo-Malayan region.

The habits are about as described for the genus.

NOTES.— The above treatment was based on syntypes of *palmicola*, *eggersi*, and *tanganus*, on the holotype of *bassiavorus*, on the lectotype of *moreirai*, and on about 200 other specimens.

## Tribe CRYPTURGINI

Crypturgi LeConte, 1876, Proc. Amer. Philos. Soc. 15:387 (Type-genus: *Crypturgus* Erichson, 1836)

Anatomical features.— The frons is usually not sexually dimorphic, its sculpture is simple, the posterodorsal area of the head is moderately produced caudad, the eye is sinuate to emarginate, the antennal funicle is 2–3-segmented, the club is moderately flattened, with the sutures on the anterior and posterior faces about equal, the pronotum is unarmed (American species) and weakly declivous in front, the lateral margins are rounded, the procoxae are contiguous, and the declivity is simple and unarmed.

Biological features.— All species are monogamous and phloeophagous. *Crypturgus* normally uses the tunnel of another insect to gain entry into the host. The galleries and habits have not been studied in detail.

Taxonomy.— The three native North American species in this tribe were obviously derived from the Asian fauna rather recently. All allied forms occur in Eurasia and northern Africa. More distant affinities appear to be with the Dryocoetini. The American forms are easily recognized.

### Genus *CRYPTURGUS* Erichson

*Crypturgus* Erichson, 1836, Archiv Naturgesch. 2:60 (Type-species: *Bostrichus pusillus* Gyllenhal, subsequent designation by Thomson, 1859, Skandinaviens Coleoptera synoptiskt bearbetade 1:147)

Diagnosis.— This genus is distinguished from *Dolurgus* Eichhoff by the smaller size, by the 2-segmented antennal funicle, and by the solid antennal club with a partial septum where suture 1 should be and an indistinct suture near the apex.

Description.— Length 1.0–1.2 mm, 2.8 times as long as wide; color dark brown to black. Sexes similar. Frons convex, sculpture simple. Eye oval, deeply emarginate; finely granulate. Antennal funicle 2-segmented; club small, solid, an indistinct suture at apex. Pronotum longer than wide, evenly arched, sparsely punctured throughout, summit indefinite. Scutellum small. Elytra striate; declivity convex, rather steep; females in two species bearing a spongy area near apex on lower half of declivity. Tibiae rather broad, widest on distal third; outer margin armed by a series of about six coarse teeth.

Distribution.— Canada and the United States, Europe, northern Asia, and north Africa; about 12 species are known, 3 occur in North America.

Biology.— The bole of coniferous hosts is selected for attack. The beetles locate the entrance hole of another insect, usually a bark beetle, to gain access to the phloem tissues. Here they commence the excavation of their own tunnels, usually at the cambium perpendicular to the gallery of the host insect. Their irregular tunnels extend 1–3 cm; eggs are deposited along the margins, apparently in niches. Larval mines are difficult to follow, but apparently they wander through the phloem up to 3 cm from their origins. There appears to be one generation per year. They overwinter as adults in the brood galleries.

#### Key to the Species of *Crypturgus*

1. Pronotal disc subreticulate, lines radiating from punctures only; elytra smooth, shining, discal pubescence almost obsolete, very short on sides and declivity; interstriae wider than striae; female without spongy area on declivity; Ontario and Newfoundland to New Jersey, etc.; *Abies*, *Picea*; 1.1–1.2 mm ..... 1. ***pusillus*** **(Gyllenhal)**

— Pronotum uniformly, strongly reticulate; interstriae slightly narrower than striae, their surface often irregular, subshining; interstrial and strial hair conspicuous on disc and declivity; female with a spongy area near apex of declivity ..... 2

2(1). Strial punctures rather large, rather sharply impressed; interstriae mostly smooth, shining; interstrial setae short, in rows, each about half as long as distance between rows, strial setae semirecumbent, about as long as interstrial setae; E Texas to New Jersey and Florida; *Pinus*; 1.0–1.2 mm ..... 2. ***alutaceus*** Schwarz

— Strial punctures rather small, shallow, not clearly outlined; interstriae with transverse lines, rather irregular, subshining; interstrial setae rather long, closely set, in rows, each as long as distance between rows on disc, strial setae semirecumbent, almost as long as those of interstriae; Alaska and Nova Scotia to Arizona and Pennsylvania; *Abies*, *Picea*; 1.0–1.2 mm ..... 3. ***borealis*** Swaine

### 1. *Crypturgus pusillus* (Gyllenhal)

*Bostrichus pusillus* Gyllenhal, 1813, Insecta Svecica descripta, Coleopt. 1(3):371 (Syntypes?; presumably Sweden; presumably at Univ. Uppsala)

*Bostrichus aphodiodes* Villa, 1883, Col. Eur. Suppl., p. 36 (Syntypes; Europe; not located); Hagedorn, 1910: Coleopt. Cat. 4:36. *Synonymy*

*Crypturgus atomus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:152 (Holotype, sex?; New York; Mus. Comp. Zool., 983); Wood, 1973, Great Basin Nat. 33:175. *Synonymy*

*Crypturgus parallelocollis* Eichhoff, 1878, Mem. Soc. Roy. Sci. Liége (2)8:73 (Syntypes?; Europe; presumably lost with Hamburg Mus); Schedl, 1946, Zbl. Ges. Ent. 1:7. *Synonymy*

*Crypturgus gaunersdorferi* Reitter, 1885, Deutsch. Ent. Zeitschr. 29:389 (Syntypes?; Euboea Isl., Greece; not located); Eggers, 1922, Ent. Blätt. 18:118. *Synonymy*

*Crypturgus cribrellus* Reitter, 1894, Naturf. Vereines Berlin 33:64 (Syntypes?; Ragusa, Dalmatia; not located); Schedl, 1946, Zbl. Ges. Ent. 1:7. *Synonymy*

*Crypturgus maulei* Roubal, 1910, Rev. Russ. d'Ent. 10:203. (Syntypes?; Litauen; not located); Schedl, 1946, Zbl. Ges. Ent. 1:7. *Synonymy*

*Crypturgus danicus* Eggers, 1932, Ent. Medd. 18:80 (Holotype, male; Insel Seeland, Denmark; U.S. Nat. Mus.); Schedl, 1946, Zbl. Ges. Ent. 1:7. *Synonymy*

*Crypturgus cylindricollis* Eggers, 1940, Centrbl. Ges. Forstw. 66:37 (Holotype, female; Lastua, Dalmatia; not located); Schedl, 1946, Zbl. Ges. Ent. 1:7. *Synonymy*

DIAGNOSIS.— This species is distinguished from *borealis* Swaine and *alutaceus* Schwarz by the subreticulate, shining pronotal disc, by the subglabrous, shining elytra, and by the absence of a spongy area on the female declivity.

MALE.— Length 1.1–1.2 mm, 2.8 times as long as wide; color dark brown.

Frons convex; surface reticulate, punctures fine, obscure; vestiture inconspicuous.

Pronotum 1.2 times as long as wide; widest near middle, sides moderately arcuate, converging equally anteriorly and posteriorly, anterior and posterior margins equally, rather narrowly rounded; surface reticulate at margins, subreticulate and shining toward disc, punctures moderately coarse, deep, not close. Vestiture hairlike, restricted to peripheral areas.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on more than basal two-thirds, rather narrowly rounded behind; striae 1 feebly, others not impressed, punctures rather small, deep; interstriae wider than striae, smooth, shining, interstrial punctures minute to obsolete. Declivity convex, moderately steep; strial punctures smaller than on declivity. Vestiture almost obsolete on disc, consisting of rows of minute strial and slightly longer interstrial hair; longest setae on declivity equal to less than half distance between rows.

FEMALE.— Similar to male.

DISTRIBUTION.— Ontario and Newfoundland to New Jersey; north Africa, Europe, northern Asia.

CANADA: **New Brunswick**: Fredricton, St. Stephen. **Newfoundland**: Middlebrook Prov. Pk. **Nova Scotia**: Cape North, Kejimkujik Lake, Weymouth. **Ontario**: Rockcliffe, Wooley. **Quebec**: Chelsea. USA: **Connecticut**: Cornwall. **Maine**: Bar Harbor, Camp Caribou, Orono, Paris, Portland. **Massachusetts**: Cambridge, Charlemont, Framingham, Westboro. **New Hampshire**: Durham, Mt. Washington, Waterville. **New Jersey**: New Egypt. **New York**: Cicero Swamp, Cranberry Lake, Elka Park, Kingsbridge, Syracuse, Wanakena. **Pennsylvania**: Pocono Lake. **Rhode Island**: Providence.

HOST.— *Abies* sp., *Picea glauca*, *P. rubens*.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotype of *atomus*, on 182 other American specimens, and on several hundred specimens from Europe and Asia. The distribution suggests an introduction to this continent during the early settlement of North America.

### 2. *Crypturgus alutaceus* Schwarz

*Crypturgus alutaceus* Schwarz, 1894, Proc. Ent. Soc. Washington 3:17 (Lectotype, male; Tampa, Florida; U.S. Nat. Mus., 4561, present designation)

DIAGNOSIS.— This species is distinguished from *pusillus* (Gyllenhal) by the more strongly reticulate pronotum, by the larger strial punctures, by the longer, more abundant elytral vestiture, and by the small spongy area on the female elytral declivity.

MALE.— Length 1.0–1.2 mm, 2.7 times as long as wide; color dark brown to black.

Frons and pronotum essentially as in *pusillus*, except pronotal surface uniformly reticulate, subshining. Elytra as in *pusillus*, except strial punctures slightly larger, interstriae with occasional transverse lines; vestiture consisting of rows of erect interstrial and semirecumbent strial hair, interstrial setae on disc equal in length to half distance between rows, strial setae shorter.

FEMALE.— Similar to male except lower half of elytral declivity on interstriae 1 and 2 appearing spongy (somewhat variable).

DISTRIBUTION.— E Texas to New Jersey and Florida.

USA: **Florida**: Big Pine Key, Royal Palm St. Pk., Sebring, Suwannee Springs, Walton Co. **Georgia**: Athens, Camelia, Clarke Co., Everett, Hays, Monroe Co., Thomasville. **Louisiana**: La Salle Parish. **Maryland**: Beltsville, Bladensburg, Dowell. **Mississippi**: Baxterville, Lucedale. **New Jersey**: Lahaway. **North Carolina**: Boardman, Durham, Tryon. **Texas**: Kirbyville, Polk Co. **Virginia**: King William Co., Mt. Vernon. **West Virginia**: Davis in Tucker Co., Dellslow, Grant Co., Pocahontas Co., Wood Co.

HOSTS.— *Picea mariana*, *Pinus echinata*, *P. plustrus*, *P. taeda*.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the syntypic type series of 8 specimens and on 95 other specimens. From the syntypes I here designate a male from Tampa, Florida, as lectotype for *Crypturgus alutaceus* Schwarz; this specimen at the U.S. National Museum has been considered to be the type for many years, but it was never so designated.

### 3. *Crypturgus borealis* Swaine

Fig. 176

*Crypturgus borealis* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):7 (Lectotype, female; Winnipeg, Manitoba; Canadian Nat. Coll., 9287, designated by Bright, 1967, Canadian Ent. 99:673)

*Crypturgus corrugatus* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):8 (Lectotype, female; North Mountain, Pennsylvania; Canadian Nat. Coll., 9286, designated by Bright, 1967, Canadian Ent. 99:673); Wood, 1957, Canadian Ent. 89:396. *Synonymy*

DIAGNOSIS.— This species is distinguished from *alutaceus* Schwarz by the smaller, shallow strial punctures, by the irregular interstriae, and by the much longer vestiture.

MALE.— Length 1.0–1.2 mm, 2.8 times as long as wide; color dark brown to almost black.

Frons and pronotum as in *alutaceus*, pronotal punctures smaller, obscure. Elytra as in *alutaceus* except strial punctures smaller, less clearly impressed, interstriae with a few transverse lines and impressed points to almost densely subrugulose in some specimens; strial punctures reduced in size on declivity; vestiture longer, interstrial setae as long as distance between rows.

FEMALE.— Similar to male except with a spongy area on declivital interstriae 1 and 2 (variable) as in *alutaceus*.

DISTRIBUTION.— Alaska and Nova Scotia to Arizona and Pennsylvania.

ALASKA: Fairbanks, Porcupine River. CANADA: **Alberta**: Banff, Edmonton, Lesser Slave Lake, Slave Lake. **British Columbia**: Likely, Nicomin Ridge, Pine Pass, Trinity Valley. **Manitoba**: Winnipeg. **New Brunswick**:

Fredricton. **Northwest Territories**: Aklavik. **Nova Scotia**: St. Ann. **Ontario**: Algonquin N.P., Orillia, Ottawa. **Quebec**: Aylmer, Mt. Lyall, Gaspé, Trinity Bay. **Saskatchewan**: Prince Albert N.P. USA: **Arizona**: Ft. Apache Indian Res., Grand Canyon N.P., Whiteriver. **Colorado**: Gould, Newcastle, Poudre Canyon, Rabbit Ears Pass, Ridgeway. **Idaho**: Moscow Mts., Franklin Co. **Maine**: Camp Caribou. **Michigan**: Grand Island, Seney. **Missouri**: Eminence. **New Mexico**: Sandia Mts. ***New York***: Cranberry Lake, Elka Park, Heart Lake in Essex Co. **Montana**: Blackfeet N.F., Drummond, Pray. **Oregon**: Gold Lake in Willamette N.F. **Pennsylvania**: North Mountain. **South Dakota**: Black Hills. **Utah**: Logan Canyon, Logan Dry Canyon, La Sal Mts., Soapstone Creek in Wasatch N.F.

HOSTS.— *Abies balsamea, A. concolor, A. grandis, A. lasiocarpa, Picea engelmannii, P. glauca, P. rubens, Pinus contorta, P. echinata, P. ponderosa.*

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of *borealis* and *corrugatus*, on my homotypes of both, and on 374 other specimens.

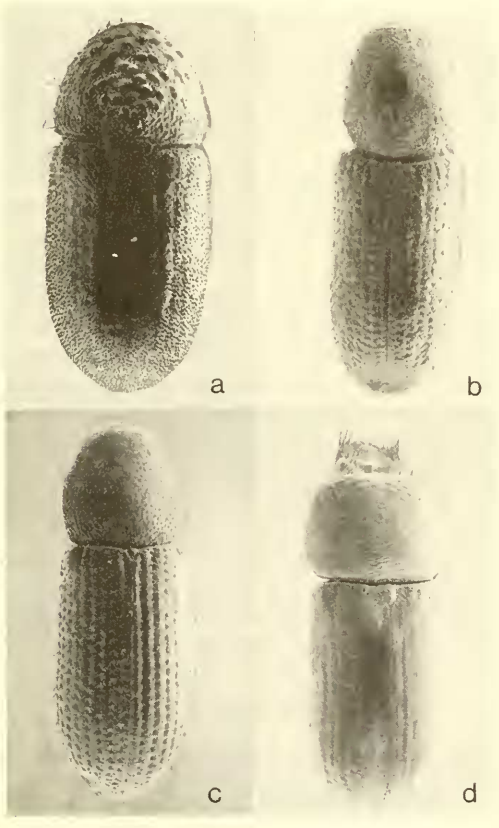



Fig. 176. Dorsal aspect of adult: a, *Cryphalus ruficollis*; b, *Crypturgus borealis*; c, *Dolurgus pumilus*; d, *Trypodendron betulae*. (After Bright 1976:210.)

## GENUS *DOLURGUS* EICHHOFF

*Dolurgus* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:147 (Type-species: *Hylastes pumilus* Mannerheim, monobasic)

DIAGNOSIS.— This genus is distinguished from *Crypturgus* Erichson by the 3-segmented antennal club, and by the presence of three feebly recurved sutures on the anterior face of the antennal club. It is distinguished from *Aphanarthrum* Wollaston by the aseptate suture 1 on the antennal club, and by the coarsely striate elytra.

DESCRIPTION.— Length 1.6–1.9 mm, 2.7 times as long as wide. Sexual differences not apparent. Frons convex, simple. Eye oval, deeply emarginate; finely granulate. Scape rather short; funicle 3-segmented; club small, three aseptate, feebly recurved sutures on distal half of anterior face. Pronotum longer than wide, lateral margins rounded; surface punctured, unarmed. Scutellum small. Elytra striate, sculpture simple. Tibiae rather broad, widest on distal fourth; armed by several coarse teeth.

DISTRIBUTION.— Northwestern North America. Only one species is known.

### *Dolurgus pumilus* (Mannerheim)

Fig. 176

*Hylastes pumilus* Mannerheim, 1843, Moskov. Obshch. Isp. Prirody Otd. Biol. Biul. (Bull. Soc. Imp. Nat. Moscou) 16:297 (Holotype, sex?; Sitka Island, Alaska; Univ. Zool. Mus., Helsinki)

*Dolurgus pumilus*: Eichhoff, 1868, Berliner Ent. Zeitschr. 12:147

DIAGNOSIS.— This distinctive species resembles the species of *Crypturgus*, but it is distinguished by characters included in the above generic key and description.

MALE.— Length 1.6–1.9 mm, 2.7 times as long as wide; color brown.

Frons broadly concave; surface subreticulate, punctures fine, deep, rather close; vestiture of fine hair, inconspicuous.

Pronotum 1.05 times as long as wide; widest just behind middle, sides moderately arcuate on posterior two-thirds, distinctly constricted on anterior third, rather narrowly rounded in front; surface reticulate, punctures rather coarse, moderately deep, rather abundant. Vestiture hairlike, inconspicuous.

Elytra 1.8 times as long as wide; sides almost straight and parallel on basal three-

fourths, rather narrowly rounded behind; striae feebly impressed, punctures coarse, rather deep; interstriae narrower than striae, a few indistinct, transverse lines, shining, very fine punctures forming an almost uniseriate row on lateral side of each discal interstriae. Declivity steep, convex; essentially as on disc. Vestiture of rows of very fine, short, strial and interstrial hair.

FEMALE.— Similar to male.

DISTRIBUTION.— Alaska to California.

ALASKA: Gold Creek Road at Juneau, Sitka Island. CANADA: **British Columbia**: Massett, Queen Charlotte Islands, Stanley Park, Vancouver. USA: **California**: Crescent City, Del Monte, Inverness, Klamath in Del Norte Co., Montara, Monterey Co., Pacific Grove in Sonoma Co. **Oregon**: Astoria, Coos Bay, Gold Lake in Willamette N.F., Mary's Peak, Mt. Ashland, Newport, Santiam Pass. **Washington**: Hoquiam, Junction, Quillayute.

HOSTS.— *Abies nobilis*, *Picea engelmannii*, *P. sitchensis*, *Pinus contorta*, *P. muricata*, *P. radiata*, and *P. tuberculata*.

BIOLOGY.— This species may enter the host through the entrance tunnel of another species, but evidently the habit is not obligatory. Their galleries resemble those of *Crypturgus*.

NOTES.— The above treatment was based on the holotype and on 153 other specimens.

## Tribe XYLOTERINI

Xyloteroideae Lindemann, 1876, Bull. Soc. Imp. Nat. Moscou 51:165 (Type-genus: *Trypodendron* Stephens, 1830 = *Xyloterus* Erichson, 1836)

Trypodendrinae Trédl, 1907, Ent. Blätt. 3:18 (Type-genus: *Trypodendron* Stephens, 1830)

Anatomical features.— The frons is sexually dimorphic, with the male flattened or concavely impressed, the female is convex, the eye is completely divided, the antennal funicle is 4-segmented, the club is unmarked by sutures and is usually pubescent to the base, in some species the base is sufficiently corneous to clearly indicate that it was derived from an obliquely truncate club, the pronotum is strongly declivous and asperate, with the anterior margin slightly modified in the male, the female proepimeron bears a mycetangium, the procoxae are contiguous, and in some species the male is slightly smaller than the female.

Biological features.— All are monogamous and xylomycetophagous. The male joins the female in the parental gallery. The eggs are deposited individually in niches that are enlarged by the larvae to a size sufficient to accommodate the adult beetle. Both larvae and adults feed primarily upon the spores of symbiotic fungi. Reproduction is always bisexual.

Taxonomy.— *Trypodendron* occurs in Eurasia and evidently reached North America recently. The endemic, monobasic *Xyloterinus* is scarcely separable from the Asiatic *Indocryphalus* and undoubtedly is also a recent addition to the North American fauna. This tribe was probably derived very early from the same basic stock that gave rise to the Xyleborini. The three genera that constitute the tribe are distinguished from one another with some difficulty due to the intermediacy of *Indocryphalus*; the two North American genera are more easily recognized.

### Genus *XYLOTERINUS* Swaine

*Xyloterinus* Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):83 (Type-species: *Bostrichus politus* Say, original designation)

Diagnosis.— This genus is distinguished from the allied genera by the broadly and weakly procurved subcorneous basal area of the antennal club, and by the rather large, broad, transverse proepimeral excavation of the female.

Description.— Female distinctly larger than male. Frons convex in both sexes, although somewhat flattened in male. Antennal club with subcorneous basal area much thicker and broadly procurved. Pronotum subcircular, with anterior margin strongly procurved and armed in both sexes; foveate excavation on proepimeral area of the female rather long and broad, transverse. Elytra with punctures of striae and interstriae distinct; declivity convex. Anterior tibia flattened, with posterior face smooth in both sexes.

Distribution.— E North America; one species is known.

Biology.— The habits are essentially as in *Trypodendron* except that two rows of larval cradles occur above and two below the parental gallery. The hosts are mostly deciduous trees.

Notes.— This genus is very closely related to *Indocryphalus* Eggers, from eastern Asia, but it differs in having the antennal club indistinctly subtruncate and the female proepimeral excavation transverse. In *Indocryphalus* the club is of uniform thickness and densely pubescent to its base, and the proepimeral excavation is longitudinal.

#### *Xyloterinus politus* (Say)

Fig. 177, 178

*Bostrichus politus* Say, 1826, J. Acad. Nat. Sci. Philadelphia 5:256 (Syntypes; eastern United States; all types lost)

*Xyloterinus politus*: Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):83.

*Xyloterus unicolor* Eichhoff, 1872, Berliner Ent. Zeitschr. 15:136 (Syntypes?; female; Wisconsin;

presumably lost with Hamburg Mus.); Wood, 1957, Canadian Ent. 89:353. *Synonymy*

FEMALE.— Length 3.3–3.7 mm, 2.7 times as long as wide; body color dark brown.

Frons convex, a weak transverse impression just above epistoma, and a feeble median elevation from epistoma to upper level of eyes; surface of epistoma smooth and shining, reticulate and sparsely, rather coarsely granulate above; vestiture sparse, fine, rather long. Eye completely divided, subequal halves separated by a distance equal to width of upper half; finely granulate. Antennal scape rather long; funicle 4-segmented; club as long as scape, oval, basal area thicker, subcorneous and, on anterior face, broadly procurved.

Pronotum very slightly wider than long (1.02 times); sides feebly arcuate on basal two-thirds, subcircularly rounded in front; anterior margin armed by four teeth; asperities decreasing in size posteriorly, very fine and rather sparse behind summit; surface of posterior and lateral areas reticulate, shallowly, rather finely punctured; vestiture inconspicuous, fine, short, sparse. Proepimeral excavation rather large, about four times as long as wide, long axis transverse, extending from posterolateral coxal margin more than two-thirds of distance toward sharply margined posterolateral angles of disc.

Elytra 1.7 times as long as wide, sides subparallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures small, distinctly impressed; interstriae two to three times as wide as striae, smooth, punctures about half as large as those of striae, shallow, in irregular rows. Declivity rather steep, convex; striae weakly impressed, punctures somewhat larger than on disc; costal margin sharply raised near apex. Vestiture consisting of sparse, fine, hairlike setae; short on disc, longer and more abundant on declivity.

MALE.— Similar to female except length 2.7–2.9 mm, 2.4 times as long as wide; frons more strongly impressed from epistoma to above eyes, only feebly convex; teeth on anterior margin of pronotum usually reduced in size, sometimes obsolete; and proepimeral excavation poorly developed and smaller. Male genitalia as figured.

DISTRIBUTION.— Minnesota and New Brunswick to Mississippi and N Florida.

CANADA: **New Brunswick**: Fredericton. **Ontario**: Hastings Co., Ottawa, Ridgeway, Toronto. **Quebec**: Chelsea, Granby, Ile Perrot, Lac Tremblant Nord, Montreal, Mt. Orford, Plessiville, Quebec, Ste. Anne de Bellevue, Ste. Hilaire. USA: **Connecticut**: Litchfield, New Canaan. **District of Columbia**: Washington. **Georgia**: Haivasee. **Illinois**: Champlain. **Kentucky**: Cumberland St. Pk., Louisville. **Maine**: Brunswick, Orono. **Maryland**: Bladdensburg, Plummer's Island. **Massachusetts**: Cambridge, Framingham, W Springfield, Sherborn. **Michigan**: Detroit, Grand Ledge. **Mississippi**: Iuke. **Minnesota**: Itasca Park, Hennepin Co., Washington Co. **New Hampshire**: Claremont, Waterville, Webster. **New Jersey**: Axton, Boonton, Clemonton, Morristown, Ft. Lee, Middlesex Co., Hopatcong, Montclair, Orange Mts. **New York**: Brooklyn, Buffalo, Catskill Mts., Cranberry Lake, Ithaca, Pelham, Lacey, New Rochelle, Syracuse, West Point. **North Carolina**: Pink Beds. **Ohio**: Ashland, Cleveland, Delaware Co., Franklin Co., Hocking Co., Ira in Summit Co., Lake Co., Lake Winola, Orrville, Pickaway Co., Scioto Co., Wooster. **Pennsylvania**: Angora, Burning Wells, Castle Rock, Charter Oak, Frankford, Germantown, Harrisburg, Hummelstown, Inglenook, Laport, Lawndale, Lehigh Gap, Mt. Alto, Peck's Pond, Perry Co., Rickets, Roxborough, Sommerset Co., Sweden Valley, Tinicum. **Virginia**: Jones Creek. **West Virginia**: Bayard, Grant Co., Hancock Co., Little Falls, Monongalia Co., Morgantown, Pendleton Co., Raleigh Co., Randolph Co., Taylor Co., Wood Co. **Wisconsin**: Antigo, Clintonville, Madison, Prince Edward Co.

HOSTS.— Various species of *Acer*, *Alnus*, *Betula*, *Carya*, *Castanea*, *Fagus*, *Fraxinus*, *Quercus*, *Picea*, *Pinus*, *Tsuga*, and *Ulmus*; rare in the coniferous hosts.

BIOLOGY.— As described for the genus.

NOTES.— The identity of this species is based on the Fitch and LeConte specimens that apparently were compared to the types of *politus*. The synonymy of *unicolor* was based on a study of the Eichhoff descriptions and Eichhoff's (1878) statement that *politus* and its description were unknown to him. About 400 specimens were examined.

## GENUS *TRYPODENDRON* STEPHENS

*Trypodendron* Stephens, 1830, Illustrations of British Entomology, Mandibulata 3:353 (Type-species: *Dermestes domesticus* Linnaeus, subsequent designation by Westwood, 1838 (1840), Synopsis of the Genera of British Insects, p. 39)

*Xyloterus* Erichson, 1836, Archiv Naturgesch. 2(1):60 (Type-species: *Bostrichus lineatus* Olivier, subsequent designation by Thomson, 1859, Skandinaviens Coleoptera synoptiskt bearbetade 1:146); Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:412. *Synonymy*

DIAGNOSIS.— This genus is distinguished from *Xyloterinus* Swaine by the strongly,

narrowly procurved subcorneous basal area of the antennal club, by the inflated, tuberculate posterior face of the female protibiae (in the male it is flat and finely tuberculate), by the deeply, concavely excavated male frons, by the subquadrate male pronotum, and by the longitudinal proepimeral excavation in the female.

DESCRIPTION.— Length 2.7–4.6 mm, 2.5–2.6 times as long as wide; color brown to black or bicolored.

Frons dimorphic, convex in female, extensively, deeply concave in male; eye completely divided into two parts; antennal scape elongate, funicle 4-segmented, club with subcorneous basal area strongly, narrowly procurved; pronotum subcircular in female, subquadrate in male, anterior margin armed or not; female proepimeral excavation longitudinal. Scutellum present. Elytra feebly striate, interstrial punctures usually obsolete, declivity convex, usually feebly sulcate, subapical costal margin sharply elevated. Anterior tibia subinflated and rather coarsely asperate on posterior face in female, flattened and finely asperate in male.

DISTRIBUTION.— America north of Mexico, N Asia and Europe; about a dozen species are known; five species occur in North America.

BIOLOGY.— These monogamous ambrosia beetles attack the bole of unthrifty or dying trees larger than 10 cm in diameter. The entrance tunnel is formed by the female before the arrival of the male. It penetrates the bark and continues into the sapwood, where it may branch several times. The larvae are reared in cradles that are arranged in single series above and below the parental gallery. These cradles are enlarged by the larvae as they grow and serve as pupation chambers when the larvae are mature.

Key to the Species of *Trypodendron*
(Modified from Wood 1957:345)

1. Pronotum asperate over entire surface, including posterolateral areas; elytral striae with punctures regular, rather deep, sharply defined on both disc and declivity; Minnesota and New York to Arkansas and Mississippi; *Pinus, Tsuga*; 3.5–4.1 mm ..... 1. ***scabricollis*** **(LeConte)**

— Pronotum with posterolateral areas punctate; elytral striae rather obscure, punctures very shallow, usually visible but not sharply defined on either disc or declivity ..... 2

2(1). Frons of male armed by a rather large, sharply pointed, median tubercle between upper halves of eyes; posterolateral areas of pronotum more closely and deeply punctured (particularly on females); pronotum dark brown to black in color; mature color of elytra dark brown to black, usually with a pale area extending from elytral base to declivital margin between interstriae 2 and 7; surface of pronotum and elytra minutely reticulate; N Idaho, Manitoba, and Quebec to South Dakota and New Jersey; *Betula, Alnus*; 2.7–3.5 mm ..... 2. ***betulae*** **Swaine**

— Frons of male without a tubercle at center; posterolateral angles of pronotum very finely, less closely punctured (particularly on females); color pattern variable, pronotum often with at least part of basal area pale ..... 3

3(2). Larger; female pronotum usually not asperate on median area at base; mature color black, young adults pale on an area between interstriae 2–7 from base to declivital margin and continuing on sides of declivity between interstriae 5–7 from base to apex; surface of elytra smooth, shining; Alaska and New Brunswick to California, New Mexico, and West Virginia; *Populus*; male 3.6–4.3 mm, female 3.8–4.6 mm ..... 3. ***retusum*** **(LeConte)**

— Smaller, males 2.7–3.3 mm, females 3.0–3.7 mm; median area of pronotum asperate to basal margin on both sexes; color variable, but almost never uniformly black; from coniferous hosts ..... 4

4(3). Elytral surface smooth, shining, interstriae usually very minutely and irregularly punctured; elytra more broadly rounded behind, declivity abrupt, and subapical margin appearing broadly rounded from above; color dark brown to almost black, with pale yellowish brown markings on base of pronotum and on elytra on interstriae 2–4, 7, and on declivity (five dark alternating with four pale longitudinal stripes); transition in color from light to dark abrupt; Alaska and Newfoundland to California, New Mexico, and North Carolina; coniferous hosts; 2.7–3.5 mm ..... 4. ***lineatum* (Olivier)**

— Elytral surface rather dull, minutely reticulate; elytra more narrowly rounded behind, declivity not as steep, subapical raised margin appearing subacuminate from above; color brown, anterior and lateral areas of pronotum and sides of elytra usually a darker brown, transition from light to dark gradual; Yukon and New Brunswick to California and Minnesota; *Pinus banksiana* and *P. contorta*; 2.9–3.7 mm ..... 5. **rufitarsus (Kirby)**

### 1. *Trypodendron scabricollis* (LeConte)

Figs. 177, 178

*Xyloterus scabricollis* LeConte, 1868, Trans. Amer. Ent. Soc. 2:158 (Holotype, male; Washington, D.C.; Mus. Comp. Zool., 991).

*Trypodendron scabricollis*: Provancher, 1878, Additions et corrections à la faune coléoptèrologique de la Quebec, p. 13, also 1878, La Nat. Canad. 10:381.

DIAGNOSIS.— This species is distinguished by the finely, sparsely asperate posterolateral areas of the pronotum, by the sharply impressed strial punctures, by the smooth and shining elytral surface, and by the coloration.

FEMALE.— Length 3.6–4.1 mm, 2.5 times as long as wide; body brown, basal one-fourth of pronotum and elytra between interstriae 2–7 usually somewhat lighter in color.

Frons convex, weakly impressed above epistoma; a short, broad carina on lower half reaching epistomal margin; surface rather coarsely granulate; vestiture moderately long, sparse, inconspicuous. Antennal club oval, with mediodistal margin very slightly produced.

Pronotum 0.90 times as long as wide; sides weakly arcuate and converging toward broadly rounded anterior margin; anterior margin armed by four teeth, median pair larger; asperities on anterior slope decreasing in size posteriorly to basal margin; posterolateral areas usually finely punctate-asperate; vestiture sparse, inconspicuous.

Elytra 1.7 times as long as wide; sides subparallel on basal two-thirds, rather narrowly rounded behind; strial punctures sharply, deeply impressed on both disc and declivity; interstriae more than twice as wide as striae, surface smooth, shining, with extremely minute, rather abundant, confused punctures (visible at a magnification of 70 diameters or more). Declivity convex, moderately steep; strial punctures as on disc, but usually a little smaller; interstriae 2 impressed, narrower than 1 or 3; subapical margin giving elytra a subacuminate appearance when viewed from above. Vestiture visible only on declivity, very short.

MALE.— Similar to female except 3.5–3.7 mm, 2.3 times as long as wide; frons broadly excavated from epistoma to vertex, more or less foveate at center in most specimens, lateral margins ornamented by longer, more abundant hair; pronotum subquadrate, 0.71 times as long as wide, anterior margin straight and unarmed.

DISTRIBUTION.— Minnesota and New York to Arkansas and Mississippi.

USA: **Arkansas**: Jasper, Pulaski Co. **Maine**: Agricultural Experiment Station. **Minnesota**: Cass Lake, Ely. **Mississippi**: State College (Starkville), Trimcane Swamp. **New Jersey**: Brown's Mills Junction, Grenlock, Iona, Lahaway. **North Carolina**: Asheville, Durham, Pisgah Ridge, Tryon. **Pennsylvania**: Hazelton, Mt. Alto, North Mt. **Virginia**: Gloucester. **West Virginia**: Davis, Dellslow, Monongalia Co., Morgantown, Pocahontas Co.

HOSTS.— *Pinus banksiana*, *P. echinata*, *P. resinosa*, *P. taeda*.

BIOLOGY.— Cut, unthrifty, or dying trees are selected for attack. The habits are essentially as described for the genus.

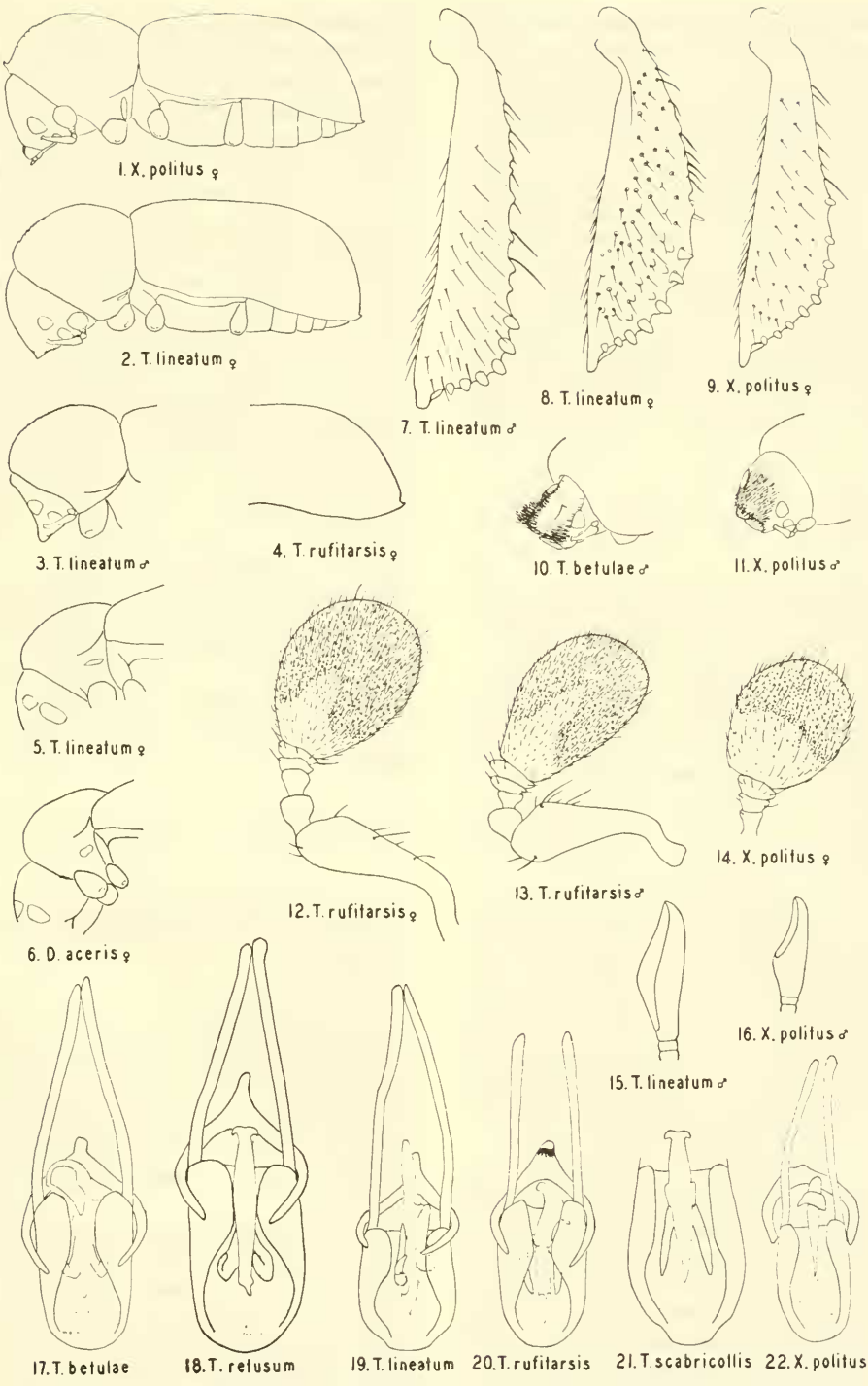



Fig. 177. *Trypodendron*, *Indocryphalus*, *Xyloterinus* spp.: 1–6, lateral or sublateral aspects of body, pronotum, or declivity of 1, *X. politus*; 2, 5, female and 4, male *T. lineatum*, 6, *I. aceris*; 7–9, posterior face of protibia of 7, male *lineatum*, 8, female *lineatum*, 9, female *X. politus*; 10–11, male frons of 10, *T. betulae*, 11, *X. politus*; 12–16, anterior or lateral face of antenna of 12, male *T. rufitarsis*, 13, 15, female *T. rufitarsis*, 14, 16, female *X. politus*; 17–22, male genital capsule, dorsal aspect of 17, *T. betulae*, 18, *T. retusum*, 19, *T. lineatum*, 20, *T. rufitarsis*, 21, *T. scabricollis*, 22, *X. politus*. (After Wood 1957:339.)

NOTES.— The above treatment was based on the holotype and on 166 other specimens.

### 2. *Trypodendron betulae* Swaine
Figs. 176, 177, 178

*Trypodendron betulae* Swaine, 1911, Canadian Ent. 43:216 (Lectotype, male; Ste. Anne de Bellevue, Quebec; Canadian Nat. Coll., 9288, designated by Bright, 1967, Canadian Ent. 99:679)

DIAGNOSIS.— This species is distinguished by the more coarsely punctured posterolateral areas of the pronotum, by the dull, minutely reticulate surface of the pronotum and elytra, by the color pattern of the mature beetle, by the presence of a rather large, sharply pointed median frontal tubercle between the upper halves of the eyes of the male, and by the distinctive male genitalia.

FEMALE.— Length 3.1–3.5 mm, 2.6 times as long as wide; body color dark brown to black, with a pale yellowish brown area between interstriae 2 and 7 extending from base to declivital margin (pale area larger or smaller depending on age of specimen).

Frons convex, a weak transverse impression just above epistoma; a broad, low median carina extending from epistoma almost to upper level of eyes; surface rather coarsely and sparsely granulate; vestiture sparse, inconspicuous. Antennal club oval, symmetrical in outline.

Pronotum 0.90 times as long as wide, slightly wider than elytra; sides feebly arcuate and indistinctly converging on posterior half; anterior margin armed by two rather large and two small median teeth; asperities decreasing in size posteriorly to base; surface of posterolateral area minutely reticulate and punctured, punctures comparatively coarse, close, some of them subgranulate; vestiture sparse, short, inconspicuous.

Elytra 1.7 times as long as wide, sides straight, subparallel on basal two-thirds; striae indicated by indistinct, feebly impressed punctures; surface rather dull, appearing minutely reticulate (magnification at least 70 diameters). Declivity convex, moderately steep, interstriae 2 narrower than 1 or 3 and rather strongly impressed; interstriae 1 and 3 sometimes bearing a few minute granules; subapical margin a raised line appearing rather narrowly rounded from above.

MALE.— Similar to female except 2.7–3.4 mm, 2.2 times as long as wide; frons broadly excavated from epistoma to vertex, a median carina at center ending dorsally between upper halves of eyes in a rather large, pointed tubercle; lateral margins of frontal excavations ornamented by more numerous, longer hairs; pronotum subquadrate, 0.67 times as long as wide, anterior margin straight, unarmed.

DISTRIBUTION.— British Columbia and Quebec to South Dakota and New Jersey.

CANADA: **Manitoba**: Aweme. **Ontario**: Black Sturgeon Lake, Ottawa, Rockcliffe. **Quebec**: Chelsea, Gaspé Co., Ile Perrot, Laniel, Lac Tremblant, Montebello, Ste. Anne de Bellevue. Bright (1976:118) adds **British Columbia, Alberta, Northwest Territories, New Brunswick, Nova Scotia.** USA: **Idaho**: Sandpoint. **Maine**: Cupsupic. **Massachusetts**: Arlington, Cambridge. **Minnesota**: Itasca Park. **New Hampshire**: Mt. Washington, Waterville, Webster. **New Jersey**: Springfield. **New York**: Cranberry Lake. **South Dakota**: Savoy in Lawrence Co. **Wisconsin**: Clintonville.

HOSTS.— *Betula lenta, B. papyifera.*

BIOLOGY.— Specimens were taken from unthrifty, standing trees larger than 10 cm in diameter. The habits are as described for the genus.

NOTES.— The above treatment was based on the type series and on 262 other specimens.

### 3. *Trypodendron retusum* (LeConte)
Figs. 177, 178

*Xyloterus retusus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:158 (Holotype, male; Canada; Mus. Comp. Zool., 992)

*Trypodendron retusum*: Swaine, 1913, Rept. Ontario Ent. Soc. 43:89.

DIAGNOSIS.— This species is distinguished by the larger size, by the smooth and shining surface of the elytra, by the coloration, by the absence of asperities in the median basal area of the female pronotum of most specimens, and in the male by the genitalic chracters.

FEMALE.— Length 3.8–4.6 mm, 2.5 times as long as wide; body color uniformly black when fully mature, young adults with pale yellowish brown areas at base of pronotum and on elytra between interstriae 2–7 from base to declivital margin and continuing on sides of declivity between interstriae 5–7 to apex, extent of pale areas depending upon age of specimen.

Frons convex, moderately impressed above epistoma, with a short, broad, rather

indefinite median carina above epistoma; surface rather coarsely, sparsely granulate; vestiture sparse, rather long, inconspicuous. Antennal club oval, with mediodistal portion very slightly produced.

Pronotum 0.83 times as long as wide; sides weakly arcuate, anterior half of pronotum semicircularly rounded; anterior margin armed by four teeth, median pair larger; asperities decreasing in size posteriorly to behind summit, very finely, sparsely asperate in basal area (basal area entirely devoid of asperities in about two-thirds of available specimens); posterolateral areas feebly reticulate, finely and sparsely punctured, punctures not at all granulate; vestiture rather short, inconspicuous.

Elytra 1.7 times as long as wide; sides subparallel on basal two-thirds, narrowly rounded behind; strial punctures very fine, rather indistinctly, shallowly impressed; interstriae smooth and brightly shining, with extremely minute, rather abundant, confused punctures (visible at a magnification of 40 or more diameters). Declivity convex, moderately steep; strial punctures reduced; interstriae 2 impressed and narrower than 1 or 3; subapical margin sharply elevated and produced on a small portion at apex, giving the elytra a subacuminate appearance from above. Vestiture sparse, short, fine.

MALE.— Similar to female except 3.6–4.3 mm, 2.3 times as long as wide; frons broadly excavated from epistoma to vertex, lateral margins ornamented by longer, more abundant hair; pronotum subquadrate, 0.67 times as long as wide, anterior margin feebly recurved, unarmed, asperities extending to base of median area.

DISTRIBUTION.— Alaska and New Brunswick to California, New Mexico, and West Virginia.

CANADA: **Alberta**: Cypress Hills, Edmonton, Medicine Hat. **British Columbia**: Bowman Lake, Kaslo, Quamechan Lake on Vancouver Island. **Manitoba**: Aweme, Riding Mt. N.P. **New Brunswick**: Bathurst, Fredericton, Oak Bay. **Ontario**: Ottawa, Sudbury. **Quebec**: Ft. Coulonge, Ile Perrot, Laniel, Ste. Anne de Bellevue. **Saskatchewan**: Indian Head. Bright (1976:119) adds **Alaska, Yukon.** USA: **Arizona**: Grand Canyon. **California**: Chester, Lassen N.P., Plumas Co. **Colorado**: Pagos Springs in Hinsdale Co., Norwood in Montrose Co., Cheyenne Canyon. **Connecticut**: Hampton. **Idaho**: Priest River. **Michigan**: Huron Mts. **Minnesota**: Hennepin Co., Itasca Pk., Lake Co. **Nevada**: Baker. **New Hampshire**: Webster. **New Mexico**: Cloudcroft. **New York**: Elka Park, Forestburg, West Point. **Oregon**: Fort Klamath, Klamath Falls. **Pennsylvania**: Promised Land. **South Dakota**: Cheyenne Crossing in Lawrence Co., Hill City. **Utah**: Logan Canyon, Payson Canyon, Long Hollow in Dixie N.F. **Vermont**: Hancock. **Washington**: Seattle. **West Virginia**: Dellslow, Morgantown. **Wisconsin**: Dane Co.

HOSTS.— *Populus deltoides, P. grandidentata, P. tremuloides.*

BIOLOGY.— Unthrifty standing trees larger than 10 cm in diameter are usually selected for attack. The habits are essentially as described for the genus.

NOTES.— The above treatment was based on the holotype and on 362 other specimens.

### 4. *Trypodendron lineatum* (Olivier)

Figs. 177, 178

*Bostrichus lineatus* Olivier, 1795, Entomologie ou histoire naturelle des insects, Coleoptera 4(77):18 (Syntypes; northern Europe; d'Orey Coll., Paris Mus.?)

*Trypodendron lineatum*: Eichhoff, 1878, Mém. Soc. Roy. Liége (2)8:417

*Apate bivittata* Kirby, 1837, *in* Richardson's Fauna Boreali-Americana 4:192 (Lectotype, female; Boreal America; British Mus. Nat. Hist., present designation); Wood, 1957, Canadian Ent. 89:349. *Synonymy*

*Bostrichus cavifrons* Mannerheim, 1843, Bull. Soc. Imp. Nat. Moscou 16:297 (reprint p. 125) (Syntypes, male; Sitka Island; Univ. Zool. Mus., Helsinki); Wood, 1969, Great Basin Nat. 29:114. *Synonymy*

*Trypodendron vittiger* Eichhoff, 1880, Die europäischen Borkenkäfer, p. 298 (Syntypes?; California; presumably lost with Hamburg Mus.); Schwarz, 1886, Ent. Amer. 2:41. *Synonymy*

*Trypodendron borealis* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):21 (Lectotype, female; Athabasca Landing, Alberta; Canadian Nat. Coll., 9289, designated by Bright, 1967, Canadian Ent. 99:679); Wood, 1957, Canadian Ent. 89:349. *Synonymy*

DIAGNOSIS.— This species is distinguished by the smooth, shining elytral surface, by the steeper elytral declivity, with the raised subapical margin appearing broadly rounded when visible from above, by the coloration, and in the male by the genitalic characters.

FEMALE.— Length 3.0–3.5 mm, 2.5 times as long as wide; body color very dark brown to black, with base of pronotum and interstriae 2–4 and 7–8 light yellowish brown to dark brown, transition from light to dark color abrupt, pale areas quite variable in extent, apparently depending upon the age of the

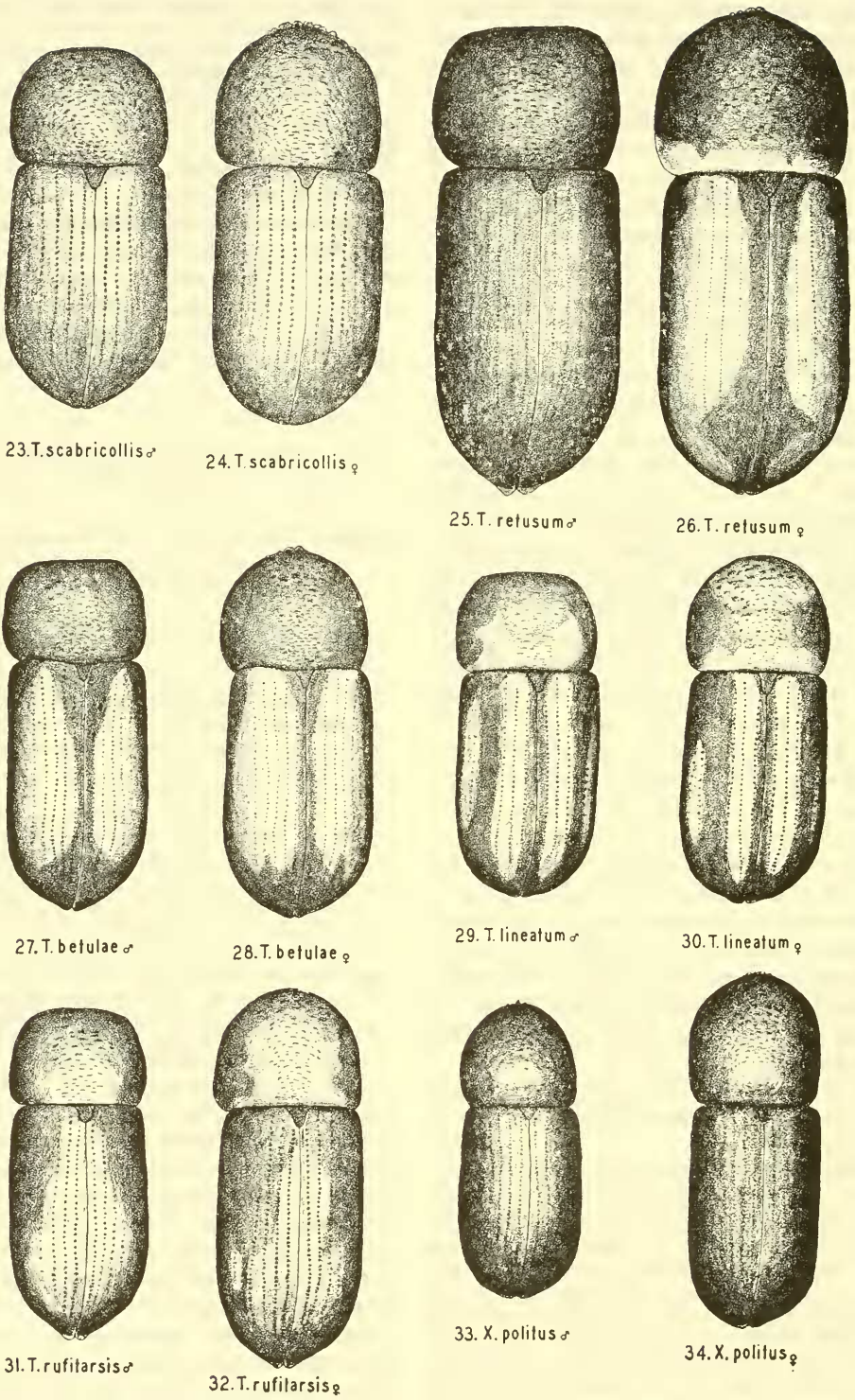



Fig. 178. *Trypodendron* and *Xyloterinus* spp., dorsal aspect of males and females: 23–24, *T. scabricollis*, 25–26, *T. retusum*, 27–28, *T. betulae*, 29–30, *T. lineatum*, 31–32, *T. rufitarsis*, 33–34, *X. politus*. (After Wood 1957:341.)

specimen as well as other factors (presumably environmental).

Frons convex, weakly impressed above epistoma, with a short, broad, rather indefinite median carina above epistoma; surface reticulate, with rather fine, sparse granules; vestiture fine, rather long, inconspicuous. Antennal club oval, with mediodistal angle slightly produced.

Pronotum 0.83 times as long as wide; sides weakly arcuate, rather broadly rounded in front; anterior margin unarmed, several irregularly placed submarginal asperities present; asperities decreasing in size posteriorly to base; posterolateral area finely reticulate, with sparse, fine, shallow punctures; vestiture fine, sparse, inconspicuous.

Elytra 1.6 times as long as wide; sides subparallel on basal two-thirds, rather broadly rounded behind; strial punctures very fine, rather indistinctly, shallowly impressed; interstriae smooth, shining, with extremely minute, rather abundant, confused impressed points (magnification 40 diameters or more). Declivity convex, steep; strial punctures reduced; interstriae 2 weakly impressed, slightly narrower than 1 or 3; subapical margin sharply elevated, scarcely or not at all visible from above, outline, when visible, appearing broadly rounded from above. Vestiture sparse, short, fine.

MALE.— Similar to female except 2.7–3.2 mm, 2.4 times as long as wide; frons broadly excavated from epistoma to vertex, lateral margins ornamented by longer, more abundant hair; pronotum subquadrate, 0.71 times as long as wide, anterior margin straight, unarmed.

DISTRIBUTION.— Alaska and Newfoundland to New Mexico and North Carolina; Europe and N Asia.

ALASKA: Numerous localities. CANADA: Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland, Nova Scotia, Ontario, Quebec, Saskatchewan. USA: Arizona, California, Colorado, Connecticut, District of Columbia, Idaho, Maine, Michigan, Minnesota, Montana, Nevada, New Hampshire, New Mexico, New York, North Carolina, Oregon, Pennsylvania, South Dakota, Tennessee, Utah, Washington, West Virginia, Wyoming.

HOSTS.— Virtually all species of *Abies*, *Larix*, *Picea*, *Pinus*, *Pseudotsuga*, *Thuja*, *Tsuga*; rare in *Alnus*, *Betula*, *Malus*, and *Juniperus*.

BIOLOGY.— Felled, injured, and unthrifty trees larger than 10 cm in diameter are selected for attack. The habits are as described for the genus.

NOTES.— Of the two syntypes used to describe *Apate bivittata* only the female remains in the British Museum (Natural History). That female is here designated as the lectotype of Kirby's species. The above treatment was based on the lectotype of *bivattata*, on all known syntypes of *cavifrons*, on Swaine's syntypes of *borealis*, on more than 50 European and Asian *lineatum*, and on more than 4,600 North American specimens.

### 5. *Trypodendron rufitarsis* (Kirby)

Figs. 177, 178

*Apate rufitarsis* Kirby, 1837, *in* Richardson's Fauna Boreali-Americana 4:193 (Lectotype, male; Boreal America; British Mus. Nat. Hist., present designation)

*Trypodendron rufitarsis*: Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):22.

*Trypodendron ponderosae* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):22 (Lectotype, female; Peachland, British Columbia; Canadian Nat. Coll., 9290, designated by Bright, 1967, Canadian Ent. 99:679); Wood, 1957, Canadian Ent. 89:351. *Synonymy*

DIAGNOSIS.— This species is distinguished by the dull, finely reticulate surface of the elytra, by the coloration, by the narrowly rounded posterior outline of the elytra, by the unarmed anterior margin of the female pronotum, and in the male by the genitalic characters.

FEMALE.— Length 3.4–3.7 mm, 2.6 times as long as wide; body color brown, anterior and lateral areas of pronotum and sides of elytra usually a darker brown, transition from light to dark color gradual.

Frons convex, weakly impressed above epistoma, with a short, broad, rather indefinite median carina above epistoma; surface reticulate, with rather fine sparse granules; vestiture fine, rather long, inconspicuous. Antennal club oval, with mediodistal angle slightly produced.

Pronotum 0.83 times as long as wide, sides weakly arcuate, rather broadly rounded in front; anterior margin unarmed, several irregularly placed submarginal asperities present; asperities on anterior slope decreasing in size posteriorly to base; posterolateral area

finely reticulate, with sparse, fine, shallow punctures scarcely perceptible; vestiture fine, sparse, inconspicuous.

Elytra 1.7 times as long as wide; sides subparallel on basal two-thirds, narrowly rounded behind; strial punctures very fine, rather indistinctly, shallowly impressed; interstriae dull, minutely reticulate (visible at a magnification of 70 diameters of more). Declivity convex, moderately steep; strial punctures smaller; interstriae 2 rather weakly impressed, narrower than 1 or 3; subapical margin sharply elevated, produced on apical portion, giving elytra a subacuminate appearance from above. Vestiture sparse, short, fine.

MALE.— Similar to female except 2.9–3.2 mm, 2.5 times as long as wide; frons broadly excavated from epistoma to vertex, lateral margins ornamented by longer, more abundant hair; pronotum subquadrate, 0.67 times as long as wide, anterior margin straight, unarmed.

DISTRIBUTION.— Yukon and New Brunswick to California, Arizona, and Minnesota.

CANADA: **Alberta**: Laggan. **British Columbia**: Likely, Lorna, Midday Valley, Mt. Apex, Peachland, Stanley, Trinity Valley. **Manitoba**: Riding Mt. N.P. **New Brunswick**: Maple Grove, Nictor Lake, "Pisequit Br." **Ontario**: Black Sturgeon Lake, Hymers. Bright (1876:122) adds **Yukon**. USA: **Arizona**: Flagstaff, Whiteriver. **California**: Fallen Leaf Lake, Lake Alpine, Medicine Lake, White Wolf, Yosemite N.P. **Colorado**: Newcastle, Pine River in La Platta Co., Pingree Park, Pitkin, Vallecito R.S. in La Platta Co. **Idaho**: Centerville, Lakeview, Minadoka N.F., Soda Springs. **Minnesota**: Ely. **Montana**: Beaverhead, Beaver N.F., Sula, Wisdom. **Oregon**: Blue Mts., Cable Cove, Detroit, Grant Co., Klamath Falls, Miami N.F., Pineville, Whitman N.F. **Utah**: Logan Canyon, Long Hollow in Dixie N.F., Mammoth Mt. **Washington**: Longmire, Metaline Falls, Olympia.

HOSTS.— *Pinus banksiana, P. contorta,* and rare in *P. jeffreyi, P. monticola, P. ponderosa, Picea engelmannii.*

BIOLOGY.— Injured, unthrifty, or dying trees on dry to moderately dry sites are selected for attack; standing trees evidently are preferred. The habits are as described for the genus.

NOTES.— The male syntype of *rufitarsis* that is labeled as the type in the British Museum (Natural History) is here designated as the lectotype of Kirby's species. The above treatment was based on the lectotypes of *rufitarsis* and *ponderosae,* and on 347 other specimens.

## Tribe XYLEBORINI

Xylebori LeConte, 1876, Proc. Amer. Philos. Soc. 15:358 (Type-genus: *Xyleborus* Eichhoff, 1864)
Webbinae Hopkins, 1915, U.S. Dept. Agric. Tech. Bull. 17(2):224 (Type-genus: *Webbia* Hopkins, 1915)

Anatomical features.— The male is dwarfed and moderately to strongly deformed, but most basic characters are as in the female. The frons is convex, the eye is emarginate (divided in *Pseudoxyleborus,* Asia), the antennal funicle is 5-segmented (3–4-segmented in some Asiatic forms), the club is obliquely truncate (some Asiatic exceptions), the pronotum is declivous and asperate on the anterior half, its margins are rounded, the procoxae vary from widely separated to contiguous, and the meso- and metatibiae are rather broad, tapered to the apex on the apical third of their length, and armed by a rather large number of small, closely set, socketed denticles and setae.

Biological features.— All are consanguineously polygynous and xylomycetophagous. Eggs are deposited individually or in clusters in the parental galleries. The larvae may or may not extend the parental chambers. Both adults and larvae feed primarily on spores of symbiotic fungi. The haploid males are flightless and do not join the female in the formation of parental galleries. Facultative arrhenotokic parthenogenesis apparently is universal.

Taxonomy.— Some recent authors place virtually all representatives of this tribe in one genus. I believe a comprehensive world review of the group will reveal the existence of several well-defined genera, some of which are recognized below. The Xyleborini are primarily tropical, and most American groups are shared with other tropical areas. Except for introduced species, all North American forms appear to have been derived from tropical America rather recently. Earlier faunal exchanges may have involved Africa and, possibly, Australia.

### Genus *PREMNOBIUS* Eichhoff

*Premnobius* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:65, 404 (Type-species: *Premnobius cavipennis* Eichhoff, monobasic); Browne, 1961, West African Timber Borer Research Unit Rept. 4:45–51 (Status of genus)

Diagnosis.— This genus is somewhat intermediate between the Ipini and *Xyleborus.* Although it is probably more closely related to *Sampsonius* Eggers than to *Xyleborus,* it is much more likely to be confused with the latter. From *Xyleborus* it differs by the rather strongly flattened antennal club that is pubescent to its base, at least at the sides, by the much more slender labial palpi, by the tuberculate posterior face of the protibiae (except in *Dryocoetoides*), by the simple larval spiracles, and by the presence of pupal cradles formed by the larvae in the gallery system.

Description.— Length, female 2.3–3.3 mm, 2.9 times as long as wide; pale to rather dark reddish brown. Males much smaller.

Frons convex, conservatively sculptured; eye elongate, finely faceted, deeply, broadly emarginate. Antennal scape elongate; funicle 5-segmented; club strongly flattened except at base, pubescent to base. Pregular area not depressed below ventral contour of head. Labial palpi slender, segment 3 not enlarged, segments subequal in length. Pronotum much longer than wide; summit anterior to middle; anterior margin unarmed. Elytra elongate, feebly striate; declivity obliquely truncate to deeply, broadly excavated, margins usually dentate. Protibiae tuberculate on posterior face, meso- and metatibiae of *Xyleborus* type. Anterior coxae subcontiguous. Pupal cradles formed by larvae.

Distribution.— Africa and Florida to Brazil; 16 African species; 2 of these also occur in America.

Notes.— Schedl (1957), followed by Bright (1968), treated this genus as a synonym of *Xyleborus.* Browne (1961) reviewed anatomical characters of both larvae and adults

and biological characters that clearly place *Premnobius* among the most primitive Xyleborini and set them apart as a unique genus within the tribe.

Key to the American species of *Premnobius*

1. Smaller; declivital interstriae 1 with a row of pointed tubercles; declivity occupying only 33 percent of elytral length; its lateral margin finely serrate, a slightly larger tubercle near middle, another on lower fourth; Africa, Florida to Brazil; 2.3–2.8 mm ..... 1. ***cavipennis*** **Eichhoff**

— Larger; declivital interstriae 1 entirely unarmed; declivity occupying 43 percent of elytral length, its lateral margins each armed by four rather coarse tubercles on upper third and a much larger spine slightly below middle; Africa, Colombia to Brazil; 3.0–3.3 mm ..... ***ambitiosus*** **(Schaufuss)**

### 1. *Premnobius cavipennis* Eichhoff

Fig. 179

*Premnobius cavipennis* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:404 (Syntypes; Cap bonae spei in Africa meridionalis, and Colombia; lost with Hamburg Mus.)

*Xyleborus industrius* Sampson, 1912, Ann. Mag. Nat. Hist. (8)10:248 (Holotype, female; Uganda; British Mus. Nat. His.); Schedl, 1962, Rev. Ent. Mocambique 5(1):538. *Synonymy*

*Xyleborus xylocranellus* Schedl, 1931, Ann. Mag. Nat. Hist. (10)8:344 (Holotype, female; Brazil; Schedl Coll.); Browne, 1961, West African Timber Borer Research Unit Rept. 4:50. *Synonymy*

*Premnobius biturberculatus* Eggers, 1932, Rev. Zool. Bot. Afr. 22:35 (Holotype, female; Region de Sassa, Congo; Tervueren Mus.); Schedl, 1962, Rev. Ent. Mocambique 5(1):538. *Synonymy*

*Premnobius latior* Eggers, 1933, Trav. Lab. d'Ent. Mus. Nat. d'Hist. Nat. Mem. 1:9 (Holotype, female; St. Jean de Maroni, French Guiana; Paris Mus.); Wood, 1977, Great Basin Nat. 37:210. *Synonymy*

DIAGNOSIS.— This small, long, cylindrical species with the declivity deeply excavated is most easily recognized by the flattened, pubescent antennal club and rather abundant, short, fine pubescence. It is commonly attracted to light.

FEMALE.— Length 2.3–2.8 mm, 2.9 times as long as wide; color reddish brown.

Frons broadly convex, median line near center feebly elevated in most specimens; surface subreticulate, obscurely punctured above, some punctures replaced by very fine granules below upper level of eyes. Eye and antenna as described for the genus.

Pronotum 1.2 times as long as wide; sides almost straight and parallel on slightly more than basal half, rather broadly rounded in front; anterior margin unarmed; summit indefinite, slightly more than one-third pronotum length from anterior margin; anterior slope steep, rather finely asperate; posterior areas smooth, shining, very finely, rather deeply, closely punctured; lateral margins subacute. Vestiture of fine, short, rather abundant hair.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal three-fourths, shallowly subemarginate on median third behind; striae not impressed, punctures minute, in scarcely definable rows; interstriae smooth, usually with numerous minute, obscure points, about six times as wide as striae, punctures small, confused, usually indistinguishable from those of striae. Declivity broadly, rather deeply, concavely excavated, on posterior third of elytra, lateral margins distinctly higher than suture; sutural interstriae with a row of fine, pointed tubercles; declivital face with rather large, moderately deep, confused punctures, shining; lateral margins on upper half with a row of minute denticles, a small tooth near middle; lower half with one to three minute denticles, a moderately large tooth on margin on lower fourth; lateral margin obsolete before apex. Vestiture of abundant, rather short, fine hair, somewhat longer and coarser at base of declivity.

MALE.— Not seen; described by Browne (1961) as much smaller than female, with features less perfectly formed; elytral declivity much more gradual, less strongly excavated; flightless.

DISTRIBUTION.— Florida to Brazil, and Africa.

USA: **Florida**: Plant City, 14-VII-39, at light, R. H. Beamer; Sanford, 8-VIII-39, at light, D. E. Hardy;

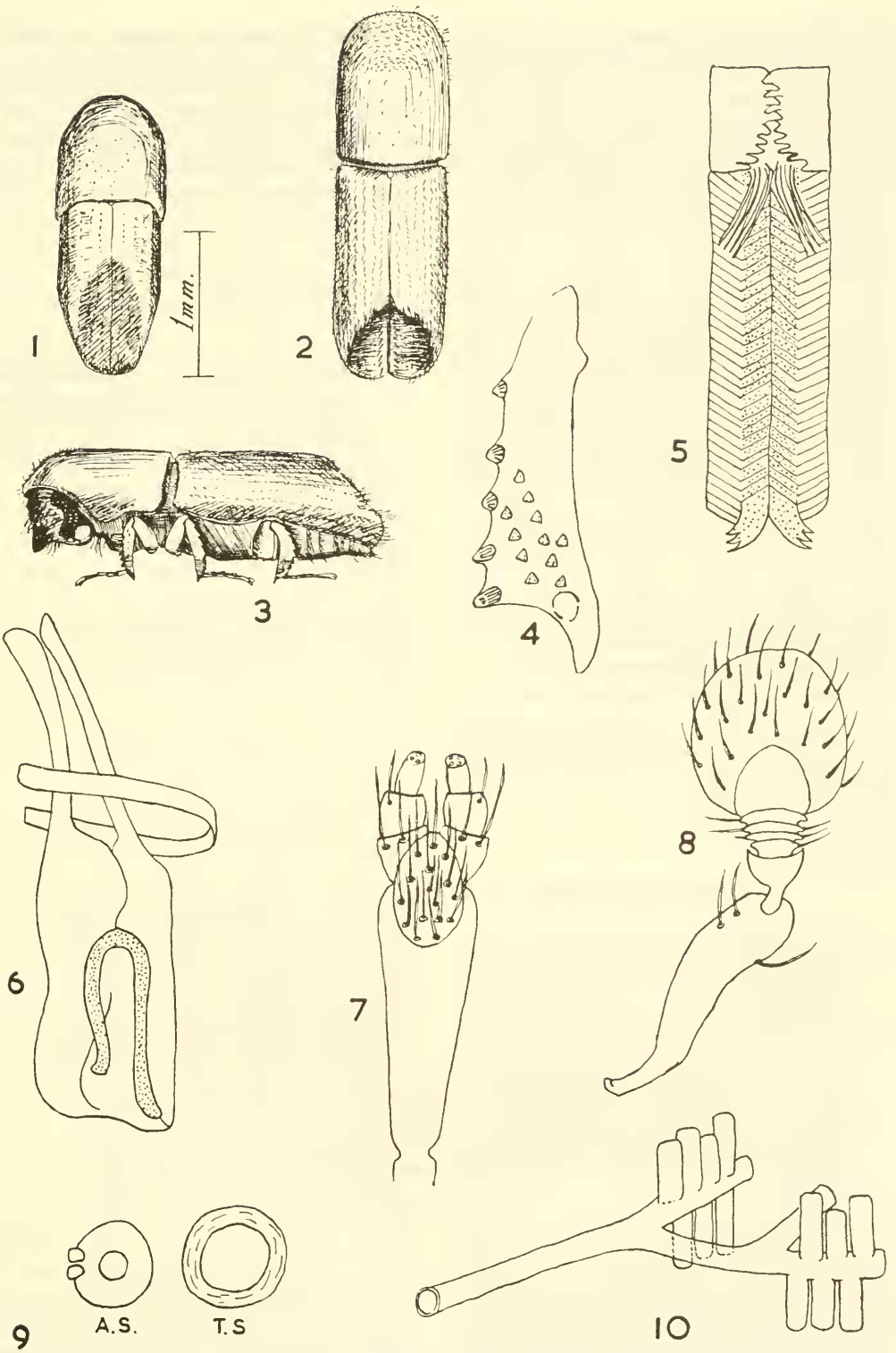



Fig. 179. *Premnobius cavipennis*: 1, male; 2–3, female; 4, female protibia; 5, female proventricular plate; 6, male genital capsule; 7, female labium; 8, female antenna; 9, larval abdominal and thoracic spiracles; 10, part of gallery system. (After Browne 1961:46.)

Miami, 6-VII-51, *Rhizophora mangle*, S. L. Wood. MEXICO: Chiapas: Valle de Ocosingo, 6-VII-51, L. J. Stannard. Veracruz: 18 miles (29 km) E Coatzocoalcos, 26-VI-67, 30 m, No. 104, tree limb, S. L. Wood. Yucatán: Chichen Itza, 30-VI-51, L. J. Stannard. HONDURAS: La Ceiba, 29-V-49, at light, E. C. Becker; La Lima, Cortéz, 5-V-64, *Sweitenia*, S. L. Wood. OTHER AMERICAN COUNTRIES: Cuba, Puerto Rico, Jamaica, Venezuela, French Guiana, and Brazil.

HOSTS.— Numerous tree species in Africa and South America.

BIOLOGY.— Unthrifty, fallen, or cut branches larger than 3 cm in diameter, limbs, or logs are selected for attack. The female constructs a radial tunnel about 3 cm into the wood; the tunnel may then branch or radiate palmately. Ambrosial fungus is cultured on the tunnel walls. The larvae develop in the tunnels, feeding upon the fungal growth until just before pupation, when each constructs its own pupation cell either above or below the parental gallery much as in many Platypodidae. About 11 to 17 pupal cradles occur in each gallery system. The young adults emerge through the parent entrance hole. Mating with the flightless males occurs before the female leaves the brood gallery.

NOTES.— The above treatment was based on 53 American and 34 African specimens, several of which were compared to Eggers' homotypes. The types of *industrius* and *latior* were also examined.

### *Premnobius ambitiosus* (Schaufuss)

*Xylocleptes ambitiosus* Schaufuss, 1897, Berliner Ent. Zeitschr. 42:109 (Holotype, female; Gabun; repository unknown, but presumably lost with Hamburg Mus.)

*Premnobius cavipennis* var. *spinosus* Hagedorn, 1908, Deutsche Ent. Zeit. 3:376 (Holotype, female; Kinchassa or Waelbroek, Congo; Brussels Mus.); Eggers, 1922, Ent. Blätt. 18:173. *Synonymy*

*Premnobius brasiliensis* Nunberg, 1958, Acta Zool. Cracoviensia 2:490 (Holotype, female; São Paulo, Brazil; Escola Nacional de Agronomia, São Paulo); Schedl, 1960, Ent. Blätt. 56:107. *Synonymy*

This African species has been reported from Brazil and Bolivia, and I have a specimen from Sevilla, Valle de Cauca, Colombia, V-58, en gaumo, A. Duque V. It has not been reported from North or Central America, but at the present rate of dispersal it should soon reach Central America. In Africa it breeds in a wide variety of host plants.

It is very similar to *cavipennis* Eichhoff, but it is readily distinguished by the larger size and by the much larger declivital teeth. The identity of this species is based on the direct comparison of the holotypes of *ambitiosus* and *spinosus* by Eggers (1922), and by my comparison of Eggers's homotype to my specimens.

## GENUS *SAMPSONIUS* EGGERS

*Sampsonius* Eggers, 1933, Trav. Lab. Ent. Mus. Nat. d'Hist. Nat., Paris, Mém. 1:23 (*nomen nudum*); Eggers, 1935, Rev. de Ent. Río de Janeiro 5:158 (Type-species: *Sampsonius sexdentatus* Eggers, original designation)

DIAGNOSIS.— The true affinities of this genus are uncertain, but it evidently is more closely allied to *Premnobius* than to other known genera, although the relationship is remote. It is distinguished by the unusually slender body, by the flattened antennal club that has two slightly procurved sutures on the anterior face and at least one strongly procurved suture on the posterior face, by the armed anterior margin of the pronotum in which two serrations are unusually large, by the gradual declivity with its remarkable structure, and by the habits.

DESCRIPTION.— Length, female 2.9–5.8 mm, 3.3–3.8 times as long as wide; rather light reddish brown. Male dwarfed, flightless.

Frons narrow, convex; eyes enlarged, emarginate, coarsely faceted; pregular area depressed; segment 1 of maxillary palpi slightly enlarged. Antennal scape elongate; funicle 5-segmented; club rather strongly flattened, sutures 1 and 2 moderately to strongly procurved, at least one suture visible on posterior face. Pronotum elongate, summit well in front of middle, anterior slope asperate, anterior margin armed by two enlarged serrations, supplemented by smaller lateral serrations in some species. Scutellum moderately large, flat, fitted into sutural notch at base of elytra. Elytra elongate, weakly striate, declivity gradual, variously, often remarkably sculptured. Procoxae contiguous, intercoxal piece obsolete. Anterior tibiae slender, posterior face slightly inflated. Male dwarfed, anterior slope of pronotum impressed to excavated; declivity less strongly impressed, characters imperfectly formed.

DISTRIBUTION.— S Mexico to Brazil; about 10 species are known; 4 occur from Chiapas to Panama.

BIOLOGY.— These species are ambrosia beetles. As with other Xyleborini, the males are flightless; therefore mating must occur in the brood chamber. The females are evidently incapable of excavating an entrance tunnel. They seek out a newly constructed tunnel of a *Xyleborus* species of appropriate diameter to accommodate their body and enter and often wait for the host to advance the tunnel adequately before clearing first one branch and then the other of eggs and young larvae; then they finally evict the host. Whether the host is removed forcibly or is repelled by offensive secretions or other factors was not determined. The *Sampsonius* female then deposits clusters of eggs in the tunnels. The larvae excavate tabular extensions of the gallery with the grain of the wood in much the same fashion as does the host species. They are found in branches or seedlings about 2–8 cm in diameter; they are very rare.

NOTES.— This genus evidently represents a primitive stock of the Xyleborini as indicated by the structure of the antenna, by the slightly enlarged segment 1 of the labial palpi, and by the scutellum. The total elimination of the prothoracic intercoxal piece, the unusually slender body form, and the unusual sculpture are probably adaptations to the domicile "parasitic" habit.

Key to the Species of *Sampsonius*

1. Sutural interstriae on declivity flat to moderately elevated on apical fourth, but entirely devoid of an acute or abruptly extended process; larger species ..... 2
— Declivital interstriae 1 near apex with an abruptly elevated process; smaller species ..... 3

2(1). Elytral declivity concave only on longitudinal axis, suture higher on apical third than lateral convexities; devoid of declivital spines; Colombia; 5.1 mm (see also 2. ***reticulatus*** **Bright**) ..... ***expulsus*** **Wood**
— Elytral declivity almost straight on longitudinal axis, lateral convexities on apical third higher than suture; lateral area near apex of interstriae 3 bearing one long, slender spine; Panama; 5.6–5.8 mm ..... 1. ***detractus*** **Wood**

3(1). Larger; elytral declivity commencing at or slightly anterior to middle; declivity with lateral convexities on interstriae 3 slightly higher than suture, area from interstriae 3 to serrate lateral margin less strongly impressed; pair of spines near apex of sutural interstriae rather small, acute, their length equal to little more than width of an interstriae, their summits contiguous; Costa Rica to Panama; female 4.0–4.4 mm ..... 3. ***usurpatus*** **Wood**
— Smaller; elytral declivity commencing well behind middle; declivital suture as high as lateral convexities, area between convexities and serrate lateral margins much more distinctly impressed; process near apex of sutural interstriae variable, much larger, occupying about a fourth of declivital length, its height equal to width of 1–3 interstriae, summits usually diverging from suture; Veracruz to Brazil; female 2.9–4.1 mm ..... 4. ***dampfi*** **Schedl**

### 1. *Sampsonius detractus* Wood
Fig. 180

*Sampsonius detractus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):31 (Holotype, female; Madden Forest, Canal Zone, Panama, Wood Coll.)

DIAGNOSIS.— The large size and the presence of one pair of long, slender spines near the apex of declivital interstriae 3 distinguish this species from other representatives of the genus.

FEMALE.— Length 5.6–5.8 mm, 3.6 times as long as wide; color reddish brown.

Frons narrow, broadly convex; surface reticulate, with small, low, rather abundant, shining granules; vestiture of sparse, fine, long hair. Eye large, emarginate, very coarsely faceted, 1.9 times as long as wide. Antennal club subcircular, rather strongly flattened, sutures 1 and 2 rather strongly procurved, 2 reaching slightly beyond middle; one strongly procurved suture near apex on posterior surface.

Pronotum 1.4 times as long as wide; sides feebly arcuate and subparallel on posterior two-thirds, narrowly produced on anterior third to two very coarse, close serrations arming anterior margin, two pairs of small serrations lateral to major ones; summit indefinite, about one-third pronotum length from anterior margin; anterior third moderately asperate; posterior areas smooth, shining, minutely, rather sparsely punctured; lateral margins abrupt. Vestiture of sparse, fine hair, slightly coarser and longer on asperate area.

Elytra 2.1 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal three-fourths, slightly narrowed, then truncate on median two-thirds; discal striae not impressed, punctures very small, distinct; interstriae smooth, shining, about four times as wide as striae, punctures almost uniseriate, minute. Declivity occupying posterior 46 percent of elytral length, gradual basal margin abruptly impressed and irregularly, finely serrate from interstriae 1 to posterolateral apical angle; surface reticulate; sutural interstriae not elevated or armed; interstriae 3 posterior to middle broadly elevated and slightly higher than suture, descending to moderate impression just mesad of serrate lateral margin; armed just before apex of interstriae 3 by a pair of very large, subcylindrical spines, each four times as high as wide, equal in length to discal distance from suture to striae 4. Vestiture of fine, moderately long hair on disc and sides, very much longer and slightly more abundant on declivity.

DISTRIBUTION.— Panama.

PANAMA: Madden Forest, Canal Zone, 2-I-64, 70 m, No. 367, tree limb, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of two females.

### 2. *Sampsonius reticulatus* Bright

*Sampsonius reticulatus* Bright, 1972, Canadian Ent. 104:1369 (Holotype, female; Dos Amates, Veracruz, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *expulsus* Wood by the confused punctures on most discal interstriae and by the different elytral declivity as described below.

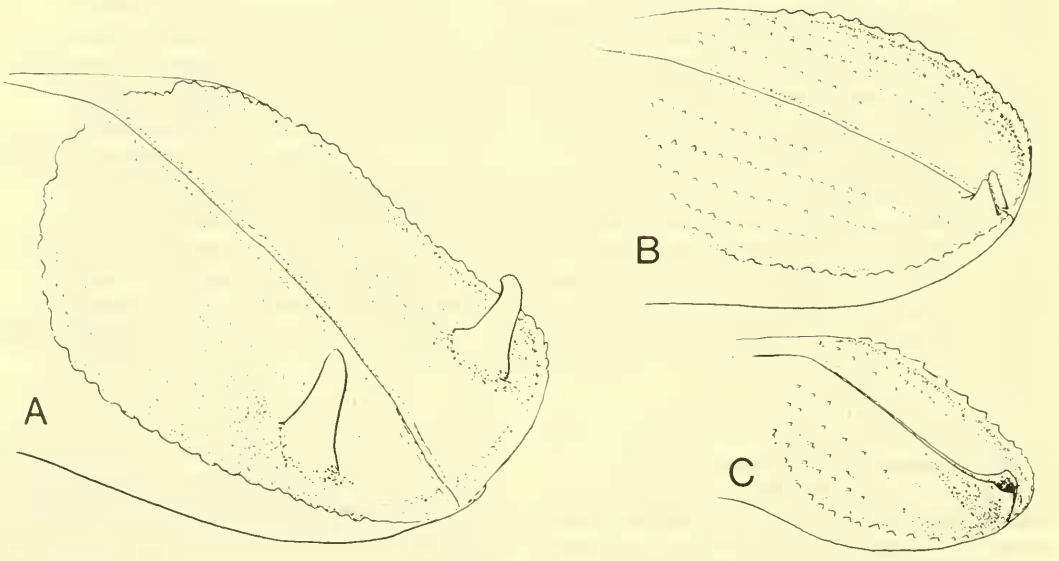



Fig. 180. *Sampsonius* spp., female declivity: A, *detractus*; B, *usurpatus*; C, *dampfi*.

FEMALE.— Length 4.9–5.3 mm, 3.8 times as long as wide; color reddish brown to yellowish brown.

Frons, pronotum, and elytral disc as in *expulsus*. Declivity somewhat similar to *expulsus* except sutures less strongly elevated, ascending laterad from striae 1 to rather abrupt summit on 3, 3 conspicuously higher than 1, its crest extending from base almost to apex, 2 with a row of fine tubercles, 3 with similar tubercles more numerous and confused; setae much longer, more abundant, longest equal in length to distance on disc from suture to striae 5.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: Dos Amates, 5-V-69, D. E. Bright.

NOTES.— The above treatment was based on the holotype and on five paratypes.

### 3. *Sampsonius usurpatus* Wood
Fig. 180

*Sampsonius usurpatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):32 (Holotype, female; Turrialba, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the closely allied *dampfi* Schedl by the larger size, by the longer elytral declivity, by the declivital suture being lower than the lateral convexities, and by the much smaller, contiguous spines near the sutural apex on the elytral declivity.

FEMALE.— Length 4.0–4.4 mm (males 2.8–3.3 mm), 3.8 times as long as wide; color reddish brown.

Frons as in *detractus* Wood except slightly narrower. Pronotum as in *detractus*.

Elytra 2.2 times as long as wide; outline as in *detractus* except tapered posteriorly, subtruncate on less than median half; disc and general contour of declivity as in *detractus* except basal margin gradual, denticles smaller, more scattered; apex of interstriae 3 entirely unarmed; sutural interstriae armed by contiguous, subapical, pointed processes about as high as their longitudinal base, height about equal to width of a discal interstriae, positioned as in *dampfi* but much smaller. Vestiture as in *detractus*.

MALE.— Dwarfed, head concealed by prolongation of pronotum; pronotum longer than elytra, 1.7 times as long as wide, its anterior three-fifths broadly, rather deeply concave, anterior margin narrowly biemarginate, giving appearance of a median and two lateral dentations; elytra similar to female but characters poorly formed, more convex, devoid of subapical spine.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Turrialba, Cartago, 9-III-64, 700 m, No. 460, tree seedling, S. L. Wood; San Ignacio de Acosta, 5-VII-63, 1500 m, No. 38, seedling, S. L. Wood; Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 76, tree seedling, S. L. Wood; Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 68, tree branch, S. L. Wood. PANAMA: El Hato del Volcán, Chiriquí, 11-I-64, 2800 m, No. 374, tree branch, S. L. Wood.

HOSTS.— Several tree species.

BIOLOGY.— As described for the genus. The scolytid host species apparently was *Dryocoetoides capucinus* (Eichhoff).

NOTES.— The above treatment was based on the type series of 32 specimens; 25 were taken from one gallery; only 2 of them were males.

### 4. *Sampsonius dampfi* Schedl
Fig. 180

*Sampsonius dampfi* Schedl, 1940, An. Esc. Nac. Cienc. Biol., Mexico 1:359 (Lectotype, female; Chiapas, Mexico; Schedl Coll., present designation)

*Sampsonius costaricensis* Nunberg, 1963, Trans. Wisconsin Acad. Sci. Arts. Let. 52:104 (Lectotype, females; Finca La Lola, Limón, Costa Rica; Univ. Wisconsin Coll., present designation); Schedl, 1969, Turrialba 19:554. *Synonymy*

DIAGNOSIS.— This species is distinguished from the allied *usurpatus* Wood by the smaller size and by the shorter elytral declivity, with different declivital sculpture.

FEMALE.— Length 2.9–4.1 mm, 3.8 times as long as wide; color reddish brown.

Head, pronotum, and elytral disc as in *detractus* Wood. Elytral declivity 37 percent of elytral length. Elytral declivity as in *usurpatus* except suture on lower half as high or higher than lateral convexities, impression just mesad of serrate lateral margin distinctly stronger; lower fourth of sutural interstriae armed by a very large, strongly elevated, variable process, appearing triangular to rectangular from lateral aspect, frequently projecting beyond sutural apex, their crests diverging from suture. Vestiture as in *detractus*.

DISTRIBUTION.— Veracruz to Brazil.

MEXICO: Chiapas: El Bosque, 3-VII-69, D. E. Bright; Finca Esperanza, 12-III-38, at light, A. Dampf; Finca Vergel, 7-VI-35, at light, A. Dampf. Veracruz: Sontecomepan, 18-VI-69, D. E. Bright. COSTA RICA: San Isidro del General, 12-XII-63, 1000 m, No. 313, tree branch, S. L. Wood; Playón, 9-VIII-63, 50 m, No. 120, *Ochroma*, S. L. Wood; Río Damitas, Dota Mts., 18-II-64, 250 m, No. 436, tree seedling, S. L. Wood; Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 49, *Vismia*, S. L. Wood; Finca La Lola, Limón, 20-VII-61, *Theobroma cacao*. PANAMA: Barro Colorado Island, Canal Zone, 17-VII-23, R. C. Shannon; Ciricito, Canal Zone, 3-III-30, R. E. Blackwelder; Concepción, Chiriquí, 7-I-64, 300 m, No. 370, *Ochroma*, S. L. Wood; Madden Forest, 2-I-64, 70 m, No. 364, tree branch, S. L. Wood; San José, Pearl Island, 26-VI-44, at light, J. P. E. Morrison. OTHER COUNTRIES: Colombia, Venezuela, Brazil.

HOSTS.— *Ochroma* sp., *Vismia* sp., *Theobroma cacao*, and several other trees.

BIOLOGY.— As described for the genus. On four occasions *Dryocoetoides capucinus* (Eichhoff) was the invaded host; on one occasion a *Xyleborus* species formed the original gallery.

NOTES.— The female syntype of *dampfi* Schedl in the Schedl Collection is here designated as the lectotype of *dampfi*, and the female syntype of *costaricensis* Nunberg in the University of Wisconsin Collection is here designated as the lectotype of *costaricensis*. The above treatment was based on both lectotypes and on 27 other specimens.

## GENUS *DRYOCOETOIDES* HOPKINS

*Dryocoetoides* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:52 (Type-species: *Dryocoetoides guatemalensis* Hopkins = *Xyleborus capucinus* Eichhoff)

DIAGNOSIS.— This genus is grouped with *Sampsonius* Eggers by the separate sutures 1 and 2 on the rather strongly flattened antennal club, with suture 2 attaining the apex and suture 1 continuing to and clearly visible on the posterior face of the club. It is easily distinguished from *Sampsonius* by the very different body form, sculpture, and habits, and from *Xylophilus* by the inflated anterior tibia, with its posterior face armed by several granules or denticles, and by the somewhat larger, more coarsely faceted eyes.

DESCRIPTION.— Length 2.2–5.1 mm, 2.3–2.8 times as long as wide; color reddish brown.

Female frons convex, sculpture simple; eye rather large, elongate, deeply emarginate, moderately to very coarsely faceted. Antennal scape elongate; funicle 5-segmented; club subcircular, moderately flattened, thickened basally, basal area subcorneous, sutures 1 and 2 clearly marked, 1 continuing to and clearly marked on posterior face, 2 continuing to apex of club. Pronotum 1.0–1.1 times as long as wide; summit at or near middle; anterior slope broadly convex, rather finely asperate; anterior margin armed by serrations; posterior areas smooth. Elytra elongate, weakly striate; interstrial punctures moderately to strongly confused; declivity convex, its lateral margin marked by crest or row of tubercles from sutural apex to interstriae 8. Protibiae inflated on posterior surface, inflated area armed by several coarse tubercles or small denticles, outer margin also armed by socketed teeth; meso- and metathoracic tibiae as typical of tribe. Male dwarfed, flightless, deformed, rare; head slightly modified; pronotum elongate, devoid of asperities, anterior half impressed to excavated, anterior margin acutely elevated on continuous crest to median tuberculate prominence; protibia not inflated or armed on posterior face.

DISTRIBUTION.— Veracruz to Peru and Brazil; 12 species are at hand; 2 of them occur in Mexico and Central America.

NOTES.— Except for its author, this genus has not been recognized, presumably because of the lack of material for study and the supposed absence of related forms sharing the generic characters. In addition to the type-species, 11 South American species before me share the antennal and tibial characters of this genus. The habits resemble those of *Xylosandrus* and the *godmani* group of *Xyleborus*.

### Key to the Species of *Dryocoetoides*

1. Smaller; elytral disc occupying less than 40 percent of elytral length; declivital surface strongly reticulate, dull, strial punctures obscure to obsolete and interstrial granules confused; crenulations on declivital interstriae 8 usually extend to level of suture between abdominal sterna 1 and 2; Nayarit and Veracruz to Peru and Brazil; 2.2–2.6 mm ..... 1. ***capucinus* (Eichhoff)**

– Larger; elytral disc occupying 50 percent of elytral length; elytral declivity mostly or entirely shining, with strial punctures distinctly, shallowly impressed and interstrial granules on 2–7 mostly uniseriate except near base; crenulations on declivital interstriae 9 rarely extend to level of suture between abdominal sterna 2 and 3; Veracruz to Colombia and Venezuela; 2.8–3.2 mm ..... 2. *monachus* (**Blandford**)

### 1. *Dryocoetoides capucinus* (Eichhoff), n. comb.

*Xyleborus capucinus* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:281 (Holotype, female; Guadeloupe Island; Brussels Mus.)

*Xyleborus rufithorax* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:281 (Holotype, female; Brazil; Brussels Mus.); Wood, 1973, Great Basin Nat. 33:187. *Synonymy*

*Dryocoetoides guatemalensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:52 (Holotype, female; Livingston, Guatemala; U.S. Nat. Mus., 7633); Wood, 1966, Great Basin Nat. 26:31. *Synonymy*

*Xyleborus capucinoides* Eggers, 1941, Arb. Morph. Taxon. Ent. Berlin-Dahlem 8:104 (Holotype, female; Gourbeyre, Guadeloupe Island; U.S. Nat. Mus., 60761); Wood, 1966, Great Basin Nat. 26:31. *Synonymy*

DIAGNOSIS.— This species is distinguished from *monachus* (Blandford) by the smaller size, by the shorter elytral disc, by the strongly reticulate, dull elytral declivity, and by the very obscure, almost obsolete declivital striae.

FEMALE.— Length 2.2–2.6 mm, 2.3 times as long as wide; color very dark brown to black.

Frons broadly convex; surface strongly reticulate, area below upper level of eyes rather closely, finely granulate; vestiture inconspicuous. Eye 3.5 times as long as wide, separated above by 3.0 times width of an eye.

Pronotum 0.96 times as long as wide; sides weakly arcuate on basal two-thirds, rather broadly rounded in front except weakly produced near median line; anterior margin armed by four moderately coarse teeth (two additional smaller denticles often present); summit at middle, rather broad; rather coarsely asperate on anterior slope; entire surface reticulate, including asperate area but not asperities; posterior area finely, closely, deeply punctured. Vestiture of fine, abundant, rather short hair.

Elytra 1.3 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal half, bluntly pointed behind; disc occupying basal 40 percent; striae scarcely evident, punctures very small, distinct, spaced by about two diameters of a puncture; interstriae almost smooth, shining; interstriae six to eight times as wide as striae, setiferous punctures slightly smaller than those of striae, strongly confused, moderately abundant. Declivity rather gradual, its entire surface reticulate; striae weakly impressed, punctures mostly obscure to obsolete; when visible, shallow and much larger than on disc; interstrial punctures replaced by fine, confused granules, sometimes uniseriate on apical half of 2 and 3; 8 subcrenulately granulate from near base of declivity to sutural apex. Vestiture of rather abundant, moderately long hair, fine on disc, slightly coarser on declivity.

MALE.— Length 2.2–2.5 mm; head and elytra about as in female but less perfectly formed; pronotum 1.4 times as long as wide, devoid of asperities, summit near base, middle third flattened on median half, anterior third deeply excavated to margins, anterior margin sharply elevated, with a median tuberculate prominence.

DISTRIBUTION.— Nayarit and Veracruz to Peru and Brazil.

MEXICO: Michoacán: Zirimicuaro, 2-XI-80, 350 m, *Inga*, T. H. Atkinson. Nayarit: San Blas. Veracruz: Matías Romero, Tecolutla. GUATEMALA: Rodeo (Esquintla), Trece Aguas (Alta Verapaz). COSTA RICA: Tapantí and Turrialba (Cartago), Beverley, Limón, and Pandora (Limón), Dominical, Finca Gromaco on Río Coto Brus, and Rincón de Osa (Puntarenas), Río Damitas in the Dota Mts., and San Isidro del General (San José). PANAMA: Ft. Clayton and Madden Forest (Canal Zone), El Hato del Volcán (Chiriquí). COLOMBIA: Barbosa (Antioquia). OTHER AREAS: Guadeloupe, Brazil, Peru.

HOSTS.— *Inga* sp., *Miconia* sp., etc.

BIOLOGY.— As described for *Xylosandrus* and the *Xyleborus godmani* group.

NOTES.— The above treatment was based on the holotypes of *capucinus*, *rufithorax*, *guatemalensis*, and *capucinoides*, and on 102 other specimens.

2. *Dryocoetoides monachus* (Blandford)

*Xyleborus monachus* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):204 (Lectotype, male; Cerro Zunil, Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished from *capucinus* (Eichhoff) by characters summarized in the above key and in the diagnosis of *capucinus*.

FEMALE.— Length 2.8–3.2 mm, 2.3 times as long as wide; color black.

Frons and pronotum essentially as in *capucinus*, with pronotal disc usually smooth and shining.

Elytra about as in *capucinus* except disc occupying basal 50 percent of elytra; surface of disc and upper half of declivity smooth, shining, lower declivity often dull, subreticulate in some specimens; interstrial granules on declivity mostly uniseriate; crenulations on interstriae 8 begin about middle of declivity.

MALE.— Length 2.7–2.9 mm; essentially as in male *capucinus*.

DISTRIBUTION.— Veracruz to Colombia and Venezuela.

MEXICO: Chiapas: Ocozocoautla, 2-VII-69, Palenque Ruins, 9-V-61, and Tapilula, 13-V-69, D. E. Bright. Veracruz: Lago Catemaco, 1–3-V-69, D. E. Bright. GUATEMALA: Cerro Zunil, G. C. Champion; Palín, Esquintla, 19-V-64, 350 m, No. 584, *Inga*, S. L. Wood; Chicacao, 21-VII-44, *Cinchona*, R. Penchur. COLOMBIA: 24 km W Barbosa, 18-VII-70, 1200 m, No. 696, Rubiaceae sapling, S. L. Wood. VENEZUELA: Rancho Grande, Pittier Nat. Pk., Aragua, 9-IV-70, 1100 m, No. 408 in tree seedling, No. 420 in *Tabebuia*, No. 479 in tree branch, S. L. Wood.

HOSTS.— *Inga* sp., *Tabebuia* sp., etc.

BIOLOGY.— As in *capucinus*.

NOTES.— The above treatment was based on the 2 male syntypes of *monachus* and on 31 females. The first syntype is labeled "type" and is generally considered to be the type; I here designate it as the lectotype of *Xyleborus monachus* Blandford. The lectotype (2.7 mm) was compared to several males of *capucinus* (2.2–2.5 mm) and to 2 of my Guatemalan females of *monachus* and several Guatemalan females of *capucinus* in order to fix the identity of this species. The possibility of intergradation between these two species was thought likely until both were taken from the same plant near Barbosa, Colombia.

GENUS *XYLOSANDRUS* REITTER

*Xylosandrus* Reitter, 1913, Wiener Ent. Zeit. 32(15 May Beiheft):80, 83 (Type-species: *Xyleborus morigerus* Blandford, monobasic)

DIAGNOSIS.— This genus is distinguished from *Xyleborus* Eichhoff by the widely separated procoxae, between which the intercoxal piece is at least half as wide as a coxa and usually flat, and, in part, by the stout body with the broadly convex, unarmed elytral declivity, declivity commencing anterior to the middle. The elytra are only slightly longer than the pronotum.

DESCRIPTION.— Length, females 1.3–1.7 mm, males 1.0–1.6 mm, female 1.9–2.3 times as long as wide, male slightly more slender; color light brown to black; vestiture hairlike. Males dwarfed, flightless.

Frons broad, convex, simple. Eye rather small, deeply emarginate, finely faceted. Antennal scape elongate; funicle 5-segmented; club obliquely truncate, margin of basal corneous area strongly recurved, sutures not evident. Pronotum slightly wider than long, summit at or slightly behind middle; anterior margin armed. Scutellum large, flat, filling sutural notch at base of elytra. Elytra stout, only slightly longer than pronotum; weakly striate; declivity commencing at or in front of middle, broadly convex, unarmed, ventrolateral margin acutely margined from sutural apex to interstriae 7. Anterior coxae apparently touching head, widely separated by an intercoxal piece almost equal to half diameter of a coxa. Males rare, dwarfed, head largely withdrawn into prothorax; pronotum more broadly convex, anterior slope somewhat flattened, feebly asperate, anterior margin unarmed; elytra more evenly convex, all characters more poorly formed, posterolateral margin not acutely elevated.

DISTRIBUTION.— Pantropical, extending into warmer temperate regions in some areas; about 25 species; 6 of these occur in America; 2 may be endemic.

BIOLOGY.— Twigs and small branches of trees and small stems of other plants are selected for attack. Some species are exceedingly aggressive and can attack the most vigorous shoots of healthy living plants. Because the males are rare and flightless, females mate in the brood chamber before seeking a

new host. In the new host the female constructs an entrance tunnel either into the pith of small stems or in the wood to a depth of about 1–3 cm, where a small cavity is formed. Here a small mass of eggs is produced. The larvae evidently feed on a mixture of the ambrosial fungus cultured on the chamber walls and on host tissues obtained while enlarging the parent cavity. The life cycle is completed in about a month. The number of offspring per female is usually small.

Key to Females of the Species of *Xylosandrus*

1. Elytra 1.0 times as long as wide, declivity commencing one-third elytral length from base; sides of elytra often almost devoid of punctures; mature color yellowish brown; Veracruz to Brazil; female 1.4–1.7 mm ..... 1. ***morigerus*** **(Blandford)**

— Elytra about 1.2 times as long as wide, declivity commencing at middle; sides of elytra clearly marked by strial rows; mature color dark brown to black ..... 2

2(1). Declivital striae obsolete; declivital surface dull, with dense, confused, minute, uniformly distributed granules; elytral hair more abundant; Asia, Africa, Hawaii, South Carolina; 2.1–2.9 mm ..... 2. ***crassiusculus*** **(Motschulsky)**

— Declivital striae with punctures clearly impressed, in rows; declivital surface shining, granules in sparse rows if present ..... 3

3(2). Larger; strial setae on declivity entirely obsolete; declivital striae at least feebly impressed, interstriae very slightly convex; Illinois and Connecticut to Kentucky and Virginia; 2.0–2.3 mm ..... 3. ***germanus*** **(Blandford)**

— Smaller, strial setae on declivity present, at least one-third as long as those of interstriae; declivital striae not impressed; interstriae flat ..... 4

4(3). Slightly more slender, elytra 1.2 times as long as wide; elytra almost evenly arched from middle of disc to apex; hair on pronotal disc more generally distributed, slightly more abundant on a transverse row in median area at base; interstrial setae on declivity fine, pointed; Louisiana and Alabama to Florida, Hawaii, etc., female 1.4–1.7 mm ..... 4. ***compactus*** **(Eichhoff)**

— Stouter, elytra 1.1 times as long as wide; elytra more abruptly arched from base of declivity to middle of declivity; pronotal disc glabrous except for rather dense median tuft of hair, its long axis longitudinal, extending from base about half distance to summit ..... 5

5(4). Pronotal disc and sides mostly or entirely reticulate; interstrial setae on declivity fine, tapered to a sharp point, each about twice as long as distance between rows; S Florida, Guatemala to Venezuela; 1.3–1.5 mm ..... 5. ***zimmermanni*** **(Hopkins)**

— Pronotal disc and sides brightly shining; interstrial setae on declivity rather coarse, each flattened on its distal half and blunt at its apex, about as long as distance between rows; Nayarit and Veracruz to Brazil; females 1.3–1.5 mm ..... 6. ***curtulus*** **(Eichhoff)**

### 1. *Xylosandrus morigerus* (Blandford)

*Xyleborus morigerus* Blandford, 1894, Insect Life 6:264 (Syntypes; probably New Guinea; British Mus. Nat. Hist.)

*Xylosandrus morigerus*: Reitter, 1913, Wiener Ent. Zeit. 32(15 May Beiheft):83

*Xyleborus coffeae* Wurth, 1908, Mededeel. Proefst. Salatiga, ser. 2, 3:2–20 (Not seen), Salatiga Cultuurgids 10:63–78 (Not seen); Schedl, 1951, Occ. Pap. Bishop Mus. 20:136. *Synonymy*

*Xyleborus luzonicus* Eggers, 1923, Zool. Meded. 7:174 (Lectotype, female; Mt. Makiling, Luzon, Philippines; U.S. Nat. Mus., designated by Anderson

and Anderson, 1971, Smithsonian Contrib. Zool. 94:18); Wood, 1974, Great Basin Nat. 34:287. *Synonymy*

DIAGNOSIS.— This species is distinguished from other American representatives of this genus by the reddish brown color, by the stouter body, by the declivity commencing only one-third of the elytral length from the base, and by the near absence of punctures on the sides of the elytra (variable).

FEMALE.— Length 1.4–1.7 mm, 1.9 times as long as wide; color reddish brown.

Frons broadly convex; surface shining, reticulate above, with rather sparse, indefinite, small and large punctures; vestiture of sparse, fine, moderately long hair.

Pronotum 0.94 times as long as wide; widest slightly behind middle, sides rather strongly arcuate, broadly rounded in front; anterior margin armed by eight (rarely 6–10) rather coarse serrations; summit broad, slightly behind middle; anterior slope coarsely asperate; posterior areas smooth, shining, almost impunctate, occasional minute, very shallow punctures evident. Vestiture of sparse hair on asperate area and lateral margins; a tuft of fine hair at median basal margin, its long axis transverse.

Elytra 1.0 times as long as wide, 1.1 times as long as pronotum; sides subparallel, very feebly arcuate on basal three-fourths, very broadly rounded behind; disc occupying about one-third of elytral length; striae not at all impressed, punctures small, shallow; interstriae smooth shining, at least eight times as wide as striae, minutely, sparsely, uniseriately granulate; punctures in lateral areas obscure to absent. Declivity rather steep, broadly convex; acutely margined from apex to interstriae 7, strial and interstrial punctures distinctly larger, granules evidently smaller. Vestiture of rows of fine, short, strial hair, and rows of much longer interstrial hair; longer and more conspicuous on declivity.

MALE.— Not represented in material at hand.

DISTRIBUTION.— Veracruz to Brazil; Micronesia and Australia to Sri Lanka (Ceylon).

USA: Intercepted at ports of entry, but not known to be established at Arizona (Nogales), California (San Francisco), New Jersey (Bound Brook), or New York (New York). Breeding populations occur in the following areas. MEXICO: Chiapas: Palenque Ruins. Veracruz: Coatzocoalcos, Matías Romero. HONDURAS: Zamorano. COSTA RICA: Dominical, Finca Gromaco on Río Coto Brus, and Rincón de Osa (Puntarenas), Pandora (Limon), Playón, Santa Ana, San Ignacio de Acosta, and San José (San José). PANAMA: Barro Colorado Island, Ft. Clayton, and Garun Dam (Canal Zone), El Hato del Volcán (Chiriquí). OTHER AMERICAN COUNTRIES: Brazil, Colombia, Venezuela.

HOSTS.— Hundreds of hosts have been reported.

BIOLOGY.— Unthrifty, broken, or cut branches about 1–3 cm in diameter are usually selected for attack. However, in Indonesia this species was responsible for primary attacks on tea, coffee, and other crops. The habits are as described for the genus. Males are exceedingly rare.

NOTES.— The holotype of *morigerus* and the lectotype of *luzonicus* were examined. The above treatment was based on 176 other specimens. Hundreds of additional specimens were seen in the field in suitable habitats from Veracruz to Venezuela in addition to those reported above. It occurs in the most remote jungle areas as well as in agricultural communities. The date and place of introduction into America are not known. The earliest records known to me were from Colombia and dated 1958.

## 2. *Xylosandrus crassiusculus* (Motschulsky), n. comb.

Fig. 181

*Phloeotrogus crassiusculus* Motschulsky, 1866, Moskov. Obshch. Isp. Prirody, Otd. Biol. Biul. (Bull. Soc. Imp. Nat. Moscou) 39:403 (3 syntypes, female; India occidental, published as "Des Montagnes de Nura-Ellia," presumably the mountains near Nuwara Eliya, Ceylon; Zoological Institute, Academy of Science, Moscow, USSR)

*Xyleborus semiopacus* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:334 (Syntypes?, female; Nipon insula Japonica; presumably lost with Hamburg Mus.); Wood, 1969, Great Basin Nat. 29:119. *Synonymy*

*Xyleborus semigranosus* Blandford, 1896, Trans. Ent. Soc. London 1896:211 (Holotype, female; Sumatra; British Mus. Nat. Hist.); Schedl, 1959, Trans. Roy. Ent. Soc. London 111:496. *Synonymy*

*Dryocoetes bengalensis* Stebbing, 1908, Indian For. Mem., Zool. 1(1):12 (Syntypes?, female; Goalpara, Assam, India; not located); Beeson, 1915, Indian For. 41:297. *Synonymy*

*Xyleborus mascarenus* Hagedorn, 1908, Deutsche Ent. Zeitschr. 1908:379 (Syntypes, females; Mauritius, and Bomole et Amani in Deutsch-Ostafrika; most lost with Hamburg Mus., one in Schedl Coll., others in H. E. Andrews Coll.?); Eggers, 1923, Zool. Meded. Leiden 7:130. *Synonymy*

*Xyleborus okoumeensis* Schedl, 1935, Stylops 4:271 (Syntypes, female; Carlshafen, Hessen-Nassau, Germany; Schedl Coll.); Schedl, 1959, Trans. Roy. Ent. Soc. London 111:496. *Synonymy*

*Xyleborus declivigranulatus* Schedl, 1936, J. Fed. Malay St. Mus. 18:30 (Syntypes, female; Selangor, Malay Peninsula; British Mus. Nat. Hist. and Schedl Coll.); Schedl 1959, Trans. Roy. Ent. Soc. London 111:496. *Synonymy*

DIAGNOSIS.— This species is distinguished by the obsolete declivital striae, by the dense, confused, minute, declivital granules, and by the dull elytral surface on the declivity.

FEMALE.— Length 2.1–2.9 mm (male 1.6 mm), 2.1 times as long as wide, color reddish brown.

Frons as in *germanus* (Blandford) except more strongly, more uniformly reticulate. Pronotum about as in *germanus* except disc smoother, punctures slightly more abundant and more sharply impressed; dried specimens with posterior margin in front of scutellum with what appears to be a small, transparent membrane (apparently dried secretions suspended by setae).

Elytra 1.15 times as long as wide, 1.15 times as long as pronotum; slightly stouter than *germanus*; disc occupying slightly less than basal half; striae not impressed, punctures small; interstriae about six times as wide as striae, punctures fine, confused. Declivity steep convex, dull; striae obsolete; rather densely covered by small, confused, uniformly distributed granules. Vestiture of fine hair with shorter strial and interstrial setae mostly confused, and longer setae in indefinite interstrial rows.

MALE.— Remotely resembling female, dwarfed, without pronotal asperities; elytra more gradually arched, transition from disc to declivity more gradual, features more poorly defined.

DISTRIBUTION.— South Carolina, Hawaii, Africa, S Asia, etc.

USA: **South Carolina**: Magnolia Gardens, Charleston Co., 5-III-75, cherry, R. Morgan; Summerville, Dorchester Co., sweet gum.

HOSTS.— It has been reported from dozens of host species in Africa and Asia.

BIOLOGY.— In Malaya (Browne 1961:104), this species may attack cut material from 1.5 cm in diameter to large logs. It has also been reported to attack newly transplanted seedlings near the root collar. The galleries resemble those of *Xyleborus dispar* (Fabricius).

NOTES.— The above treatment was based on the syntypes of *crassiusculus*, on the holotype of *semigranosus*, on syntypes of *bengalensis*, and on more than 100 other specimens. Syntypes of *mascarenus*, *okumeensis*, and *declivigranulatus* were also examined.

As with several other species in this tribe, this species evidently exists as two or more races, distinguished only by size, that apparently breed true. Their significance is not known.

This species has not previously been treated in *Xylosandrus*; however, in the present classification it is not possible to key it to

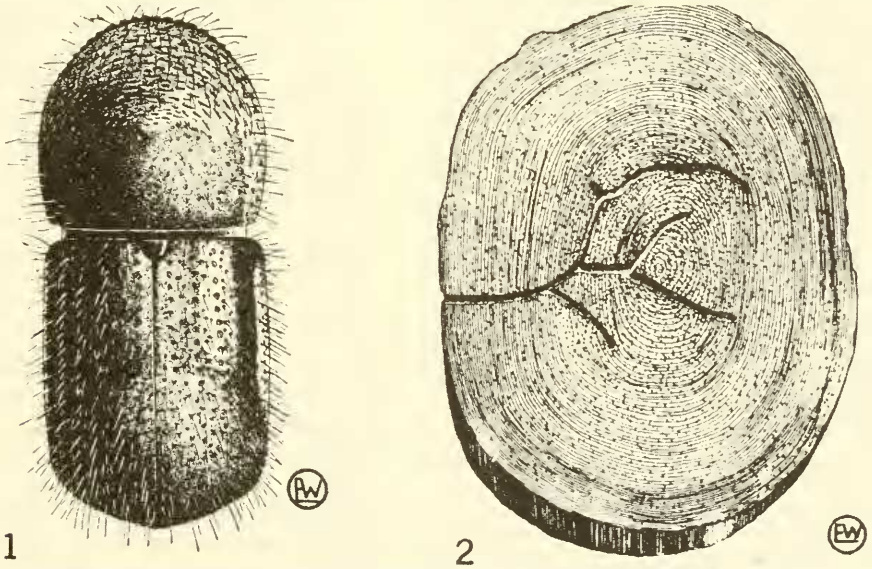



Fig. 181. *Xylosandrus crassiusculus*: 1, dorsal aspect of female; 2, galleries. (After Anderson 1974:864.)

*Xyleborus*, where it is usually treated. This problem in placement emphasizes the necessity for a thorough worldwide revision of the Xyleborini to redefine genera and to establish phyletic relationships. An abundance of usable characters have never been utilized in classifying this enormous group.

### 3. *Xylosandrus germanus* (Blandford)

*Xyleborus germanus* Blandford, 1894, Trans. Roy. Ent. Soc. London 1894:106 (Syntypes: Japan; British Mus. Nat. Hist.)

*Xylosandrus germanus*: Hoffman, 1941, J. Econ. Ent. 34:38

DIAGNOSIS.— This species is distinguished from other American species of the genus by the larger size, by the absence of strial setae, and by the feebly impressed declivital striae.

FEMALE.— Length 2.0–2.3 mm (male 1.5–1.7 mm), 2.3 times as long as wide; color very dark brown.

Frons and pronotum essentially as in *morigerus* except pronotum 1.0 times as long as wide; pronotum with posterior areas commonly with some obscure, longitudinal, minutely etched lines and a few additional fine punctures; vestiture on pronotal disc of fine, rather short, sparse hair almost uniformly distributed.

Elytra 1.3 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather broadly rounded behind; striae not impressed, punctures small, shallow, distinct; interstriae smooth, shining, punctures replaced by minute, uniseriate, rather widely spaced granules. Declivity commencing very slightly behind middle, rather steep, broadly convex; subapical ventrolateral margin acutely elevated from apex to interstriae 7; striae usually very feebly impressed, punctures deeper than on disc. Vestiture of moderately long, rather sparse, interstrial hair at least on declivity; strial hair entirely obsolete.

MALE.— Not represented in material at hand.

DISTRIBUTION.— Illinois and Connecticut to West Virginia; Japan, Taiwan, Korea, China, Vietnam.

USA: **Connecticut**: New Canaan, Yalesville. **Illinois**: Alexander Co. **Indiana**: Jefferson Co. **Kentucky**: Leslie Co., Noble. **New Jersey**: Bloomfield, East Orange, Essex Co., Millburn, New Brunswick, Norwood, Rachwood, West Caldwell. **New York**: Kingston, New Rochelle, Oyster Bay, Suffolk Co. **Ohio**: Burlington, Chillicothe, Clinton Co., Delaware Co., Tuscarawas Co. **Pennsylvania**: Delaware Co., Morristown. **West Virginia**: Chesapeake, Morgantown.

HOSTS.— *Acer* sp., *Carya* sp., *Cornus florida*, *Fagus sylvatica*, *Fraxinus* sp., *Juglans* sp., *Myrica*, *Liriodendron tulipifera*, *Pinus* sp., *Prunus* sp., *Pyrus* sp., *Quercus* spp., *Ulmus* sp., *Vitis* sp.

BIOLOGY.— This species usually infests unthrifty, cut, or broken branches, boles, and stumps of a wide variety of hosts (Hoffman 1941). The female parental tunnels extend to a depth of about 1 cm in the wood, where they may branch into three or more arms. In each branch tunnel, the longitudinal, tabular, brood tunnels are developed as typical for this genus. Normally the females attack in May and produce up to 140 eggs each over a three-week period. Apparent overlapping generations continue to produce brood until September.

NOTES.— The above treatment was based on 126 specimens from the United States and 4 from Japan. The types were examined but were not compared directly to my material.

### 4. *Xylosandrus compactus* (Eichhoff)

*Xyleborus compactus* Eichhoff, 1875, Ann. Ent. Soc. Belg. 18:201 (Syntypes, female; Japan; one syntype in Schedl Coll.)

*Xylosandrus compactus*: Nunberg, 1959, Beitr. Ent. 9:434.

*Xyleborus morstatti* Hagedorn, 1912, Ent. Blätt. 8:37 (Syntypes, female; Amani, Deutsch-Ostafrica, now Tanganyika; presumably lost with Hamburg Mus.); Murayama and Kalshoven, 1962, Ent. Bericht. 22:247–250. *Synonymy*

DIAGNOSIS.— This species is distinguished from *zimmermanni* (Hopkins) by the darker color, by the slightly larger, more slender form, by the uniformly arched elytra from the middle of the elytral disc to the apex, and by the transversely oriented tuft of hair at the base of the pronotum.

FEMALE.— Length 1.4–1.7 mm (male 1.0–1.1 mm), 2.1 times as long as wide; color very dark brown to almost black.

Frons and pronotum as in *morigerus* except punctures in posterior areas very slightly more numerous, more distinct.

Elytra 1.2 times as long as wide; disc occupying posterior half of elytra weakly arched; striae not impressed, punctures small, distinct, rather shallow; interstriae smooth, shining, four times as wide as striae, punc-

tures small, uniseriate, not at all granulate. Declivity evenly arched; sculpture as on disc except interstrial punctures finely granulate; posterolateral margin acutely elevated from apex to interstriae 7. Vestiture of rows of fine, short, strial hair, and rows of longer, slender, pointed, interstrial hair; slightly longer on declivity.

MALE.— Dwarfed, convex, somewhat similar to female but all characters poorly formed; anterior slope of pronotum flattened to feebly concave, weakly asperate.

DISTRIBUTION.— Louisiana to Alabama and Florida, Brazil, Hawaii to Sri Lanka (Ceylon), Africa.

USA: **Alabama**: Several localities. **Florida**: Coconut Grove, 27-IV-44, *Jacobina*, C. A. Bass; Ft. Lauderdale, 7-VI—41, Avocado, W. D. Wolfenbarger; Key Largo, 25-VI-51, *Ichthyomethia communis*, *Vitis*, *Ardesia paniculata*, *Ficus*, *Cajanus cajon*; Miami, 12-IX-43, mahogany, J. G. Curtis; West Palm Beach, 27-I-61. **Louisiana**: New Orleans. **Mississippi**: Biloxi, 20-VIII-68, *Azalea*, M. M. Price. OTHER AREAS: Brazil, Cuba, Hawaii to Sri Lanka (Ceylon), Africa.

HOSTS.— Hundreds of trees and shrub species have been recorded.

BIOLOGY.— This species, known as the black twig borer, most commonly attacks healthy, vigorous twigs of living trees and shrubs. It is of primary economic importance in horticultural and ornamental plants. The adult females bore into twigs about 3 mm in diameter or larger and form a small cavity in the pith. The larvae feed mostly on the ambrosial fungus, but they also extend the pith tunnel slightly. Under favorable circumstances the life cycle may be completed in less than a month.

NOTES.— The above treatment was based on 106 Florida specimens and on 67 other specimens. The identity of this species was based on the material of Eggers and Schedl.

### 5. *Xylosandrus zimmermanni* (Hopkins)

*Anisandrus zimmermanni* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:68 (Holotype, female; Biscayne, Florida; U.S. Nat. Mus., 7420)

*Xylosandrus zimmermanni*: Wood, 1962, Great Basin Nat. 22:79

DIAGNOSIS.— This species is distinguished from *compactus* (Eichhoff) by the slightly stouter body form, by the more abruptly arched elytra, and by the longitudinally oriented median tuft of hair at the base of the pronotum. It is almost identical to *curtulus* (Eichhoff) except as noted in the diagnosis of that species.

FEMALE.— Length 1.3–1.5 mm (male 0.9–1.1 mm), 2.0 times as long as wide; color dark brown to almost black.

Frons and pronotum as in *morigerus*, except anterior margin of pronotum more narrowly rounded, armed by four to six serrations; posterior areas reticulate, subshining, punctures sometimes more distinct; tuft of hair at base confined to median line, extending from basal margin about one-half distance to summit.

Elytra 1.1 times as long as wide; disc extending to middle of elytra; striae not impressed, punctures small, shallow, distinct; interstriae smooth, shining, four to six times as wide as striae, punctures minute, shallow, uniseriate. Declivity steep, broadly convex, more strongly arched near base; sculpture about as on disc except strial punctures slightly larger; posterolateral margin acutely elevated from apex to interstriae 7. Vestiture of rows of fine, short, strial hair and rows of moderately long, fine, pointed, interstrial hair.

MALE.— Essentially as in male *compactus* except anterior margin of pronotum more narrowly rounded, subserrate; anterior slope of pronotum feebly convex, more coarsely asperate in lateral areas; pronotal disc reticulate.

DISTRIBUTION.— S Florida and Chiapas to Venezuela.

USA: **Florida**: Sebring, 20-VI-51, *Ardesia*, *Acer rubrum*, S. L. Wood. MEXICO: **Chiapas**: Palenque Ruins, 22-VI-69, D. E. Bright. GUATEMALA: Volcán de Agua, 19-V-64, 1000 m, tree twig, S. L. Wood; Palin, Esquintla, 19-V-64, No. 588, Anonillo, S. L. Wood. COSTA RICA: Santa Ana, San José, 1-VIII-63, No. 92, *Cupania guatemalensis*, S. L. Wood; San Ignacio de Acosta, 5-VII-63, 1600 m, No. 38, tree twigs, S. L. Wood; Tapanti, Cartago, 17-VIII-63, 1300 m, No. 102, *Calliandra confusa*, S. L. Wood; Guapiles, Limon, 22-VIII-66, 100 m, No. 116, *liana*, S. L. Wood; Pandora, Limon, 23-VIII-63, 50 m, No. 147, twig of shrub, S. L. Wood. VENEZUELA: Rancho Grande, Pittier Nat. Pk., 9-IV-70, 1100 m, No. 431, *Nectandra*, S. L. Wood.

HOSTS.— *Acer rubrum*, *Ardesia* sp., *Calliandra confusa*, *Cupania guatemalensis*, etc.

BIOLOGY.— Cut, broken, and unthrifty twigs and small branches are attacked by this species. The habits are essentially as in *morigerus* (Blandford).

NOTES.— The above treatment was based on the holotype of *zimmermanni* and on 48 other specimens. This species is almost identical to *curtulus* (Eichhoff).

6. *Xylosandrus curtulus* (Eichhoff), n. comb.

*Xyleborus curtulus* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:281 (Holotype, female; Brazil; Brussels Mus.)

*Xyleborus curtuloides* Eggers, 1941, Arb. Morph. Taxon. Ent. Berlin-Dahlem 8:102 (Holotype, female; Gourbeyre, Guadeloupe; Eggers Coll., apparently on loan to Schedl). *New synonymy*

*Xyleborus biseriatus* Schedl, 1963, Reichenbachia 1:226 (Holotype, female; Nova Teutonia, Santa Catarina, Brazil; Schedl Coll.); Wood, 1973, Great Basin Nat. 33:187. *Synonymy*

DIAGNOSIS.— This species is distinguished from the almost identical *zimmermanni* (Hopkins) by the smooth, shining posterior areas of the pronotum, and by the shorter, stouter, blunt, interstrial setae on the declivity.

FEMALE.— Length 1.3–1.5 mm (male 1.0 mm), 2.0 times as long as wide; color dark brown to almost black.

Identical to *zimmermanni* except as noted in diagnosis; blunt interstrial setae on declivity equal in length to distance between interstrial rows of setae.

MALE.— As in male *zimmermanni* except posterior areas of pronotum shining, and declivital interstrial setae shorter.

DISTRIBUTION.— Nayarit and Veracruz to Brazil.

MEXICO: **Colima**: 2 miles (3 km) W Armeria, 28-VI-65, 70 m, No. 135, *Phoradendron*, S. L. Wood. **Nayarit**: 5 miles (8 km) N Rosamorada, 28-VI-65, 100 m, No. 252, tree branch, S. L. Wood; Laguna Santa María, 6-VII-65, 1000 m, No. 195, liana, S. L. Wood. **San Luis Potosí**: El Salto, 19-VI-53, *Ficus*, S. L. Wood. **Oaxaca**: 12 miles (19 km) S Matías Romero, 24-VI-67, No. 93, *Phoradendron*, S. L. Wood. **Veracruz**: 16 miles (25 km) S Tecolutla, 25-VI-53, S. L. Wood. GUATEMALA; Rodeo, Esquintla, 4-VI-64, 150 m, No. 673, liana, S. L. Wood. HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 569 in *Phoradendron robustissimum*, No. 544 in *Serjania*, S. L. Wood. OTHER COUNTRIES: Colombia, Venezuela, Brazil.

HOSTS.— *Ficus* sp., *Phoradendron* spp., *Serjania* sp., etc.

BIOLOGY.— As in *zimmermanni*.

NOTES.— The above treatment was based on the holotype of *curtulus*, on a cotype of *curtuloides*, on my homotype of *biseriatus*, and on 39 other specimens.

Because of a series from Caicedonia, Valle de Cauca, Colombia, having the posterior areas of the pronotum mostly reticulate and the declivital interstrial setae slightly longer than normal for this species, it was placed in synonymy (Wood 1966) with *zimmermanni*. However, since then several additional series have been taken indicating broadly overlapping distributions with no indications of intergradation except for that one series. Based on material now at hand, *curtulus* and *zimmermanni* are both recognized as valid species.

## GENUS *THEOBORUS* HOPKINS

*Theoborus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:57 (Type-species: *Theoborus theobromae* Hopkins, original designation.)

DIAGNOSIS.— This genus has two separate sutures on the anterior face of the antennal club, both of which are continued on the posterior face as in *Dryocoetoides* Hopkins. It is distinguished from *Dryocoetoides* by the flat, smooth posterior face of the protibia, and by the somewhat smaller, more finely faceted eyes.

DESCRIPTION.— Length of females 1.7–2.9 mm, 2.3–2.8 times as long as wide; males dwarfed, deformed, flightless.

Characters essentially as in *Dryocoetoides* except as noted in the above diagnosis.

DISTRIBUTION.— Neotropical and perhaps elsewhere; the exact limits of the genus have not been defined.

BIOLOGY.— Not recorded, evidently similar to *Dryocoetoides*.

NOTES.— Because of the exceedingly large number of tropical species of Xyleborini known largely from inadequate and inaccessible type series, a thorough revision of the generic classification of the tribe is impossible at the present time. Apparently characters are available that will serve to subdivide this enormous group into recognizable taxa. Although the present inadequate effort to accomplish this leaves much to be desired, it may stimulate others to recognize the problem and to contribute toward its solution.

### Key to the Species of *Theoborus*

1. Elytral declivity strongly convex, its posterolateral margin rounded and devoid of crenulations; striae and interstrial punctures on disc small, shallow,

confused, in definite rows on declivity; declivital interstrial punctures replaced by minute granules; vestiture of fine, abundant, long hair on disc and declivity ..... 2

— Elytral declivity very broadly convex to weakly impressed, its posterolateral margin subacutely elevated and carinate or crenulate from sutural apex to interstriae 7; strial punctures in definite rows easily distinguishable from interstrial punctures ..... 3

2(1). Smaller; punctures on pronotal disc smaller, shallow; elytral punctures larger, more distinctly granulate on declivity; Costa Rica to Colombia and Venezuela; 1.8–2.1 mm ..... 1. ***theobromae*** **Hopkins**

— Larger; punctures on pronotal disc larger, deeper; elytral punctures smaller, about half as large, very feebly granulate on declivity; Guatemala to Bolivia and Brazil; 2.3 mm ..... 2. ***villosulus*** **(Blandford)**

3(2). Elytral declivity broadly convex, its posterolateral margin unevenly, somewhat crenulate; interstriae four to six times as wide as striae, strial punctures very small, usually little if any larger than those of interstriae (except *molestulus*); color dark brown ..... 4

— Elytral declivity moderately impressed at least on interstriae 2, its posterolateral margin a continuous costa; interstriae about three times as wide as striae, strial punctures moderately large, at least twice as large as those of interstriae; color yellowish to light reddish brown ..... 8

4(3). Body more slender, at least 2.6 times as long as wide ..... 5

— Body stouter, less than 2.3 times as long as wide ..... 7

5(4). Declivital interstriae 2 impressed, unarmed on lower two-thirds, 1 and 3 slightly elevated, tubercles on 1 confused; Panama; 2.3 mm ..... 3. ***incultus*** **(Wood)**

— Declivital interstriae 1 to 3 uniseriately tuberculate, 2 not impressed, 1 and 3 not elevated ..... 6

6(4). Strial punctures very small, spaced within a row by three to four diameters of a puncture; declivity rather abrupt, steep, its surface somewhat shagreened, cusps on ventrolateral margin higher, those near suture coarse, declivital interstrial vestiture of long, fine hair two to three times as long as distance between rows, strial hair up to half as long; Costa Rica to Panama; 1.7–2.0 mm ..... 4. ***pristis*** **Wood**

— Strial punctures somewhat larger, spaced within a row by one to two diameters of a puncture; declivity more gradually, more broadly arched, shining, cusps on ventrolateral margin low, not particularly larger near suture; interstrial declivital vestiture stout, very slightly longer than distance between rows, strial hair fine, at least half as long as that of interstriae; Costa Rica; 1.8–2.0 mm ..... 5. ***micarius*** **Wood**

7(4). Interstrial punctures on disc confused, not granulate; declivital vestiture more abundant, consisting of strial rows and confused interstrial hair; Panama to Venezuela; 1.9–2.3 mm ..... 6. ***crinitulus*** **(Wood)**

— Interstrial punctures uniseriate, replaced by small tubercles to base; elytral setae in uniseriate rows; Panama; 2.0–2.2 mm ..... 7. ***molestulus*** **Wood**

8(3). Smaller; elytral declivity shorter, steeper, occupying 30 percent of elytral length, more narrowly impressed particularly on lower half; interstrial setae on declivity very stout, short, as long as distance between rows or less; Veracruz to Brazil; 2.3–2.5 mm ..... 8. ***solitariceps*** **Schedl**

— Larger; elytral declivity more gradual, occupying 40 percent of elytral length, more broadly impressed on lower half; interstrial setae on declivity slender, pointed, about one and one-half times as long as distance between rows; Costa Rica to Colombia and Brazil; 2.5–2.9 mm ..... 9. ***coartatus*** **Sampson**

### 1. *Theoborus theobromae* Hopkins

*Theoborus theobromae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:57 (Holotype, female; Dominicana, West Indies; U.S. Nat. Mus., 7637)

*Xyleborus pseudococcotrypes* Eggers, 1941, Arb. Morph. Taxon. Ent. Berlin – Dahlem 8:105 (Holotype, female; St. Jean du Maroni, French Guiana; Paris Mus.); Wood, 1962, Great Basin Nat. 22:79. *Synonymy.*

*Xyleborus hirtellus* Schedl, 1949, Rev. Brasil Biol. 9:271 (Syntypes, females; St. Vincent Island, British West Indies, and Trinidad; British Mus. Nat. His. and Schedl Coll.); Schedl, 1952, Ent. Blätt. 47–48:163. *Synonymy*

DIAGNOSIS.— This small, stout, pubescent species has the elytral declivity rather strongly convex, with its ventrolateral margin broadly rounded and unarmed. It is closely allied to *villosulus* (Blandford).

FEMALE.— Length 1.8–2.1 mm, 2.2 times as long as wide; color dark brown to almost black.

Frons broadly convex; surface reticulate, a few small granules below upper level of eyes; vestiture inconspicuous.

Pronotum 1.0 times as long as wide; sides moderately arcuate and not converging on basal two-thirds, rather broadly rounded in front; anterior margin armed by six to ten rather coarse serrations; summit broad, at or slightly behind middle; anterior slope coarsely asperate; posterior area reticulate, finely, shallowly, rather sparsely punctured. Vestiture of rather abundant, fine, moderately long hair.

Elytra 1.3 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on slightly less than basal two-thirds, rather broadly rounded behind; striae not impressed, punctures small, shallow, in rows; interstriae smooth, shining, about six times as wide as striae, punctures confused, of same size and appearance as those of striae and not easily distinguished from them. Declivity convex, steep, occupying posterior half of elytral length; strial punctures indistinctly deeper, interstrial punctures uniseriate, each accompanied by a small granule; posterolateral margin rather broadly rounded, its granules not distinctly larger elsewhere. Vestiture of fine, rather long, abundant hair, more conspicuous on declivity.

MALE.— Dwarfed (1.2 mm), flightless, and deformed; essentially as female but with characters less perfectly formed, except pronotum as in male *Dryocoetoides*.

DISTRIBUTION.— Veracruz and British West Indies to Colombia and Venezuela.

MEXICO: Chiapas: Palenque Ruins. Veracruz: Dos Amates. COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 55, *Ochroma*, S. L. Wood; Dominical, Puntarenas, 9-XII-63, 3 m, No. 298, tree branch, S. L. Wood; Turrialba, Cartago, 5-VII-63, 700 m, No. 20, *Erythrina costaricensis*, S. L. Wood; Guápiles, Limón, 22-VIII-66, 100 m, No. 111, liana, S. L. Wood; Finca La Lola, 9-III-63, *Theobroma cacao*, J. L. Saunders. PANAMA: Barro Colorado Island, 27-XII-63, 70 m, No. 344, liana, S. L. Wood; Ft. Clayton, 22-XII-63, 30 m, tree limb, S. L. Wood. OTHER COUNTRIES: Dominica, Barbados, Trinidad, Colombia, Venezuela.

HOSTS.— *Erythrina costaricensis*, *Ochroma* sp., *Theobroma cacao*, etc.

BIOLOGY.— This species infests unthrifty, cut, or broken branches about 2–5 cm in diameter. The gallery system evidently is as in *Dryocoetoides*, but notes were not taken on a mature system.

NOTES.— The above treatment was based on the holotype of *theobromae*, on the "type" of *hirtellus*, and on about 300 other specimens. Evidently more than one specimen has been labeled as the type of *hirtellus*, as is a common feature of Schedl's species. The one in the British Museum (Natural History) is here considered to be the type.

### 2. *Theoborus villosulus* (Blandford)

*Xyleborus villosulus* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):204 (Holotype, female; Río Naranjo, San Marcos, Guatemala; British Mus. Nat. Hist.)

*Xyleborus coccotrypoides* Eggers, 1943, Mitt. Münchner Ent. Ges. 33:388 (Holotype, female; Cochabamba, Bolivia; Paris Mus.); Wood, 1976, Great Basin Nat. 36:349. *Synonymy*

*Xyleborus villosus* Schedl, 1949, Rev. Brasil Biol. 9:270 (Syntypes, female; Nova Teutonia, Brazil; Schedl and Plaumann Colls.); Wood, 1976, Great Basin Nat. 36:349. *Synonymy*

DIAGNOSIS.— This species is distinguished from *theobromae* Hopkins by the larger size, by the coarser punctures on the pronotal disc, and by the finer punctures on the elytra.

FEMALE.— Length 2.3 mm, 2.3 times as long as wide; color brown.

As in *theobromae* except punctures on pronotal disc slightly larger and deeper; elytral punctures about half as large as those of *theobromae*, punctures appearing very feebly granulate on declivity.

DISTRIBUTION.— Guatemala to Brazil and Bolivia.

GUATEMALA: Río Naranjo, San Marcos, G. C. Champion; Palín, Esquintla, 19-V-65, 300 m, No. 588, Anonillo, S. L. Wood. OTHER COUNTRIES: Bolivia, Brazil, French Guiana, and Venezuela.

NOTES.— The above treatment was based on the holotypes of *villosulus*, *coccotrypoides*, and *villosus* and on 10 other specimens.

### 3. *Theoborus incultus* (Wood)

*Xyleborus incultus* Wood, 1975, Great Basin Nat. 35:400 (Holotype, female; Ft. Clayton, Canal Zone, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *pristis* Wood by the larger size, by the more distinctly impressed strial punctures, and by the declivital sculpture as described below.

FEMALE.— Length 2.3 mm, 2.6 times as long as wide; color dark brown.

Frons and pronotum essentially as in *micarius* Wood except anterior margin of pronotum weakly produced at median line and armed by two larger serrations, punctures on posterior areas larger, at least twice as large as in *micarius*.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal 60 percent, narrowly rounded behind, a slight emargination at suture; striae not impressed, punctures small, distinctly impressed, spaced within a row by one to two diameters of a puncture; interstriae almost smooth, punctures fine, less than half as large as those of striae, moderately confused on basal third of disc, uniseriate behind. Declivity rather steep, convex; surface minutely granular on lower two-thirds, dull; interstriae 1 moderately elevated to near apex, armed by 15 or more small, pointed, confused denticles, 2 rather strongly impressed, armed on upper third by 4–6 similar, uniseriate denticles, 3 slightly elevated, armed as in 1 except denticles almost uniseriate, 4–9 each with a row of fine denticles, 3 and 9 join and continue submarginally to apex as a moderately strong elevation, its crest armed by a row of about four denticles. Vestiture largely confined to sides and declivity; of fine, short strial and slightly longer interstrial hair, longest setae about equal in length to width of an interstriae.

DISTRIBUTION.— Panama.

PANAMA: Ft. Clayton, Canal Zone, 22-XII-63, *Cecropia* branch, S. L. Wood.

NOTES.— The above treatment was based on the holotype.

### 4. *Theoborus pristis* Wood

*Xyleborus* (*Theoborus*) *pristis* Wood, 1972, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):32 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— The antennal club of this species is clearly as in *theobromae* Hopkins, but the relationship is not close. It differs from *theobromae* by the more slender form, by the less strongly serrate anterior margin of the pronotum, by the more broadly convex elytral declivity, and by the different sculpture of the elytral declivity.

FEMALE.— Length 1.7–2.0 mm, 2.6 times as long as wide; color very dark brown.

Frons broadly convex, a weak, narrow, transverse impression just above epistoma; surface strongly reticulate, punctures sparse, obscure, coarse; vestiture of sparse, fine, inconspicuous, long hair.

Pronotum 1.04 times as long as wide; essentially as in *theobromae* except surface more strongly reticulate, including anterior area between asperities, and anterior margin weakly serrate. Vestiture of fine, rather short hair on sides and asperate area, disc almost glabrous.

Elytra 1.3 times as long as wide; sides almost straight and parallel on basal three-fourths, rather narrowly rounded behind, serrate near weakly, narrowly emarginate suture; striae not impressed, punctures minute, shallow, distinct, spaced within a row by three to four diameters of a puncture; interstriae smooth, shining, about eight times as wide as striae, punctures uniseriate, almost indistinguishable from those of striae.

Declivity confined to posterior fourth, steep, broadly convex; striae 1 weakly, others feebly impressed, punctures slightly larger, deeper and much closer than on disc; interstriae with punctures closer and uniseriately granulate, granules often obsolete near apex; suture narrowly emarginate, margin with a row of two to four coarse cusps near suture, this row continued along margin as four to eight somewhat smaller granules, margin rather narrowly rounded to interstriae 8. Vestiture confined to sides and declivity; on declivity consisting of rows of fine hair; strial hair short; interstrial hair two to two and one-half times as long as distance between rows.

MALE.— Length (1.5–1.8 mm); essentially as in female, but with characters more poorly formed; pronotum 1.4 times as long as wide and essentially as in male *theobromae*.

DISTRIBUTION.— Costa Rica and Panama.

COSTA RICA: 6 km S San Vito, Puntarenas, 19–21-III-67, dead tree; Volcán, Puntarenas, 11-XII-63, 1000 m, No. 305 in huarumo, No. 308 in tree limb; S. L. Wood; Tapantí, Cartago, 17-IX-63, 1300 m, No. 184, *Miconia caudata*, S. L. Wood. PANAMA: Cerro Campana, 26-VII-66, 1000 m, tree branch, S. L. Wood.

HOSTS.— *Miconia caudata*, etc.

BIOLOGY.— Tunnels were constructed in limbs and saplings 10–15 cm in diameter in rather hard wood. Mature gallery systems were not observed.

NOTES.— The above treatment was based on the type series of 62 specimens.

### 5. *Theoborus micarius* Wood

*Xyleborus* (*Theoborus*) *micarius* Wood, 1972, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):33 (Holotype, female; Guápiles, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is closely related to *pristis* Wood, but it is distinguished by the slightly larger, more closely spaced strial punctures, by the more gradual, more broadly arched elytral declivity, by the smaller cusps near the suture on the ventrolateral margin of the declivity, and by the very stout, short, declivital setae.

FEMALE.— Length 1.8–2.0 mm, 2.7 times as long as wide; color very dark brown.

Frons and pronotum as in *pristis* except pronotum outline somewhat more subquadrate and 1.1 times as long as wide.

Elytra 1.5 times as long as wide; outline essentially as in *pristis*; disc as in *pristis* except strial punctures slightly larger, spaced within a row by two to three times diameter of a puncture; interstriae about five to six times as wide as striae, punctures uniseriate, distinctly smaller than those of striae. Declivity occupying 50 percent of elytral length, more gradual and more broadly convex than in *pristis*; sculpture as in *pristis* except posterolateral margin subacute, its summit rather weakly crenulate from weak sutural emargination to interstriae 7. Vestiture of rows of strial and interstrial setae, finer and shorter on disc; declivital strial hair very fine and short, interstrial setae coarse, blunt, each about one to one and one-half times as long as distance between rows.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 17-IX-63, 1300 m, No. 182, tree branch, S. L. Wood; Guápiles, Limón, 22-VII-66, 100 m, No. 120, *Cordia*, S. L. Wood.

HOST.— *Cordia* sp.

BIOLOGY.— Specimens were attacking branches 5–7 cm in diameter.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 6. *Theoborus crinitulus* (Wood)

*Xyleborus crinitulus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):34 (Holotype, female; 46 km SE Socopo, Barinas, Venezuela; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *micarius* Wood by the larger size, by the more closely, more deeply punctured pronotal disc, by the confused discal interstrial punctures, and by the steeper elytral declivity that has different sculpture.

FEMALE.— Length 1.9–2.3 mm, 2.3 times as long as wide; color rather dark reddish brown.

Frons as in *micarius* except with moderately numerous, small, rounded granules. Pronotum as in *micarius* except serrations on anterior margin larger and punctures on disc more numerous and deeper.

Elytra 1.3 times as long as wide, 1.2 times as long as pronotum; striae not impressed, punctures small, rather shallow, spaced within a row by one or two times diameter of a puncture; interstriae four to five times as wide as striae, shining, with irregular lines, punctures fine, moderately deep, confused on basal two-thirds, uniseriate toward declivity.

Declivity steep, broadly convex, occupying 42 percent of elytral length; strial punctures almost twice as large as on disc; interstriae uniseriately tuberculate, tubercles rather widely spaced, pointed, moderately fine except rather coarse on lower half of 1; suture slightly produced just before apex; subapical posterolateral margin acutely, subcrenulately elevated from suture to interstriae 8. Vestiture hairlike, rather abundant, of variable length, mostly rather short.

DISTRIBUTION.— Panama and Venezuela.

PANAMA: Barro Colorado Island, Canal Zone, 27-XII-63, 70 m, No. 345, tree branch, S. L. Wood; Ft. Clayton, Canal Zone, 22-XII-63, 30 m, No. 317, tree branch, S. L. Wood. OTHER COUNTRIES: Venezuela.

NOTES.— The above treatment was based on the type series of 21 specimens.

### 7. *Theoborus molestulus* Wood

*Xyleborus* (*Theoborus*) *molestulus* Wood, 1975, Great Basin Nat. 35:400 (Holotype, female; Barro Colorado Island, Canal Zone, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *crinitulus* Wood by the interstrial granules on the disc, by the uniseriate rows of elytral setae, and by other characters.

FEMALE.— Length 2.0–2.2 mm, 2.2 times as long as wide; color dark brown.

Frons as in *crinitulus* except less strongly reticulate, more sparsely punctured.

Pronotum about as in *crinitulus* except anterior margin armed by eight serrations, posterior areas very finely, shallowly punctured.

Elytra 1.2 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; striae not impressed, punctures rather small, shallow, distinct, spaced by one to two diameters of a puncture; interstriae almost smooth, three times as wide as striae, each with a uniseriate row of fine tubercles from base to apex. Declivity occupying posterior half of elytral length, moderately steep, broadly convex; sculpture as on disc except striae 1 feebly impressed; posterolateral margin acutely, subcrenulately elevated from apex to interstriae 7. Vestiture of interstrial rows of long, erect hair from base to apex, alternate setae twice as long as distance between rows, alternating with setae half that length on disc and declivity.

DISTRIBUTION.— Panama.

PANAMA: Barro Colorado Island, Canal Zone, 27-XII-63, No. 348, tree branch; Ft. Clayton, Canal Zone, 22-XII-63, 30 m, No. 363, tree branch; Madden Forest, Canal Zone, 2-I-64, 70 m, No. 365, tree seedling; 13 km S El Hato del Volcán, Chiriquí, 7-I-64, tree seedling; all taken by me.

NOTES.— The above treatment was based on the type series of 15 specimens.

### 8. *Theoborus solitariceps* Schedl

*Xyleborus solitariceps* Schedl, 1954, Dusenia 5:45 (Lectotype, female; Rondon, Paraná, Brazil; Schedl Coll., designated by Schedl 1979, Kataloge wiss. Sam. Nat. Mus. Wien 3(2):232)

DIAGNOSIS.— This species is distinguished from the very closely related *coartatus* (Sampson) by the smaller size, by the shorter, steeper elytral declivity, by the more narrowly impressed declivity, and by the much stouter declivital setae.

FEMALE.— Length 2.3–2.5 mm, 2.5 times as long as wide; color yellowish to reddish brown.

Frons as in *theobromae* (Hopkins) except more shining and with rather abundant, small, rounded granules on lower third. Pronotum 1.04 times as long as wide; essentially as in *theobromae* except punctures rather coarse, shallow, rather sparse; surface slightly more shining; glabrous in discal area.

Elytra 1.4 times as long as wide; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; disc occupying basal 70 percent of elytral length; striae not impressed, punctures moderately coarse, rather shallow; interstriae about three times as wide as striae, smooth, shining, punctures uniseriate, about half as large as those of striae. Declivity steep, shallowly, rather broadly impressed; sutural interstriae slightly elevated, striae 1 and interstriae 2 rather strongly impressed; interstriae 3 moderately elevated except near its apex; strial punctures about as on disc; subapical ventrolateral margin acutely costate from suture to interstriae 7. Vestiture of rows of fine, short, strial hair, and rows of erect, interstrial setae, those on disc rather fine, those on declivity very coarse, short, each about equal in length to distance between rows.

DISTRIBUTION.— Veracruz to Brazil.

MEXICO: Veracruz: Rancho Tepetates, 21-III-80, S-043, 50 m, T. H. Atkinson. HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 565, *Dioclea megacarpa*,

S. L. Wood; La Lima, Cortéz, 5-V-64, 200 m, No. 573, *Swietenia*, S. L. Wood. COSTA RICA: Playa del Coco, 18-X-63, 8 m, No. 231, *Citrus*, S. L. Wood; Dominical, Puntarenas, 24-IX-64, *Theobroma cacao*, J. L. Saunders; Guápiles, Limón, 22-VIII-66, 100 m, No. 122 in *Inga*, No. 119 in *Terminalia*, S. L. Wood; Finca La Lola, Limón, 4-III-63, *Theobroma cacao*, J. L. Saunders. OTHER COUNTRIES: Colombia, Venezuela, Brazil.

HOSTS.— *Citrus aurantifolia, Dioclea megacarpa, Swietenia* sp., *Terminalia* sp., and *Theobroma cacao.*

BIOLOGY.— This species was taken from dying branches 3–7 cm in diameter.

NOTES.— The above treatment was based on Schedl's syntype and on 22 other specimens.

### 9. *Theoborus coartatus* Sampson

*Xyleborus coartatus* Sampson, 1921, Ann. Mag. Nat. Hist. (9)7:32 (Holotype, female; Trinidad; British Mus. Nat. Hist.)

*Xyleborus artecuneolus* Schedl, 1939, Proc. Roy. Ent. Soc. London 8:14 (Holotype, female; Trinidad; British Mus. Nat. Hist.); Wood, 1966, Great Basin Nat. 26:31. *Synonymy*

DIAGNOSIS.— This species is distinguished from the closely related *solitariceps* Schedl by the larger size, by the longer, more gradual declivity, by the more broadly impressed declivity, and by the longer, more slender declivital setae.

FEMALE.— Length 2.5–2.9 mm, 2.4 times as long as wide; color yellowish to reddish brown.

Frons and pronotum as in *solitariceps.*

Elytra as in *solitariceps* except disc occupying only 60 percent of elytral length; interstriae 2 usually with punctures confused; lower half of declivity more broadly impressed; declivital interstrial setae finer, longer, pointed, each one and one-half to two times as long as distance between rows.

DISTRIBUTION.— Costa Rica to Brazil.

COSTA RICA: Río Damitas, Dota Mts., San José, 18-II-64, 250 m, No. 431, *Theobroma*, S. L. Wood; Turrialba, Cartago, 5-VII-63, 700 m, No. 22, tree branch, S. L. Wood; Guápiles, Limón, 22-VIII-66, 100 m, No. 102, tree bole, S. L. Wood; Pandora, Limón, 23-VIII-63, 50 m, No. 145, *Mimosa*, S. L. Wood; Finca La Lola, 4-III-63, *Theobroma cacao*, J. L. Saunders. PANAMA: 13 km S El Hato del Volcán, Chiriquí, 7-I-64, 1000 m, tree sapling, S. L. Wood. OTHER COUNTRIES: Colombia, Brazil.

HOSTS.— *Mimosa* sp., *Theobroma cacao, T.* sp., etc.

BIOLOGY.— Specimens were taken from the bole of small trees 8–20 cm in diameter.

NOTES.— The above treatment was based on the holotypes of *coartatus* and *artecuneolus* and on 26 other specimens, 3 of which were compared directly to both holotypes.

## GENUS *XYLEBORUS* EICHHOFF

*Phloeotrogus* Motschulsky, 1863, Bull. Soc. Imp. Nat. Moscou 36(1):512 (Type-species: *Phloeotrogus obliquecaudata* Motschulsky, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:127); Wood, 1974, Bull. Zool. Nomencl. 31:230. Appeal for suppression pending.

*Xyleborus* Eichhoff, 1864, Berliner Ent. Zeitschr. 8:37 (Type-species: *Bostrichus monographus* Fabricius, subsequent designation by Lacordaire, 1866, Histoire Naturelle des Insects. Genera des Coleopteres 7:381)

*Anisandrus* Ferrari, 1867, Die Forst- und Baumzuchtschälichen Borkenkäfer, p. 24 (Type-species: *Apate dispar* Fabricius, monobasic)

*Anaeretus* Dugès, 1888, Ann. Soc. Ent. Belge 31:140 (Type-species: *Anaeretus guanajuatensis* Dugès, monobasic)

*Progenius* Blandford, 1896, Ann. Soc. Ent. France 65:20 (Type-species: *Progenius fleutiauxi* Blandford, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:128)

*Mesoscolytus* Broun, 1904, Ann. Mag. Nat. Hist. (7)14:125 (Type-species: *Apate inurbanus* Broun, monobasic)

*Cyclorhipidion* Hagedorn, 1912, Deutsche Ent. Zeitschr. 1912:355 (Type-species: *Cyclorhipidion pelliculosum* Hagedorn = *Xyleborus perlaetus* Schedl, monobasic)

*Heteroborips* Reitter, 1913, Wiener Ent. Zeit. 32(Beiheft):79, 82 (Type-species: *Bostrichus cryptographus* Ratzeburg, monobasic)

*Xyleborips* Reitter, 1913, Wiener Ent. Zeit. 32(Beiheft):111 (Type-species: *Xyleborus meuseli* Reitter, monobasic)

*Coptoborus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:53 (Type-species: *Coptoborus emarginatus* Hopkins = *Xyleborus vespatorius* Schedl, original designation)

*Euwallacea* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:54 (Type-species: *Xyleborus wallacei* Blandford, original designation)

*Ambrosiodmus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:55 (Type-species: *Xyleborus tachygraphus* Zimmermann, original designation)

*Terminalinus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:57 (Type-species: *Terminalinus terminaliae* Hopkins, original designation)

*Boroxylon* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:58 (Type-species: *Boroxylon stephegynis* Hopkins = *Phloeotrogus bidentatus* Motschulsky, original designation)

*Cryptoxyleborus* Schedl, 1937, Sarawak Mus. J. 4:550 (Type-species: *Cryptoxyleborus naevus* Schedl, subsequent designation by Schedl, 1962, Rev. Ent. Moçambique 5:103)

*Streptocranus* Schedl, 1939, Tijdschr. Ent. 82:52 (Type-species: *Streptocranus mirabilis* Schedl, monobasic)

DIAGNOSIS.— This exceedingly large and complex genus requires considerably more taxonomic attention than is given here. The diagnosis and description presented here apply only to American forms, which include only a minor part of the subgenera occurring throughout the world. In this restricted treatment *Xyleborus* includes those American Xyleborini having the antennal club obliquely truncate, with not more than one suture at the extreme apex of the posterior face; the anterior coxae are contiguous, or if narrowly separated the intercoxal piece is deeply notched, the scutellum is moderately large and flat, it attains the general surface level of the elytral bases, and it completely fills the sutural notch at the elytral bases.

DESCRIPTION.— Length 1.6–5.9 mm, 1.9–3.4 times as long as wide; color yellowish brown to black. Sexual dimorphism extreme; males exceedingly rare, flightless.

Female frons convex, variously covered by punctures and granules; vestiture sparse, inconspicuous. Eye oval; shallowly to deeply emarginate. Antennal scape elongate; funicle 5-segmented; club obliquely truncate, not more than one suture may show at extreme apex on posterior face. Pronotum variously sculptured. Scutellum moderately large, flat, flush with surface of elytral bases, completely filling sutural notch. Elytra variously sculptured. Anterior coxae contiguous, if apparently narrowly separated, then intercoxal piece conspicuously notched on its longitudinal axis. Tibiae as characterized for tribe.

DISTRIBUTION.— Worldwide, wherever woody plants grow; about 1,500 nominate species exist; however, perhaps as many as a third of them have been or should be placed in synonymy; about 73 species occur in North and Central America.

BIOLOGY.— Virtually all parts of almost any woody plant may be attacked by representatives of this genus. Some species attack apparently healthy tissue, some prefer comparatively old, sour logs, but most species prefer recently cut, injured, or unthrifty material. All species culture an ambrosial fungus on the walls of their tunnels. The rare males are flightless; only the female seeks a new host and establishes a new tunnel. Tunnels may be of the cave type or of a simple or highly complex branching system; in certain species groups it is not uncommon for several females to use the same original entrance tunnel. The larvae are reared in the parental galleries and usually participate in the enlargement of the gallery system. If mating occurs, it takes place in the brood chambers and usually is between siblings or mother and son.

In those species that have been studied (Entwistle 1964, Norris and Chu 1970) the males are haploid and females are diploid. An unmated female evidently produces only male offspring, with which she then mates in order to produce female offspring. Because of this extreme inbreeding and partial parthenogenesis, any mutant female is the potential founder of a new morphological race or species.

NOTES.— The extremely large size and complexity of this genus, coupled with the difficulty of determining exactly what a species is, due to arrhenotokous parthenogenesis, has produced taxonomic chaos. The following attempt to subdivide the group into subgenera and species groups that reflect phylogeny is based on the examination of more than 600 named species from all parts of the world. Many inadequacies in this classification are readily apparent, but perhaps it will provide a small step toward a more satisfactory treatment of the entire genus.

In the above, tentative generic synonymy citations of authors establishing synonymy were omitted because there is some hesitation about the validity of the synonymy in some instances and in others names are here retained as subgenera. Several generic names treated as synonyms of *Xyleborus* by Schedl were omitted because they are oriental in distribution and they are being treated differently in a preliminary unpublished manuscript by another author. Certain synonymy can be established, however, including: *Xyleborus* (=*Anaeretus*, *Anisandrus*, and possibly *Cyclorhipidion*), *Ambrosiodmus* (=*Phloeotrogus*, suppressed), *Progenius* (=*Boroxylon*), *Coptoborus* (=*Streptocranus* and possibly part of *Cryptoryleborus*). These groups,

together with *Heteroborips* (not known to me), *Euwallacea*, and *Terminalinus*, apparently form recognizable genera.

*Xyleborus signatus* Schedl (1949:278) was named from Mexico; however, the type is an erroneously labeled specimen of *nepos* Eggers that does not belong to the American fauna (Wood 1975:23). Similarly, the unique type of *vitiosus* Schedl (1940:367) appears to be an erroneously labeled specimen of *adelographus* Eichhoff from Brazil (Wood 1975:22). *Xyleborus linearis* Schedl (1949:273) is an erroneously labeled specimen of the European *dryographus* Ratzeburg (Wood 1977:211). These names should be dropped from the Mexican fauna.

(Note added in press.) A detailed study of major groups within the Xyleborini was commenced after the present manuscript was completed. Although that study incorporates radical changes in generic assignments for almost half of the species here placed in *Xyleborus*, it is not sufficiently advanced that changes can be made here, except for the recognition of *Theoborus*. A preview of coming changes is presented in Wood (1980:96).

## Key to Females of the Species of *Xyleborus*

1. Anterior coxae narrowly separated, usually a small notch or depression between anterior and enlarged posterior portions of intercoxal piece; body stout, less than 2.0 times as long as wide; elytral declivity variously excavated, commencing at or anterior to middle of elytra and variously ornamented by spines on interstriae 3; pronotum wider than long, rather narrowly rounded in front and armed by a series of teeth ..... 2

— Anterior coxae contiguous (intercoxal piece deeply notched if continuous); body more slender, at least 2.2 times as long as wide; declivity and pronotum variable ..... 8

2(1). Elytral declivity deeply, rather broadly sulcate from base to apex, lateral margins equally, rather strongly elevated throughout, their summits armed by a series of three to eight coarse denticles of subequal size ..... 3

— Lower half of declivity much more broadly, shallowly excavated than upper or basal half, its lateral margins much less strongly elevated than on basal half, margins armed on upper half by a pair of coarse submammiform or spinose prominences, a series of smaller denticles variously distributed above and below these major prominences ..... 4

3(2). Declivital face densely, very minutely punctured, with strial punctures shallow, moderately coarse, close, spaced by less than diameter of a puncture; Guatemala and Panama to Colombia and Venezuela; 2.3–2.8 mm ..... 1. ***perebeae*** **(Ferrari)**

— Declivital face devoid of interstrial punctures, smooth, shagreened to shining, strial punctures small, obscure, spaced by more than diameter of a puncture; Costa Rica to Panama; 3.2–3.6 mm ..... 2. ***salvini*** **Blandford**

4(2). Declivity commencing behind middle of elytra, steep, ventrolateral margin on lower half distinctly elevated, subacutely angulate; declivital face closely, deeply covered by confused punctures; surface irregular; major spine on declivity stout, pointed, a coarse, pitlike impression just below its apex on posteromedian side; Costa Rica to Panama; 2.7–3.0 mm ..... 3. ***pandulus*** **Wood**

— Declivity commencing anterior to middle of elytra, more gradual, its ventrolateral margin rounded, sulcus distinctly continued to lower half, its surface rather smooth, with sparse, fine punctures; larger species ..... 5

5(4). Major spines on elytral declivity stout, about one-third declivital length from upper margin, its apex blunt ..... 6

— Major spine at or slightly below middle of declivity, comparatively slender, its apex sharply pointed ..... 7

6(5). Larger; largest tooth anterior to major declivital spine closer to major spine than to suture; excavated area above major spine distinctly narrower than area immediately posterior to major spine; major spine much larger; Costa Rica to Panama; 3.8–4.3 mm ..... 4. ***godmani*** **Blandford**

— Smaller; largest tooth anterior to major declivital spine closer to suture than to major spine; excavated area of declivity anterior to major spine distinctly wider than excavated area immediately posterior to major spine; Veracruz to Panama; 3.3–3.9 mm (two subspecies) ..... 5. ***sharpi*** **Blandford**

7(5). Prothorax light reddish brown, elytra black in mature specimens; surface of declivital excavation dull, very densely, deeply punctured by minute points, strial punctures rather obscure; Pacific slope of Costa Rica and Panama; 3.5–3.8 mm ..... 6. ***sanguinicollis*** **Blandford**

— Prothorax and elytra black in mature specimens; declivital surface smooth, shining, devoid of impressed points, strial punctures small, clearly impressed; Atlantic slope of Costa Rica and Colombia; 3.7–3.9 mm ..... 7. ***ebenus*** **Wood**

8(1). Anterior margin of pronotum procurved and armed by several rather coarse serrations; posterolateral margin of elytral declivity usually rounded, frequently armed by tubercles or spines, if subacutely costate then costa extending from suture to interstriae 3–5 (except only to 7 in couplets 12–13); strial setae usually present ..... 9

— Anterior margin of pronotum straight or procurved, unarmed by serrations (except subserrate in *spathipennis*, *fornicatus*); posterolateral margin of elytral declivity rounded or costate, costa never dentate, when present, extending from suture to interstriae 7; strial setae almost never present (for exceptions see couplet 35) ..... 22

9(8). Stouter species; pronotum 1.0–1.1 times as long as wide; elytra with sides subparallel on at least basal two-thirds, declivity more broadly convex to excavated ..... 10

— Slender species; pronotum 1.2–1.3 times as long as wide; elytra rather strongly tapered on posterior half, declivity gradual, convex or narrowly excavated; subgenus *Coptoborus* ..... 17

10(9). Larger, 2.3–4.0 mm; interstrial punctures strongly confused; posterolateral margin of declivity subacutely elevated, almost devoid of denticles ..... 11

— Smaller, 1.7–2.9 mm; interstrial punctures uniseriate; posterolateral margin of declivity more broadly rounded, armed by a series of denticles or spines, interstriae 1 either unarmed or with a row of small granules; declivital punctures either in rows or very small and shallow; subgenus *Neoxyleborus* ..... 15

11(10). Elytral declivity convex, striae distinct and in definite rows, interstriae 1 with minute granules equal in size to those of other interstriae ..... 12

— Declivity rather strongly impressed; declivital punctures rather large, close, distinct, strongly confused, sutural interstriae armed by two to four stout denticles ..... 14

12(11). Subapical posterolateral declivital costa armed by three to five distinct denticles; interstrial punctures at base of disc and punctures on pronotal disc averaging slightly larger; Minnesota and Quebec to West Virginia; 2.8–3.5 mm ..... 8. ***obesus*** **LeConte**

— Subapical posterolateral declivital costa of uniform height, undulating but unarmed by denticles; interstrial and pronotal punctures averaging distinctly smaller ..... 13

13(12). Anterior margin of pronotum armed by six to eight subequal serrations; strial punctures on declivity larger, deeper, interstriae there one and one-half times as wide as striae; British Columbia and Nova Scotia to Utah and Virginia; 2.8–3.5 mm ..... 9. ***dispar*** **(Fabricius)**

— Anterior margin of pronotum armed by two to six serrations, median pair always conspicuously larger; declivital strial punctures smaller, less strongly impressed, declivital interstriae at least twice as wide as striae; Ontario and Quebec to Missouri and Georgia; 2.3–2.6 mm ..... 10. ***sayi*** **(Hopkins)**

14(11). Predeclivital impression beginning at or posterior to middle of elytra; elytral pubescence abundant, particularly on declivity; denticles on declivital interstriae 3 averaging larger; S Texas to Guatemala; 3.8–4.2 mm ..... 11. ***horridus*** **Eichhoff**

— Predeclivital impression beginning on basal fourth of elytra; elytral pubescence rather sparse, less abundant on declivity than on disc; denticles on declivital interstriae 3 averaging smaller; Costa Rica to Colombia; 3.4–4.0 mm ..... 12. ***horridatus*** **Wood**

15(10). Declivity steeper, moderately flattened, occupying posterior 30 percent of elytral length; declivital interstriae 1 armed by a row of minute, pointed granules; declivital vestiture of rather slender bristles; Nayarit to Colima; 1.8–2.1 mm .... 13. ***palatus*** **Wood**

— Declivity more gradual, rather strongly excavated, occupying at least 40 percent of elytral length; declivital interstriae 1 unarmed except for one or two small denticles at base; declivital vestiture of slender to very stout scales ..... 16

16(15). Punctures on elytral declivity very small, strongly confused, each bearing a short, broad scale, striae obsolete, face of declivity broadly concave, devoid of spines, a few small denticles on basal and lateral areas; Chiapas to Brazil; 1.7–2.3 mm ..... 14. ***squamulatus*** **Eichhoff**

— Strial punctures on elytral declivity in rows; declivital vestiture of rather slender scales; margins of declivity armed by two or more pairs of large spines ..... 17

17(16). Largest spine on elytral declivity less than twice as long as its basal width, about equal in length to width of one discal interstriae; declivity less strongly excavated, armed by two to five pairs of spines (variable), although two pairs usually predominate, and several smaller denticles; Jalisco to Brazil, Hawaii; 1.8–2.6 mm ..... 15. ***spinulosus*** **Blandford**

— Largest declivital spine at least two and one-half times as long as its basal width, about equal in length to distance from suture to discal striae 3; declivity more strongly excavated, always armed by two pairs of major spines and several minor denticles; Costa Rica to Colombia; 2.4–2.9 mm .... 16. ***ferox*** **Blandford**

17(9). Elytral declivity concavely excavated, interstriae 3 armed by about two to five denticles, posterolateral margin strongly elevated toward apex and emarginate at suture; Veracruz to Argentina; 2.3–2.8 mm ..... 17. ***vespatorius*** **Schedl**

— Elytral declivity convex, its posterolateral margin weakly elevated near apex ..... 18

18(17). Declivital interstriae 2 feebly impressed; elytral apex not acuminately produced, not distinctly emarginate at suture, posterolateral margin not elevated along interstriae 9; declivital interstriae 1–7 with fine denticles except 2 usually unarmed; Panama to Brazil; 1.6–1.7 mm ..... 18. ***catulus*** **Blandford**

— Elytral apex more narrowly produced and suturally emarginate; declivital interstriae 2 not at all impressed, its sculpture about equal to 1 and 3 ..... 19

19(18). Elytral apex obtusely subacuminate, sutural emargination shallow; small tubercles on declivital interstriae 1 more widely spaced, an average distance of two or more diameters of a strial puncture between tubercles; granules on declivital interstriae 2 average smaller in size than on 1 or 3 ..... 20

— Elytral apex acutely acuminate, sutural emargination deeper than wide; granules, if present, on declivital interstriae 1 spaced by distance equal to diameter of one strial puncture ..... 21

20(19). Elytral declivity slightly more gradual; granules on posterolateral margin of declivity poorly formed, very small; largest tubercles on interstriae 1 and 3 small, subequal in size; interstrial setae on declivity moderately long, stout, almost scalelike; San Luis Potosí and Veracruz to Brazil; 1.8–2.2 mm ..... 19. ***pseudotenuis*** **Schedl**

— Elytral declivity slightly steeper; two or three tubercles on posterolateral margin of elytral declivity coarse, almost as large as those on interstriae 1; tubercles on declivital interstriae 1 conspicuously larger than those on 3; interstrial setae on declivity moderately long, rather slender; Panama to Peru; 1.6–1.7 mm ..... 20. ***cuneatus*** **Eichhoff**

21(19). Apex of elytra not at all crenulate or serrate; all elytral interstriae entirely devoid of granules and tubercles; Costa Rica; 1.9 mm ..... 21. ***exutus*** **Wood**

— Apex of elytra ending in a conspicuous cusp, lateral margin with about four additional serrations; declivital interstriae 1–7 uniseriately, very finely granulate; Costa Rica to Brazil; 1.8–2.2 mm ..... 22. ***tolimanus*** **Eggers**

22(8). Pronotum subcircular to subquadrate, its posterior half asperate, asperities almost as coarse as those on anterior slope (except *scalaris*); subgenus *Ambrosiodmus* ..... 23

— Posterior half of pronotum smooth, rarely minutely granulate, reticulate or not ..... 33

23(22). Antennal club larger, with two sutures on posterior face; pronotal summit at or slightly in front of middle, anterior slope steeper; elytral declivity slightly impressed, interstriae 2 either unarmed or granules smaller than on 1 or 3; smaller species ..... 24

— Antennal club smaller, with not more than one suture on posterior face; pronotal summit behind middle, arched from base, anterior slope less abrupt; elytral declivity impressed or not, interstriae 2 with tubercles as large or larger than those on 1 or 3; larger species ..... 25

24(23). Larger; interstriae 1 on declivity feebly elevated, usually as high as 3, 2 feebly sulcate, its granules as large as those on 1; discal interstriae about three to four times as wide as striae, punctures often granulate; color reddish brown to black; Mississippi and Virginia to Florida and Brazil; 2.0–2.4 mm ..... 23. ***obliquus*** **(LeConte)**

— Smaller; interstriae 1 on declivity not elevated, declivital granules absent; elytral punctures larger, deeper, discal interstriae twice as wide as striae; color very dark brown; Florida, Puerto Rico; 1.8–2.1 mm ..... 24. ***devexulus*** **Wood**

25(24). Elytral declivity evenly convex, all interstriae equally granulate ..... 26

— Elytral declivity weakly to rather strongly impressed toward suture, interstriae 1 unarmed or bearing very small granules, 2 rather strongly granulate or dentate ..... 29

26(25). Posterior areas of pronotum weakly granulate; pronotum distinctly longer than wide; interstrial punctures on disc confused, not at all granulate; Costa Rica; 4.0–4.3 mm ..... 26. ***scalaris*** **Schedl**

— Posterior areas of pronotum asperate; pronotum wider than long; interstrial punctures weakly confused to uniseriate, finely granulate ..... 27

27(26). Discal interstrial punctures fine, shallow, interstriae three to four times as wide as striae; declivity shallowly bisulcate, punctures fine, fine granules on basal half only; El Salvador; *Quercus*; 2.7 mm ..... 25. ***devexus*** **Schedl**

— Discal interstrial punctures rather coarse, deep, interstriae two to four times as wide as striae; declivital punctures larger, granules larger and more generally distributed ..... 28

28(27). Declivital striae 1 not impressed; strial punctures on declivity only slightly larger than on disc; declivital interstriae three times as wide as striae; Puebla to Chiapas; 3.3–3.5 mm ..... 27. ***rusticus*** **Wood**

— Declivital striae 1 slightly impressed; strial punctures on declivity almost twice as large as on disc; declivital interstriae one and one-half times as wide as striae; Connecticut to Virginia; 2.4–2.6 mm ..... 28. ***rubricollis*** **Eichhoff**

29(25). Sutural area of declivity feebly impressed, armed by at least a few very fine granules; discal interstriae only slightly wider than striae, strial punctures coarse, deep; declivital striae 2 wider than 1 and 3 combined, its granules coarse, much larger than those on 1 or 3; Florida; 2.4 mm ..... 29. ***opimus*** **Wood**

— Sutural area of declivity moderately to rather strongly impressed, interstriae 1 unarmed, 2 rather coarsely granulate or dentate ..... 30

30(29). Strial punctures on disc coarse, deep, interstriae less than one and one-half times as wide as striae; declivity near suture rather strongly impressed, interstriae 2 armed by two or three coarse tubercles, strial punctures very coarse; Florida and Louisiana to Puerto Rico; 2.5–3.0 mm ..... 30. ***lecontei*** **Hopkins)**

— Strial punctures on disc rather small, very shallow, interstriae more than two and one-half times as wide as striae ..... 31

31(30). Smaller; elytral declivity rather strongly impressed toward suture; punctures on declivital striae small, three or more times as wide as sutural interstriae; color reddish brown; Oaxaca and Veracruz to Brazil; 2.4–2.8 mm ..... 31. ***guatemalensis*** **(Hopkins)**

— Larger; declivity rather shallowly impressed toward suture; punctures on declivital striae coarse, about twice as wide as sutural interstriae; color dark reddish brown to black ..... 32

32(31). Smaller; elytral punctures and minor granules finer; Illinois and Pennsylvania to Alabama and Georgia; 3.4–3.8 mm ..... 32. ***tachygraphus*** **Zimmermann**

— Larger; elytral punctures and minor granules coarser; Guatemala; 4.9 mm ..... 33. ***rugicollis*** **Blandford**

33a(22). Posterior face of antennal club with a subapical suture on apical third; Asian species introduced into North America ..... 33b

— Posterior face of antennal club without sutures, apical margin usually formed by acute margin of basal corneous area; endemic species ..... 33c

33b(a). Smaller, stouter; elytra 1.2 times as long as wide; pronotum more nearly subcircular, anterior margin strongly procurved, coarsely serrate; declivity more gradual but more strongly convex; Panama, Hawaii, S Asia, Africa, etc.; polyphagous; 1.9–2.3 mm ..... 34a. ***fornicatus*** **Eichhoff**

— Larger, more slender; elytra 1.5 times as long as wide; pronotum subquadrate, anterior margin weakly procurved, serrations weak to absent; declivity steeper, rather weakly convex; New York to Pennsylvania, N Japan; polyphagous; 3.4–3.8 mm ..... 34b. ***validus*** **Eichhoff**

33c(a). Larger, stouter species; pronotum usually less than 1.1 times as long as wide, subquadrate; elytral declivity more gradual, occupying at least 40 percent of elytral length, its armature of fine granules usually on all interstriae; subgenus *Euwallacea*, in part ..... 34

— Mostly smaller, slender species, at least 3.0 times as long as wide; pronotum at least 1.1 times as long as wide, its sides almost straight and parallel on basal two-thirds, its anterior margin always strongly procurved; elytral declivity steeper, usually confined to less than posterior 30 percent of elytral length, its interstriae often unequally armed by small to moderately coarse, often unequal tubercles ..... 35

34(33). Anterior margin of pronotum serrate; declivital tubercles equally developed on all interstriae; body 2.2 times as long as wide; elytra 1.5 times as long as pronotum; Nicaragua and British Guiana to Bolivia and Brazil; 4.4–5.3 mm ..... 34c. ***spathipennis*** **Eichhoff**

— Anterior margin of pronotum unarmed; declivital tubercles on interstriae 1 and 3 distinctly larger, those on other interstriae minute to obsolete; body 2.5 times as long as wide; elytra 1.8 times as long as pronotum; Nicaragua to Ecuador; 5.1–5.9 mm ..... 35. ***princeps*** **Blandford**

35(33). Pronotum subquadrate or if anterior margin strongly procurved then pronotum less than 1.15 times as long as wide; interstriae 1–3 similarly sculptured or 2 with tubercles; elytral declivity more gradual, usually occupying at least 50 percent of elytral length, usually more broadly convex, with posterolateral margin more conspicuous; small strial setae commonly present in addition to those of interstriae; mostly larger, stouter species, dark brown to black ..... 36

— Pronotum never subquadrate, at least 1.2 times as long as wide, its sides usually almost straight and parallel on posterior half; declivital interstriae 1 (usually) and 3 armed by tubercles, 2 unarmed (except *titubanter*); declivity steeper, occupying less than posterior 35 percent of elytral length; strial setae absent (except in *sparsipilosus* and some *volvulus*); mostly smaller, slender species, yellowish or reddish brown (except for a few rare black species) ..... 58

36(35). Pronotum quadrate; elytral declivity usually steeper, more broadly rounded behind; sides of elytra usually subparallel on at least basal two-thirds ..... 37

— Pronotum strongly procurved on anterior margin; declivity usually more gradual, often beginning well in front of middle of elytra; sides of elytra usually tapered from middle, more narrowly rounded behind ..... 51

37(36). Striae on posterior two-thirds of elytra deeply impressed, interstriae of this area convex, shagreened (dull), and each with a row of moderately coarse, rounded granules to apex; posterolateral margin of declivity subacutely elevated from apex to interstriae 7; Costa Rica to Colombia and French Guiana; 2.7–2.8 mm ..... 36. ***asper*** **Eggers**

— Striae equally impressed and interstriae devoid of granules on more than basal half of elytra ..... 38

38(37). Granules on elytral declivity more widely spaced, usually conspicuously irregular in size and spacing, spaced by distances much greater than diameter of an adjacent strial puncture (if size irregular, ignore smallest granules for this measurement) ..... 39

— Granules on declivity of uniform size, uniformly spaced by distances not greater than diameter of an adjacent strial puncture; interstrial setae on declivity mostly very short ..... 45

39(38). Larger species, larger than 3.0 mm; granules on interstriae 1–3 about equal in size and number ..... 40

— Smaller than 2.5 mm; granules on declivital face averaging distinctly smaller and usually less numerous on interstriae 2 than those on 1 and 3 ..... 44

40(39). Body stouter, less than 2.5 times as long as wide; elytra rather broadly, obtusely rounded behind ..... 41

— Body more slender, more than 2.7 times as long as wide; elytra more narrowly, subacutely rounded behind ..... 43

41(40). Elytral declivity more strongly, more narrowly convex, posterolateral margin subacutely elevated, feebly concave between crest and interstriae 3; discal striae moderately to rather strongly impressed; Costa Rica to Brazil; 3.2–3.8 mm ..... 37. ***caraibicus*** **Eggers**

— Elytral declivity very broadly convex, posterolateral margin more strongly, acutely elevated, concave from its crest to suture; discal striae very weakly impressed ..... 42

42(41). Elytral declivity with transverse impression weak, obscure, suture convex on longitudinal axis on upper half, straight on lower half; posterolateral area of declivity very shallowly concave, Costa Rica to Panama; 3.7–4.0 mm ..... 38. ***commixtus*** **Blandford**

— Elytral declivity rather strongly, transversely impressed on lower half, suture distinctly concave on longitudinal axis on lower half; posterolateral area of declivity rather strongly concave; Costa Rica; 4.0 mm ..... 39. ***lacunatus*** **Wood**

43(40). Larger; declivital interstriae 1–3 bearing similar, small, variable granules, each interstriae with at least 15 granules; declivity more broadly convex; Costa Rica to Venezuela and French Guiana; 3.2–3.6 mm ..... 40. ***politus*** **Hagedorn**

— Smaller; declivital interstriae 1 and 3 each armed by about 4 to 8 granules of variable size, 2 bearing one moderately coarse tubercle just below middle and a series of about 6 to 10 minute granules; declivity strongly convex; Panama to Venezuela; 3.1–3.3 mm ..... 41. ***improvidus*** **Schedl**

44(39). Declivity more gradual, occupying posterior 40 percent of elytra; its surface shining; declivital interstrial bristles largely obsolete, longest setae about half as long as distance between rows; Costa Rica; 2.2–2.3 mm ..... 42. ***dissimulatus*** **Wood**

— Declivity steep, occupying posterior fourth of elytral length, its surface usually dull; declivital interstrial hair up to twice as long as distance between rows; Veracruz to Panama and Brazil; 2.2–2.5 mm ..... 43. ***posticus*** **Eichhoff**

45(38). Longitudinal axis of suture on lower half of declivity straight or feebly convex; posterolateral margin of declivity rather weakly elevated, area immediately above its crest slightly convex; more slender, body 2.8 times as long as wide ..... 46

— Lower half of declivity transversely impressed, longitudinal axis at suture slightly to moderately concave; posterolateral margin of elytral declivity more strongly, subacutely elevated, area immediately above its crest flattened to shallowly concave; stouter, less than 2.6 times as long as wide ..... 47

46(45). Smaller; declivital bristles usually less than half as long as distance between rows; Costa Rica to Venezuela; 2.5–2.7 mm ..... 44. ***concentus*** **Wood**

— Larger; declivital bristles as long as distance between rows; Panama; 3.6 mm ... ..... 45. ***quadratus*** **Blandford**

47(46). Pronotum subshining, disc with distinctly impressed, sublongitudinal parallel lines (modified reticulation); posterior margin of elytra more narrowly rounded behind; declivital interstrial bristles mostly two-thirds as long as distance between rows; Costa Rica and French Guiana; 2.3–2.7 mm ..... ..... 46. ***parallelocollis*** **Eggers**

— Pronotum almost smooth, weakly reticulate, shining; posterior margin of elytra much more broadly rounded behind; declivital interstrial bristles mostly less than one-third as long as distance between rows ..... 48

48(47). Declivity steeper, interstrial granules variable, very minute granules interspersed among larger ones; transverse impression on lower half of declivity not as strong; Chiapas to Peru and British Guiana; 2.9–3.3 mm ..... ..... 47. ***discretus*** **Eggers**

— Declivity more gradual, interstrial granules of uniformly small size or obsolete; transverse impression on lower half of declivity stronger ..... 49

49(47). Interstriae four to five times as wide as striae, strial punctures only slightly larger than those of interstriae; declivity shagreened, interstrial tubercles mostly obsolete, small, widely spaced on basal half; Costa Rica to Colombia; 3.4–4.0 mm ..... 48. ***schildi*** **Schedl**

— Interstriae less than three times as wide as striae, strial punctures about twice as large as those of interstriae; declivity shining, tubercles regularly, rather closely spaced to apex ..... 50

50(49). Larger; strial punctures on disc and declivity distinctly larger, discal striae 2 distinctly sinuate; interstriae 2 and 3 on disc with punctures confused; punctures on pronotal disc larger; Costa Rica; 3.8 mm ..... 49. ***tribulatus*** **Wood**

— Smaller; strial punctures slightly smaller, 2 straight on disc; interstriae 2 and 3 with punctures uniseriate; punctures on pronotal disc very fine; Costa Rica and Colombia to French Guiana; 2.3–2.6 mm ..... 50. ***semipunctatus*** **Eggers**

51(36). Strial punctures on disc confused but distinguishable from interstrial punctures, interstrial punctures confused and at least minutely granulate on their anterior margins; strial and interstrial punctures on declivity confused, indistinguishable; Costa Rica and French Guiana; 3.5–3.8 mm ..... ..... 51. ***tumucensis*** **Hagedorn**

— Strial punctures in rows on disc and declivity, easily distinguished from much smaller interstrial punctures ..... 52

52(51). Declivity rather steep (see also *titubanter*); sides of elytra parallel on at least basal two-thirds, more broadly rounded behind; discal interstriae clearly punctured or granulate, sometimes confused on 3; declivital striae moderately confused or not; about two to four widely spaced, small denticles on each declivital interstriae ..... 53

— Declivity gradual, occupying about posterior half of elytral length; sides of elytra parallel on basal half, tapered, then more narrowly rounded behind; interstrial punctures largely obsolete on disc (except *demissus*) ..... 54

53(52). Smaller; elytral declivity gradual, occupying posterior half of declivital length; posterior areas of pronotum smooth, punctures sparse, minute; Costa Rica and Colombia to French Guiana; 2.8–3.1 mm ..... 52. ***geayi*** **Hagedorn**

— Larger; elytral declivity rather steep, occupying posterior third of elytral length; posterior half of pronotum closely, shallowly punctured, their posterior margins minutely subgranulate; Costa Rica to Colombia; 4.2–4.4 mm ..... 53. ***grandis*** **Eichhoff**

54(52). Declivity commencing behind middle; interstriae punctured on disc; declivity convex or rather strongly, transversely impressed just below middle; interstrial granules on declivity slightly larger ..... 55

— Declivity more gradual, flattened to very shallowly, extensively concave; interstrial punctures on disc almost obsolete; interstrial granules on declivity fine to obsolete ..... 56

55(54). Declivity evenly, weakly arched both longitudinally and transversely; declivital interstrial setae very short, scalelike; Costa Rica; 2.0 mm ..... 55. ***demissus*** **Wood**

— Declivity rather strongly, transversely impressed just below middle; declivital interstrial setae slender, almost hairlike; Costa Rica and Venezuela; 3.3–3.7 mm ..... 54. ***vismiae*** **Wood**

56(54). Declivity commencing slightly behind middle, flattened to feebly convex on less than posterior fifth; declivital surface shining, rows of fine granules present on interstriae 1–3; Costa Rica; 2.8–3.4 mm (see also 56a. ***praestans*** **Wood**) ..... 56b. ***meritus*** **Wood**

— Declivity commencing at or anterior to middle, flattened to feebly concave on more than posterior third; declivital surface shagreened (dull); larger species ..... 57

57(56). Declivital interstriae 1–3 each armed by a row of small, widely spaced granules; declivity occupying posterior half of elytral length, more narrowly, less extensively flattened; Costa Rica to Panama; 4.0–4.4 mm ..... 57. ***costaricensis*** **Blandford**

— Declivital interstriae 1 and 2 usually entirely devoid of granules (one or more occasionally present); declivity occupying posterior two-thirds of elytral length, shallowly concave or broadly, shallowly bisulcate; Costa Rica; 4.5–4.8 mm ..... 58. ***prolatus*** **Wood**

58(35). Pronotal summit at or near middle, anterior slope of pronotum occupying distinctly more than anterior third; pronotum stouter, about 1.2 times as long as wide; discal interstriae punctured (punctures almost obsolete in *titubanter*); declivital striae clearly indicated (except in *imbellis*), punctures almost as on disc ..... 59

— Pronotal summit well in front of middle, anterior slope steep, confined to less than anterior third; pronotum at least 1.3 times as long as wide; discal interstriae devoid of punctures; declivital striae obsolete, declivital punctures confused, very much smaller than those on disc ..... 74

59(58). Declivity not as steep, occupying 33–38 percent of elytral length (except 25 percent in *celsus*), more broadly convex to flattened, its posterolateral margin narrowly, subangulately rounded to subacutely elevated ..... 60

— Declivity steep, convex, occupying 25 percent of elytral length, except 38 percent in *viduus*), its posterolateral margins broadly, obtusely rounded ..... 69

60(59). Elytra more narrowly rounded behind, declivity more gradual; approximately alternate interstrial punctures on disc finely granulate almost to base; approximately alternate interstrial bristles very coarse on disc and declivity; minute strial hair present on declivity ..... 61

— Elytra more broadly rounded behind, declivity usually steeper; punctures on discal interstriae never granulate, vestiture finer, usually shorter ..... 62

61(60). Smaller; tubercles on declivital interstriae 3 small, little if any larger than those on 1; elytra rather narrowly rounded behind; posterolateral margin of elytra subacutely costate; Costa Rica and Panama to French Guiana; 2.2–2.4 mm ..... 59. ***sparsipilosus*** **Eggers**

— Larger; tubercle near middle of declivity on interstriae 3 conspicuously larger; elytra subacuminate behind; posterolateral margin of elytra narrowly rounded; Costa Rica and Panama to French Guiana; 2.5–2.7 mm ..... 60. ***productus*** **Hagedorn**

62(60). Declivital interstriae 2 with pointed granules extending to or slightly below middle, their size equal to those on 1 and 3; interstrial punctures on disc mostly obsolete or exceedingly small; mature color black; Puebla; 3.0–3.2 mm ..... 61. ***titubanter*** **Schedl**

— Declivital interstriae 2 unarmed except for two or three small granules at base in all but *imbellis*; interstrial punctures on disc distinct ..... 63

63(62). Strial punctures on disc small in semidefinite rows to moderately confused, interstrial punctures rather abundant, confused; declivital punctures small, deep, confused, straie not evident; elytral vestiture short, fine, abundant; declivity unarmed; Veracruz to El Salvador; 4.4–4.7 mm ..... 62. ***imbellis*** **Blandford**

— Punctures on discal striae and interstriae in uniseriate rows; elytral declivity armed by several denticles ..... 64

64(63). Declivity rather strongly flattened or uncommonly very shallowly impressed, interstriae 1 and 2 unarmed except at base, 3 armed by about three widely spaced denticles, the one near middle conspicuously larger than others; interstrial setae on disc and declivity of about equal diameter and length (some often broken); color reddish brown; Michigan and Massachusetts to Argentina, pantropical; 2.0–3.3 mm ..... 63. ***ferrugineus*** **(Fabricius)**

— Declivity distinctly convex, interstriae 1 armed by one to several small tubercles on lower two-thirds; short and long interstrial setae commonly alternate in a row on disc and declivity ..... 65

65(64). Surface of elytral declivity shagreened (dull); declivity not as steep, more gently convex, denticles averaging slightly smaller; color yellowish to light reddish brown; Ohio and Massachusetts to Argentina, pantropical; 2.0–2.7 mm ..... 64. ***affinis*** **Eichhoff**

— Surface of elytral declivity shining; declivity at least slightly steeper, convex, denticles averaging slightly larger ..... 65

66(65). Declivity broadly, feebly convex, very steep, interstriae 1 broad, armed by two rather coarse, widely spaced denticles on its extreme lateral margin, 2 broad, flat, 3 armed by about three smaller denticles on its lateral margin, lateral margins moderately abrupt; Iowa and Vermont to E Texas and Florida; 3.6–4.5 mm ..... 65. ***celsus*** **Eichhoff**

— Declivity more strongly convex, interstriae not usually broad, denticles on interstriae 1 smaller and not displaced laterally; lateral margins of declivity more broadly rounded; smaller than 3.0 mm (the following three forms are virtually identical and may intergrade) ..... 67

67(66). Striae not at all impressed, strial punctures very small, spaced within a row by two or more diameters of a puncture; interstriae about three times as wide as striae, punctures small, regularly spaced by distances similar to those of striae; Florida and Baja California to Costa Rica ..... 66. ***volvulus*** **(Fabricius)** (s. str.)

— Striae feebly to distinctly impressed, strial punctures larger, spaced by average distances less than diameter of a puncture; interstriae less than twice as wide as striae, often weakly convex, punctures usually more irregularly spaced ..... 68

68(67). Color reddish brown; anterior tibia armed by six or seven socketed teeth, basal one rather remote from others; parts of Mexico to South America; 2.1–2.8 mm ..... 66. ***volvulus*** **(Fabricius)** (= ***torquatus*** **Eichhoff)**

— Color black; anterior tibia armed by seven socketed teeth, basal (seventh) tooth not noticeably more widely spaced than others; Michoacán and Guatemala to Costa Rica; 2.7–2.9 mm ..... 67. ***morulus*** **Blandford**

69(59). Female pronotum slightly impressed, weakly sulcate on more than basal half, sulcus one-fourth as wide as pronotum at base, half as wide near middle, anterior slope without asperities, setae on median two-thirds of anterior half rather abundant, very short, recumbent, sometimes appearing almost scalelike; declivity either flat or strongly sulcate ..... 70

— Basal half of female pronotum convex, anterior half asperate; declivity basically convex, interstriae 1 armed ..... 71

70(69). Declivity somewhat flattened, its surface reticulate-granulate, interstriae 1 as high as 3, 1–3 each with a row of very fine granules; pronotal impression not as strong, lateral setae finer; Missouri to Pennsylvania; 2.3–2.4 mm ..... 68. ***planicollis*** **Zimmermann**

— Declivity very strongly sulcate on median half, interstriae 3 much higher than 1, 1 and 2 smooth and shining and unarmed by granules, 3 armed by two coarse tubercles (0–4 smaller tubercles sometimes present); pronotal impression stronger, lateral setae coarser; Missouri to Maryland and Florida; 2.0–2.5 mm ..... 69. ***viduus*** **Eichhoff**

71(69). Elytral declivity broadly convex, somewhat flattened, its surface dull, minutely rugose-reticulate, denticles on interstriae 1 and 3 very small; color yellowish brown to light reddish brown; Minnesota and Maine to E Texas and Florida; 2.3–2.7 mm ..... 70. ***xylographus*** **(Say)**

— Declivity more narrowly convex, smooth, shining, some denticles on interstriae 1 and 3 larger, color rather light to dark reddish brown; in coniferous hosts (host of *californicus* unknown) ..... 72

72(71). Elytral vestiture abundant, short, strial setae present; centers of strial punctures on declivity reticulate-granulate; interstrial punctures on disc confused; California; 2.0–2.2 mm ..... 71. ***californicus*** **Wood**

— Elytral vestiture in interstrial rows; interiors of strial punctures on declivity smooth, shining ..... 73

73(72). Discal striae with punctures distinctly larger, interstriae not more than one and one-half times as wide as striae; denticles on declivital interstriae 1 and 3 smaller, their basal widths and heights equal to less than diameter of a strial puncture; Ontario and New Jersey to E Texas and Florida; 2.3–2.7 mm ..... 72. ***pubescens*** **Zimmermann**

— Discal interstriae at least twice as wide as striae; some declivital tubercles with height and basal width greater than diameter of a strial puncture; British Columbia and New York to Honduras; 2.2–2.7 mm ..... 73. ***intrusus*** **Blandford**

74(58). Larger; strial punctures on disc very small, shallow, interstriae about four times as wide as striae; declivity distinctly flattened on central half; Veracruz to Costa Rica; 4.0–4.4 mm ..... 74. ***declivis*** **Eichhoff**

— Smaller; strial punctures larger, deeper, interstriae about twice as wide as striae; declivity feebly flattened on smaller central area; Veracruz to Panama, Venezuela; 2.9–3.3 mm ..... 75. ***macer*** **Blandford**

### 1. *Xyleborus perebeae* (Ferrari)

Fig. 182

*Amphicranus* (?) *perebeae* Ferrari, 1869, Berliner Ent. Zeitschr. 12:252–253 (Holotype, female; Colombia; not in Vienna Mus., apparently lost.)

*Xyleborus perebeae*: Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):200

DIAGNOSIS.— This species is distinguished from the very closely related *flavipes* (Fabricius) by the dense, very minute, deep, impressed points on the elytral declivity, by the less deeply excavated elytral declivity, with the denticles on the lateral margins averaging much smaller, and by the slightly smaller average size.

FEMALE.— Length 2.3–2.8 mm, 2.0 times as long as wide; color black.

Frons broadly convex; surface reticulate, rather coarsely, obscurely, sparsely punctured; vestiture of sparse, fine, long, inconspicuous hair.

Pronotum 0.97 times as long as wide; sides, subparallel, weakly arcuate on basal half, rather narrowly rounded in front; anterior margin armed by six to eight small teeth, median denticles slightly larger; summit at middle, anterior slope steep, coarsely asperate; posterior areas reticulate, punctures minute, sparse.

Elytra 1.1 times as long as wide, 1.1 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly, feebly emarginate behind, with declivital denticles projecting slightly; striae not impressed, punctures small, shallow, distinct; interstriae almost smooth, shining, about six times as wide as striae, punctures very small, distinct, moderately confused. Declivity occupying posterior half of elytra, broadly, rather deeply excavated; entire face of excavated area minutely, densely punctured by impressed points, striae 2 and 3 clearly indicated, punctures slightly larger than on disc; sutural interstriae feebly elevated; lateral margins much higher than suture, ascending from striae 2 to moderately acute interstriae 3; interstriae 1 and 2 at base of elytra each with two or three moderately large, acutely pointed denticles, 3 with a row of about 9–12 sharply pointed denticles extending from declivital base to near apex, those in middle area moderately large, row usually interrupted just below middle; interstriae 4–7 with much smaller denticles. Vestiture of rows of fine, short, strial and interstrial hair on disc, much stouter on sides of declivital area; declivital face glabrous.

MALE.— Similar to female except 2.3 mm, pronotal summit at base, anterior slope gradual, more broadly convex, more finely asperate, anterior margin unarmed, basal median margin transversely carinate and precipitous behind; elytra similar but less perfectly formed, declivital interstriae 2 with fine granules.

DISTRIBUTION.— Guatemala to Panama and Colombia to Venezuela.

GUATEMALA: Trece Aguas in Alta Verapaz. COSTA RICA: Moravia and Turrialba in Cartago, Finca La Lola, Guápiles, and Pandora in Limón, Rincón de Osa in Puntarenas, Santa Ana, San Isidro del General, San Ignacio de Acosta, and Playón in San José. PANAMA: Barro Colorado Island, Ft. Clayton, and Madden Forest in

the Canal Zone, El Hato del Volcán in Chiriquí, and Cerro Campana in Cocle. OTHER COUNTRIES: Colombia, Venezuela.

HOSTS.— *Coffea robusta, Crotalaria* sp., *Ochroma* sp., *Psidium guava, Theobroma cacao,* and numerous other woody plants.

BIOLOGY.— The female usually attacks cut or broken branches and tree seedlings 2–7 cm in diameter. The entrance tunnel extends directly into the wood to a depth of about 1 cm, then bifurcates and follows a growth ring both to the right and to the left, on the same transverse plane, and often meeting and joining on the opposite side of the branch. Masses of eggs are deposited in the tunnels. The larvae feed in congress upon the ambrosial fungus and, evidently, also upon the woody tissues, thus expanding the original gallery along the grain of the wood to form a large tabular chamber barely large enough to accommodate the mass of growing larvae. As many as 30–50 larvae may be produced by one female. Males are rare. It is a common species in agricultural and other disturbed areas.

NOTES.— The above treatment was based on 101 females and one male. The identity of this species was based on the series of Blandford, Eggers, and Schedl.

### 2. *Xyleborus salvini* Blandford

*Xyleborus salvini* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):200 (Lectotype, female; Volcán de Chiriquí, Panama; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished from the very closely allied *flavipes* (Fabricius) by the more broadly, less deeply excavated elytral declivity, with denticles on the lateral margins smaller and stouter, by the larger strial punctures on the declivital face, and by the larger size.

FEMALE.— Length 3.2–3.6 mm, 2.0 times as long as wide; color black.

As in *perebeae* except frontal punctures slightly coarser; punctures on pronotal disc slightly larger; strial punctures smaller, interstriae about eight times as wide as striae; interstrial punctures on disc smaller, almost obsolete. Declivity as in *perebeae* except surface smooth, slightly shagreened, devoid of impressed points, strial punctures distinctly smaller, very shallow, spaced by two to four diameters of a puncture; denticles on basal and lateral margins averaging slightly smaller. Vestiture slightly longer than in *perebeae.*

DISTRIBUTION.— Costa Rica to NW Panama.

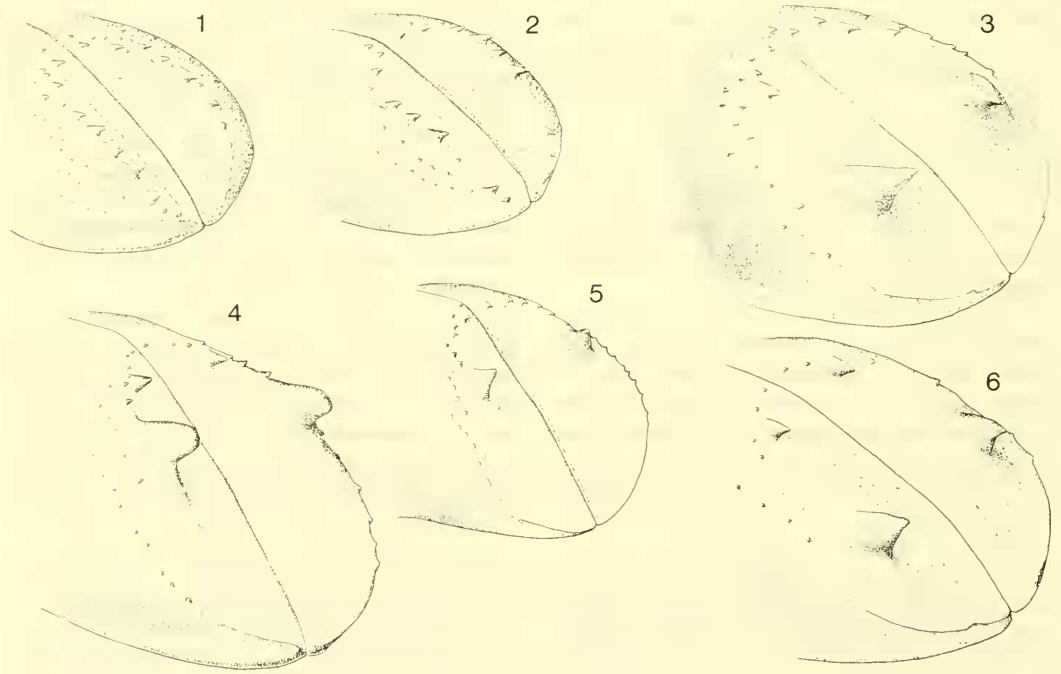



Fig. 182. *Xyleborus* spp., female declivities with setae omitted: 1, *perebeae,* normal, 2, same, a variation; 3, *sanguinicollis*; 4, *godmani*; 5, *pandulus*; 6, *ebenus.*

COSTA RICA: Escasú, San José, 2-X-63, 1300 m, No. 218, tree seedling, S. L. Wood; Tapantí, Cartago, 2-VII-63, 1300 m, No. 10, *Conostegia oerstediana*, S. L. Wood. PANAMA: Volcán de Chiriquí, G. C. Champion.

HOSTS.— *Conostegia oerstediana*, etc.

BIOLOGY.— As in *perebeae*. It is an exceedingly rare species.

NOTES.— The above treatment was based on the four syntypes and on two other females that were compared to the type. The first syntype is here designated as the lectotype of *salvini* Blandford.

### 3. *Xyleborus pandulus* Wood
Fig. 182

*Xyleborus pandulus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):34 (Holotype, female; Fort Clayton, Canal Zone, Panama; Wood Coll.)

DIAGNOSIS.— This rather common species has been incorrectly identified by Schedl, and others, as *varians* (Fabricius). It differs from *varians* by the smaller average size, by the steeper elytral declivity, and by the flatter lower half of the declivity with its ventrolateral margin subacutely elevated and its face irregular and closely, coarsely punctured.

FEMALE.— Length 2.7–3.0 mm, 2.0 times as long as wide; color dark brown, almost black.

Frons and pronotum as in *perebeae* (Ferrari) except each minute puncture on pronotal disc with a minute, smooth, shining spot on its posterior margin.

Elytra 1.0 times as long as wide, 1.06 times as long as pronotum; disc limited to basal half; disc as in *perebeae* except strial punctures slightly smaller. Declivity abruptly impressed at base, steep, rather broadly, deeply excavated on upper half, lower half more broadly flattened and with its abrupt lateral margin weakly elevated; basal margin abrupt, armed by about 4–8 small, pointed denticles scattered from interstriae 1–3; margin at interstriae 3 bearing a large, stout, conical spine one-fourth declivital length from basal margin, a larger setiferous pore just below its apex; interstriae 4 with four to six small, pointed denticles on and just before declivital margin, 5 with similar denticles extending along margin to or near sutural apex; declivital face closely, deeply, rather coarsely punctured, surface subshining, somewhat irregular. Vestiture limited to stout, scalelike bristles on margin and sides of declivity.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Dominical, Puntarenas, 9-XII-63, 3 m, No. 301, tree branch, S. L. Wood; Boston, Limón, IX-64, *Theobroma cacao*, J. L. Saunders; Finca La Lola, Limón, VIII-63, *Theobroma cacao*, J. L. Saunders. PANAMA: Canal Zone: Ft. Clayton, 22-XII-63, 30 m, No. 320, tree limb, S. L. Wood; Madden Forest, 2-I-64, 70 m, No. 367, tree limb, S. L. Wood; Limón Bay, 30-XII-63, 5 m, No. 354, tree branch, S. L. Wood.

BIOLOGY.— As in *perebeae*.

NOTES.— The above treatment was based on the type series of 20 specimens.

### 4. *Xyleborus godmani* Blandford
Fig. 182

*Xyleborus godmani* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):197 (Holotype, female; Bugaba, Chiriquí, Panama; British Mus. Nat. Hist.)

*Xyleborus caelebs* Blandford, 1898, Biol. Centr. Amer. Coleopt. 4(6):198 (Holotype, male; Volcán de Chiriquí, Panama; British Mus. Nat. Hist.); Wood, 1972, Great Basin Nat. 32:198. *Synonymy*

DIAGNOSIS.— This species is distinguished from *pandulus Wood* by the larger size, by the narrower excavated area on the anterior part of the elytral declivity, and by the larger major spine on the elytral declivity, with a different arrangement of minor denticles.

FEMALE.— Length 3.8–4.3 mm, 2.0 times as long as wide; color black.

Frons and pronotum about as in *perebeae* except punctures on pronotal disc slightly larger.

Elytra 1.1 times as long as wide, 1.2 times as long as pronotum; sides almost straight and parallel on basal half, very slightly narrowed then broadly rounded behind except broadly emarginate on median fourth; disc occupying basal 40 percent of elytra; striae minute, interstrial punctures minute, indistinct, surface slightly irregular. Declivity abrupt, rather gradual, broadly excavated; a very large, blunt spine on margin in line with interstriae 3 about one-fifth of declivital length from base; basal margin between major spine and suture armed by four or more very small denticles and one moderately large, pointed denticle located closer to major spine than to suture; lower half of ventrolateral margin below major spine subacutely rounded and armed by several small denticles, one or two at upper and lower ends slightly larger; declivital face smooth, obscurely shagreened, punctures very small, striae 1, 2, and 3 obscure, a few confused punctures on interstriae

2. Vestiture of stout bristles on margin and sides of declivity.

MALE.— Obscurely resembling female; 3.3–4.2 mm; pronotal summit at base, anterior slope gradual, somewhat flattened, punctured, asperities obsolete, basal margin transversely carinate; elytral declivity about as in female but more deeply excavated, major spine smaller, minor denticles reduced or absent, punctures on face of declivity distinctly larger.

DISTRIBUTION.— Costa Rica to Panama on the Pacific slope.

COSTA RICA: Santa Ana, San José, 4-X-63, 1300 m, No. 223, tree limb, S. L. Wood; Río Damitas, Dota Mts., San José, 18-II-64, No. 436, tree sapling, S. L. Wood; Dominical, Puntarenas, 9-XII-63, 3 m, No. 295, tree branch, S. L. Wood; Rincón de Osa, Puntarenas, 11-VII-66, 30 m, No. 69, *Vismia*, S. L. Wood. PANAMA: Volcán de Chiriquí, G. C. Champion; Bugaba, Chiriquí, G. C. Champion.

HOSTS.— *Vismia* sp., etc.

BIOLOGY.— As in *perebeae*. It is a rare species.

NOTES.— The above treatment was based on the holotypes of *godmani* and *caelebs*, and on 48 other specimens, several of which were compared to the types.

### 5a. *Xyleborus sharpi sharpi* Blandford

*Xyleborus sharpi* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):199 (Lectotype, female; Paraíso, prob. Panama; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This subspecies is exactly like *s. lenis* Wood except the face of the elytral declivity is densely, rather deeply punctured by minute impressed points.

FEMALE.— Length 3.3–3.9 mm, 2.0 times as long as wide; as in *s. lenis* except for surface sculpture of elytral declivity as noted in above diagnosis.

DISTRIBUTION.— Costa Rica to Panama on the Atlantic slope.

COSTA RICA: Limón Province; Beverly, 26-VIII-63, 10 m, No. 154, liana, S. L. Wood; Finca Boston, IX-64, *Theobroma cacao*, J. L. Saunders; Finca La Lola, 23-VIII-62, *Theobroma cacao*, J. L. Saunders; Guápiles, 22-VIII-66, 100 m, No. 119, *Terminalia*, S. L. Wood. Cartago Province: Tapantí, 17-VIII-63, 700 m, No. 107, tree branch, S. L. Wood. Heredia Province: Puerto Viejo, 12-III-64, 70 m, No. 480, liana, S. L. Wood. PANAMA: Barro Colorado Island, Canal Zone, 1938, C. Zetek; Madden Forest, Canal Zone, 2-I-64, 70 m, No. 367, tree limb, S. L. Wood; Ft. Clayton, 22-XII-63, 30 m, No. 320, tree limb, S. L. Wood; Cerro Campana, Cocle, 26-VII-66, 1000 m, No. 32, tree branch, S. L. Wood.

HOSTS.— *Terminalia* sp., *Theobroma cacao*, etc.

BIOLOGY.— As in *perebeae*.

NOTES.— The above treatment was based on the three syntypes and on 56 other specimens. The female syntype from Paraiso is here designated as the lectotype. Blandford indicated that this specimen came from Guatemala; however, its structure is of the southern form; the country of origin is not indicated on the label. Because several reports on this southern race have been published under this name, the Paraiso specimen was selected as the lectotype rather than a representative of the less common northern race.

### 5b. *Xyleborus sharpi lenis* Wood

*Xyleborus sharpi lenis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):35 (Holotype, female; 29 km E Coatzocoalcos, Veracruz, Mexico; Wood Coll.)

DIAGNOSIS.— This species is almost identical to *pandulus Wood*. It is distinguished by the much finer punctures on the declivital face, by the smoother declivital surface (the surface is very irregular, with irregular serpentine lines in *pandulus*), and by the smaller, less abundant denticles on the ventrolateral margin of the declivity.

FEMALE.— Length 3.3–3.9 mm, 2.0 times as long as wide; color dark brown.

Frons and pronotum essentially as in *perebeae*, except punctures on pronotal disc very slightly larger.

Elytra 1.1 times as long as wide, 1.3 times as long as pronotum; outline essentially as in *godmani* except apical emargination wider, not as deep; basic sculpture as in *godmani* except major spine stout, conical, pointed, largest denticle on basal margin closer to suture than to major spine; declivital area below major spine broadly elevated, denticles on posterolateral margin sparse, low, poorly formed; punctures on declivital face small, shallow, general surface between punctures shining, minutely irregular, spaces between punctures smooth, without impressed points. Vestiture as in *godmani*.

DISTRIBUTION.— Veracruz to Chiapas.

MEXICO: **Chiapas**: 13 km N Ocosingo, 2-VI-69; 21 km N Ocozocoautla 2-VII-69, Palenque Ruins, 9-V-69; all by D. E. Bright. **Oaxaca**: Valle Nacional. **Veracruz**: 29 km E Coatzocoalcos, 26-VI-67, 30 m, No. 104, tree limb, S. L. Wood; Dos Amates, 5-V-69, D. E. Bright;

Lago Catemaco, 16–20-VI-69, D. E. Bright; 16 km NW Sontecomapan, 18-VI-69, D. E. Bright.

BIOLOGY.— As in *perebeae*.

NOTES.— The above treatment was based on the holotype and on 33 other specimens. It differs from *s. sharpi* only by the minute surface sculpture of the elytral declivity.

### 6. *Xyleborus sanguinicollis* Blandford
Fig. 182

*Xyleborus sanguinicollis* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):198 (Holotype, female; Bugaba, Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from the rather distantly allied *sharpi* by the much lower position of the major declivital spines on the elytral declivity, by the larger size and more slender, pointed form of the major declivital spine, by the arrangement of minor declivital denticles, and by the rufescent pronotum, with black elytra.

FEMALE.— Length 3.5–3.8 mm, 2.0 times as long as wide; color black, with prothorax light reddish brown.

Frons and pronotum essentially as in *perebeae* except serrations on anterior margin of pronotum slightly larger; pronotum color reddish brown.

Elytra 1.1 times as long as wide, 1.2 times as long as pronotum; disc occupying 40 percent of elytral length, about as in *perebeae*. Declivity much as in *sharpi*, broadly excavated, sulcate on median third; basal margin abrupt, armed by five pairs of denticles from suture to interstriae 3, middle one distinctly larger; major spine slightly below middle, in line with interstriae 3, very large, moderately stout, sharply pointed, its base rising gradually from more than a third of declivital area on each elytron; a few minor denticles at base of interstriae 4 and 5, those on 5 continuing along declivital margin almost to suture, final one slightly larger than others; punctures on face of declivity very small, obscure, general surface densely punctured by minute points. Vestiture as in *godmani*.

MALE.— Length 3.0–3.6 mm; pronotum as in male *perebeae* and *sharpi*; elytra as in female except most minor denticles absent.

DISTRIBUTION.— Costa Rica to NW Panama on the Pacific slope.

COSTA RICA: San Ignacio de Acosta, San José, 5-VII-63, 1600 m, No. 38, tree sapling, S. L. Wood; San Isidro del General, 13-XII-63, 1000 m, No. 280, tree branch, S. L. Wood; Río Damitas, Dota Mts., San José, 18-II-64, 250 m, No. 436, tree sapling, S. L. Wood; Finca Gromaco, Puntarenas, 14-VII-63, 500 m, No. 80, tree seedling, S. L. Wood; Volcán, Puntarenas, 11-XII-63, 1000 m, No. 305, Humaro, S. L. Wood; Dominical, Puntarenas, 9-XII-63, 3 m, No. 301, tree limb, S. L. Wood; Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 69, *Vismia*, S. L. Wood. PANAMA: Bugaba, Chiriquí, G. C. Champion.

HOSTS.— *Vismia* sp., etc.

BIOLOGY.— As in *perebeae*.

NOTES.— The above treatment was based on the holotype, on my 2 homotypes, and on 36 other specimens.

### 7. *Xyleborus ebenus* Wood
Fig. 182

*Xyleborus ebenus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):39 (Holotype, female; Guápiles, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *sanguinicollis* Blandford by the black prothorax, by the smooth, shining surface of the lower elytral declivity, and by the distinctly impressed declivital punctures.

FEMALE.— Length 3.7–3.9 mm, 2.0 times as long as wide; color black. As in *sanguinicollis* except as noted in above diagnosis.

MALE.— Differing from male *sanguinicollis* in same characters as for females.

DISTRIBUTION.— Atlantic slope of Costa Rica to Pacific slope of Panama and Colombia.

COSTA RICA: Guápiles, Limón, 22-VII-66, 100 m, No. 110, 113, tree sapling, S. L. Wood; Zant, Limón, 30-V-48, *Theobroma cacao*, Salas; Turrialba, Cartago, 9-III-66, 700 m, No. 460, tree sapling, S. L. Wood. PANAMA: Cerro Punta, Chiriquí, 11-I-64, 2800 m, S. L. Wood; Cerro Campana, Cocle, 26-VII-66, 1000 m, No. 32, tree branch, S. L. Wood. COLOMBIA: 8 km S Colonia (near Buenaventura), Valle de Cauca, 9-VII-70, 30 m, No. 619 in *Pouteria*, No. 636 in *Protium nervosum*, S. L. Wood.

HOSTS.— *Pouteria* sp., *Protium nervosum*, *Theobroma cacao*, etc.

BIOLOGY.— As in *perebeae*.

NOTES.— The above treatment was based on the type series of 25 specimens and on 32 other specimens.

### 8. *Xyleborus obesus* LeConte
Fig. 187

*Xyleborus obesus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:159 (Lectotype, female; Virginia; Mus. Comp. Zool., 989, present designation)

*Xyleborus serratus* Swaine, 1910, Canadian Ent. 42:162 (Lectotype, female; Ste. Anne de Bellevue, Quebec; Canadian Nat. Coll., 9327, designated by Bright, 1967, Canadian Ent. 99:680); Hopkins, 1915, U.S. Dept. Agric. Rept. 99:69. *Synonymy*

*Anisandrus populi* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):22 (Lectotype, female; Ste. Anne de Bellevue, Quebec; Canadian Nat. Coll., subsequent designation by Bright, 1967, Canadian Ent. 99:673); Schedl, 1964, Reichenbachia 3:314. *Synonymy*

DIAGNOSIS.— This species is distinguished from *dispar* (Fabricius) by the presence of three to five denticles on the posterolateral margin of the elytral declivity, and by the slightly larger punctures on the pronotal disc. Most specimens appear much stouter than *dispar*, but this character is not consistent.

FEMALE.— Length 2.8–3.5 mm, 2.0–2.2 times as long as wide; color very dark brown, almost black.

Frons broadly convex, slightly, transversely impressed above epistoma; surface reticulate, punctures rather small, shallow, moderately close; vestiture inconspicuous, hairlike.

Pronotum 0.93 times as long as wide; widest on basal third, sides rather strongly arcuate, broadly rounded anteriorly, slightly produced near median line; anterior margin armed by four (rarely six) rather coarse serrations; summit at middle, broad; anterior half rather coarsely asperate; posterior areas reticulate, fine- and medium-sized punctures intermixed, rather shallow. Vestiture hairlike, short on disc, long on lateral and anterior margins.

Elytra 1.1 times as long as wide, 1.3 times as long as elytra; sides straight and parallel on basal three-fourths, obtusely subangulate behind; striae not impressed, punctures moderately coarse, rather deep; interstriae smooth, shining, twice as wide as striae, punctures rather fine, confused. Declivity steep, broadly convex; striae slightly impressed, about as on disc; interstrial punctures uniseriate, very finely granulate; subapical posterolateral margin subacutely elevated from a point in line with striae 2 to interstriae 7, its crest tuberculate, three to five tubercles moderately coarse. Vestiture of rows of very small strial hair, and of fine, long, moderately abundant interstrial hair; longest setae almost twice as long as an interstriae.

MALE.— Length 1.5–1.8 mm; dwarfed, strongly convex; head basically as in female; pronotum outline as in female, much more broadly convex, summit indefinite, almost devoid of asperities, surface, smooth, shining, anterior margin unarmed; elytra declivous almost from base, striae and interstriae as in female, posterolateral margin very feebly elevated, granules almost obsolete.

DISTRIBUTION.— Minnesota and Quebec to West Virginia.

CANADA: **Ontario**: Ottawa. **Quebec**: Ft. Coulogne, Ile Perrot, Kings Mtn., Ste. Anne's. USA: **Connecticut**: Hampton. **Minnesota**: Hennepin Co., Itasca Park, Ramsey Co. **Wisconsin**: Clintonville.

HOSTS.— *Fagus grandifolia, Populus tremuloides*, and *Quercus* sp.

BIOLOGY.— Evidently as in *dispar*.

NOTES.— The above treatment was based on the 2 syntypes of *obesus* in the LeConte collection, on 4 topotypic homotypes (possibly syntypes), and on 81 other specimens. The first syntype in the LeConte series, from Virginia, is here designated as the lectotype of *obesus* LeConte. It bears a red type label, Type No. 989, and has been regarded as the type for many years, although not previously so designated.

### 9. *Xyleborus dispar* (Fabricius)
Fig. 187

*Apate dispar* Fabricius, 1792, Entomologia systematica emendata et aucta, secundum classes . . . 1(2):363 (Syntypes; Germany; Copenhagen Mus.; not examined)

*Bostrichus brevis* Panzer, 1793, Fauna Germanica 8:34 (Syntypes?; Germany); Hagedorn, 1910, Coleopt. Cat. 4:102. *Synonymy*

*Bostrichus thoracicus* Panzer, 1793, Fauna Germanica 8:34 (Syntypes?; Germany); Hagedorn, 1910, Coleopt. Cat. 4:102. *Synonymy*

*Scolytus pyri* Peck, 1817, Massachusetts Agric. J. 4(3):207 (Syntypes?; Massachusetts; presumably lost); Schedl, 1960, Coleopterists Bull. 14(1):11. *Synonymy*

*Bostrichus tachygraphus* Sahlberg, 1834, Dissertatio entomologica insecta Fennica enumerans, p. 52 (Syntypes?); Hagedorn, 1910, Coleopt. Cat. 4:102. *Synonymy*

*Bostrichus ratzeburgi* Kolenati, 1846, Meletemata Ent. 3:39 (Syntypes?); Ferrari, 1867, Die Forst- und Baunzuchtschädlichen Borkenkäfer, p. 27. *Synonymy*

*Anisandrus swainei* Drake, 1921, Ohio J. Sci. 21:203 (Holotype, female; New York; U.S. Nat. Mus.); Wood, 1957, Canadian Ent. 89:403. *Synonymy*

*Xyleborus cerasi* Eggers, 1937, Ent. Blätt. 33:335 (Holotype, female; Montella, Avellino, Italy; deposited

in but not now in Eggers Coll., presumably on loan to Schedl); Schedl, 1964, Reichenbachia 2:220. *Synonymy*

DIAGNOSIS.— This species is distinguished from *obesus* LeConte by the absence of denticles on the posterolateral margin of the elytral declivity, and from *sayi* (Hopkins) by the larger body size and by the larger numbers of serrations arming the anterior margin of the pronotum.

FEMALE.— Length 2.8–3.5 mm, 2.2 times as long as wide; color dark brown to black.

Frons and pronotum as in *obesus* except anterior margin of pronotum armed by six to eight serrations and punctures on posterior areas of pronotum uniformly small.

Elytra as in *obesus* except declivity not quite as steep, interstrial granules on declivity averaging slightly larger, and elevated subapical posterolateral margin slightly, minutely sinuate, not actually serrate or armed by denticles; vestiture hairlike, longest setae little if any longer than width of an interstriae.

MALE.— As in male of *obesus* except anterior margin of pronotum feebly serrate and anterior slope of pronotum more coarsely asperate; setae on median half of elytra very short.

DISTRIBUTION.— British Columbia and Nova Scotia to Utah and Virginia; introduced from Europe.

CANADA: **British Columbia**: Bowser, Creston, Langley Prairie, Nanaima, Royston, Squamish, Vancouver. **Nova Scotia**: Ann Valley, Cornwallis, Gap Valley, Halifax. **Ontario**: Ridgeway. USA: **District of Columbia**: Washington. **Idaho**: Coeur d'Alene, Moscow, Plummer. **Maine**: Orono, Paris, Strong. **Maryland**: Annapolis, Melrose Highlands. **Massachusetts**: Chicopee, Natick, Petersham. **Michigan**: Agricultural College, Elberta, Mt. Clemens, Shelby. **New Jersey**: Clemton, Jamesburg, Morristown, Newark, Orange Mtn., Rutherford, Westville. **New York**: Albany, Cranberry Lake, Forestburg, Lockport, Peekskill, Staten Island, West Point. **North Carolina**: Wakefield. **Ohio**: Clarksburg, Euclid, Minerva, Perry. **Oregon**: Beaverton, Carlton, Forest Grove, Polk Co., Talent. **Pennsylvania**: Burning Well, Eagles Mere Park, Forest Dale, Milford, Montebello, Morrisville, Promised Land, Tannersville. **Rhode Island**: Kingston. **Utah**: Logan Canyon, Milton in Morgan Co., Hobble Creek in Utah Co., Salt Lake City. **Virginia**: Falls Church, Rosslyn. **Washington**: Blaine, Dole, Enumclaw, Puyallup, Richmond Beach. **West Virginia**: Bayard, Randolph Co.

HOSTS.— *Acer nigrum*, *A. platanoides*, *A. saccharinum*, *Betula fontinalis*, *B. papyrifera*, *Castanea dentata*, *Corylus* sp., *Juglans* sp., *Malus* spp., *Prunus* sp., *Pyrus communis*, *Quercus* spp., *Salix* sp., *Vitis* sp.

BIOLOGY.— Unthrifty or injured limbs and boles 5–20 cm in diameter or larger are selected for attack. The female constructs a short, radial entrance tunnel from which two transverse egg galleries branch about 1–3 cm below the surface of the wood. In smaller material the tunnel may spiral rather than follow a transverse pattern. Short branch tunnels may extend from the main gallery; at times longitudinal branches may again branch on a transverse plane into two galleries resembling the original pair. At times this species has been an important pest in fruit orchards. This is the only species of Scolytidae known to have a true diapause.

NOTES.— The above treatment was based on 7 European specimens and on 414 American specimens. They agree with specimens identified as *dispar* by Eggers, who studied the type series, and with LeConte's specimens of *pyri*, which agree with those of Fitch, Harris, and Schwarz. The holotype of *swainei* was examined and compared to my material.

### 10. *Xyleborus sayi* (Hopkins)

Fig. 187

*Xyleborus obesus* var. *minor* Swaine, 1910 (nec. Stebbing, 1909), Canadian Ent. 42:164 (Lectotype, female; Ste. Anne de Bellevue, Montreal Island, Quebec; Canadian Nat. Coll., 9315, subsequent designation by Bright, 1967, Canadian Ent. 99:680)

*Anisandrus sayi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:68 (Holotype, female; Morgantown, West Virginia; U.S. Nat. Mus., 7432); Wood, 1957, Canadian Ent. 89:403. *Synonymy*

*Xyleborus neardus* Schedl, 1950, Ann. Mag. Nat. Hist. (12)3:893. Replacement name for *minor* Swaine

DIAGNOSIS.— This species is distinguished from *dispar* (Fabricius) by the smaller body size and by the smaller number of serrations arming the anterior margin of the pronotum.

FEMALE.— Length 2.3–2.6 mm, 2.2 times as long as wide; color dark brown to almost black.

As in *dispar* except anterior margin of pronotum armed by two to six serrations, median pair much larger; declivital striae less distinctly impressed, punctures averaging slightly smaller; elytral vestiture as long as in *dispar*, slightly more abundant.

MALE.— Length 1.3 mm; as in male *dispar* except anterior margin of pronotum unarmed, asperities on anterior slope smaller; vestiture about as in female.

DISTRIBUTION.— Ontario and Quebec to Missouri and Georgia.

CANADA: **Ontario**: Fletcher, Ottawa, Toronto. **Quebec**: Knowlton, Ste. Anne de Bellevue. USA: **Connecticut**: Lyme. **District of Columbia**: Washington. **Indiana**: Shoals. **Kentucky**: Cumberland St. Pk. **Maine**: Strong. **Maryland**: Great Falls, Silver Spring. **Michigan**: Detroit. **Missouri**: Dent Co. **New Jersey**: Anglesia, Red Bank. **New York**: Buffalo, Ithaca, Syracuse, West Point. **North Carolina**: Cherokee, Pink Beds, Tryon, Whitesides Mtn. **Ohio**: Hocking Co. **Pennsylvania**: Clark's Valley, La Port. **Tennessee**: Gatlinburg, Tellico Plains. **Virginia**: Falls Church, Rosslyn. **West Virginia**: Dellslow, French Creek, Morgantown, Pocahontas Co., Webster Co.

HOSTS.— *Acer rubrum*, *A.* sp., *Betula papyifera*, *B.* sp., *Castanea* spp., *Cornus* sp., *Fagus sylvatica*, *Kalmia latifolia*, *Lindera benzoin*, *Nyssa* sp., *Sassafras albidum*.

BIOLOGY.— Evidently as in *dispar* except that smaller limbs and branches are attacked.

NOTES.— The above treatment was based on 4 paralectotypes of *minor*, on the holotype of *sayi*, and on 160 other specimens.

### 11. *Xyleborus horridus* Eichhoff
Fig. 183

*Xyleborus horridus* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:282 (Lectotype, female; Teapa, Mexico; Brussels Mus., present designation)

*Xyleborus flohri* Schedl, 1972, Koleopt. Rund. 50:69 (Holotype, female; Mexico; Schedl Coll.); Wood, 1977, Great Basin Nat. 37:211. *Synonymy*

DIAGNOSIS.— This species is distinguished from the closely related *horridatus* Wood by the larger average size, by the absence of a predeclivital impression on the basal half of the elytra, by the much more abundant elytral vestiture, particularly on the declivity, and by the larger tubercles on declivital interstriae 3, and by the distribution.

FEMALE.— Length 3.8–4.2 mm, 2.3 times as long as wide; color dark reddish brown.

Frons broadly convex, a weak, transverse impression above epistoma; surface reticulate, punctures rather small, close, obscurely impressed, subgranulate on lower half; vestiture of fine, sparse hair.

Pronotum 1.0 times as long as wide; widest on basal third, sides moderately arcuate, distinctly converging toward broadly rounded anterior margins; anterior margin armed by 8–12 low serrations; summit broad, slightly behind middle; anterior slope rather coarsely, closely asperate; posterior areas smooth, shining, punctures moderately fine, rather deep, close. Vestiture of fine, rather short hair.

Elytra 1.5 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, converging very slightly, then very broadly rounded behind; disc occupying very slightly more than basal half of elytra; striae 1 feebly, others not impressed, punctures small, distinctly impressed; interstriae smooth, shining, obscure indications of impressed lines, four times as wide as striae, punctures strongly confused, rather close. Declivity broadly impressed, rather gradual and narrower on its basal half; steeper and more nearly subconcave on its apical half, surface smooth, shining, and densely, coarsely, rather shallowly covered by confused punctures; position of interstriae 1

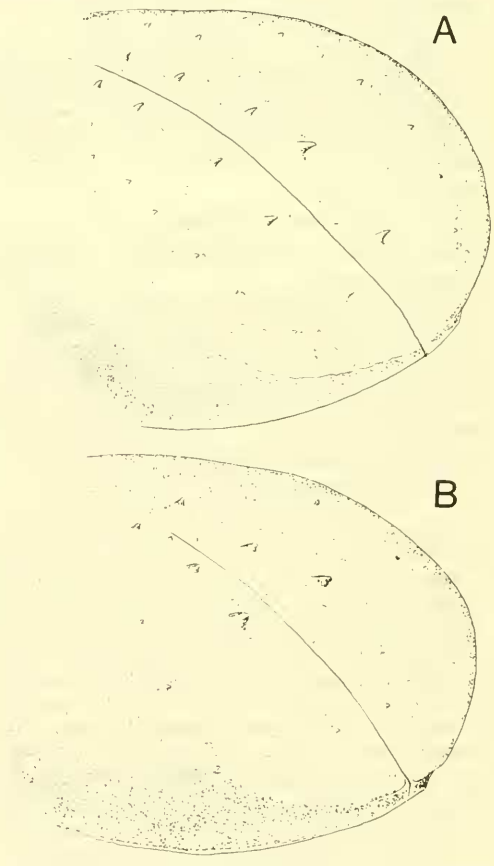



Fig. 183. *Xyleborus* spp., female declivities with setae omitted: A, *horridus*; B, *horridatus*.

armed by a row of 3–5 rather coarse, stout, pointed tubercles, those near base and apex smaller; position of interstriae 3 armed by a row of 6–8 smaller denticles; lateral areas attaining a rounded summit at about interstriae 4; posterolateral margin suacutely elevated from apex to about interstriae 5. Vestiture of rather abundant, fine, rather long hair; more abundant on declivity; slightly longer on sides.

DISTRIBUTION.— S Texas to Guatemala.

USA: Texas: Brownsville, 3-VI, 11-V, 3-VI-32; Hidalgo Co., 20-III-52, D. J. and J. N. Knull. MEXICO: Tabasco: Teapa, Salle. Veracruz: El Palmar, 4-IV-57, *Hevea brasiliensis*, R. Coronado, and 22-III-58, *Hevea brasiliensis*, E. Topete. GUATEMALA: Pantaleon, G. C. Champion.

HOSTS.— *Hevea brasiliensis*, etc.

NOTES.— The above treatment was based on the 2 female syntypes in the Brussels Museum and on 22 other specimens. The second of these syntypes is from Teapa and is here designated as the lectotype of this species.

### 12. *Xyleborus horridatus* Wood

Fig. 183

*Xyleborus horridatus* Wood, 1967, Great Basin Nat. 27:135 (Holotype, female; San Isidro del General, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the closely related *horridus* Eichhoff by the smaller average size, by a predeclivital impression that may begin on the basal fourth of the elytra, by the less abundant elytral vestiture, by the smaller denticles on declivital interstriae 3, and by the distribution.

FEMALE.— Length 3.4–4.0 mm, 2.3 times as long as wide; color rather dark reddish brown.

Frons and pronotum as in *horridus* except anterior margin armed by 10–14 low serrations.

Elytra as in *horridus* except declivity commencing anterior to middle of elytral length, a predeclivital impression on interstriae 1 and 2 sometimes extending to basal fourth; denticles on declivital interstriae 1 about 2–4 in number, averaging slightly smaller in size, denticles on other interstriae much smaller, mostly obsolete; vestiture on elytral disc shorter, less abundant, very sparse, almost obsolete on declivity.

MALE.— Length 3.3–3.5 mm; head and elytra much as in female except characters poorly formed, elytral declivity commencing on basal fourth, all denticles virtually obsolete, posterolateral margin rounded; pronotal asperities almost obsolete, anterior half of pronotum deeply, concavely excavated, anterior margin smooth, strongly, acutely elevated and produced into an acute median process.

DISTRIBUTION.— Costa Rica to Colombia.

COSTA RICA: San Isidro del General, 5-XII-63, 1000 m, No. 277, *Citrus*, S. L. Wood; Dominical, Puntarenas, 9-XII-63, 3 m, No. 296, liana, S. L. Wood; Guápiles, Limón, 22-VIII-66, 100 m, No. 125, *Theobroma cacao*, S. L. Wood; Pandora, Limón, 23-VII-63, 50 m, No. 135, tree limb, S. L. Wood; Hamburgfarm on Río Reventazón, Santa Clara, Limón, 10-VI-23, Nevermann. PANAMA: Barro Colorado Island, Canal Zone, 26-II-29, S. W. Frost. COLOMBIA: Finca El Canto, La Plata, Huila, 28-IV-59, naranjo dulce, B. Humides.

HOSTS.— *Citrus sinensis*, *Theobroma cacao*, etc.

BIOLOGY.— Unthrifty limbs 5–10 cm in diameter were attacked. The mature gallery system consisted of a mass of bifurcately branched and rebranched tunnels. The entire system was rather compact, with none of the short branches extending more than a few centimeters from the original entrance tunnel.

NOTES.— The above treatment was based on the type series of 35 specimens and on 5 additional specimens.

### 13. *Xyleborus* (*Neoxyleborus*) *palatus* Wood

*Xyleborus palatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):35 (Holotype, female; 24 km W Armeria, Colima, Mexico; Wood Coll.)

DIAGNOSIS.— This species is but remotely related to other species groups included here in the subgenus *Neoxyleborus*. It differs from other species treated here in this group by the steeper, flat elytral declivity, and by the arrangement of declivital denticles.

FEMALE.— Length 1.8–2.1 mm, 2.3 times as long as wide; color very dark brown to black.

Frons broadly concave, a slight, transverse impression above epistoma; surface strongly reticulate, punctures small, shallow, sparse.

Pronotum 1.1 times as long as wide; sides feebly arcuate, almost parallel on basal two-thirds, rather broadly rounded in front; anterior margin armed by 6 to 10 serrations, median one or two pairs distinctly larger; summit at middle; anterior area rather coarsely asperate; posterior areas mostly reticulate

with some shining areas, punctures rather small, shallow, moderately close. Vestiture of moderately abundant, fine, short hair.

Elytra 1.4 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on slightly more than basal two-thirds, rather narrowly rounded behind; disc occupying basal 60 percent of elytral length; striae not impressed, punctures rather small, moderately deep, spaced within a row by one to two diameters of a puncture; interstriae almost smooth, shining, about three to four times as wide as striae, punctures very fine, slightly confused on basal two-thirds of disc, uniseriate toward declivity. Declivity rather steep, flat on median half from rounded base to near apex; surface shagreened; striae as on disc, apices of 2 and 3 diverge toward suture; interstriae 1–3 flat; all interstriae with rows of small, pointed granules, those near base on all interstriae larger, those on 1 and 2 on face of declivity and on lower half of 5, 7, and 8 minute, others slightly larger; posterolateral margin rounded, marked by a row of small tubercles from apex to interstriae 9. Vestiture of minute strial hair on and near declivity, and interstrial bristles each as long as distance between rows on and near declivity, confused on anterior areas of disc.

DISTRIBUTION.— Nayarit to Colima.

MEXICO: **Colima**: 53 km S Colima, 27-VI-65, 700 m, No. 125 in flight, S. L. Wood; 24 km W Armeria, 30-VI-65, 30 m, No. 147 in flight, No. 153 in a tree branch, S. L. Wood; 6 km S Cihuatlán, Colima, 30-VI-65, 70 m, No. 157, liana, S. L. Wood. **Jalisco**: Volcán Colima, 23-VI-65, 2500 m, No. 124, shrub limb, S. L. Wood. **Nayarit**: Laguna Santa María, 6-VII-65, 1000 m, No. 193, liana, S. L. Wood; 8 km E San Blas, 12-VII-65, 70 m, No. 232, leguminose tree, S. L. Wood.

BIOLOGY.— Unthrifty limbs and branches were attacked.

NOTES.— The above treatment was based on the type series of 24 specimens.

### 14. *Xyleborus* (*Neoxyleborus*) *squamulatus* Eichhoff

*Xyleborus squamulatus* Eichhoff, 1869, Berliner Ent. zeitschr. 12:282 (Holotype, female; Brazil; Brussels Mus.)

DIAGNOSIS.— This species is distinguished from the distantly related *spinulosus* Blandford by the broadly impressed, shallowly concave elytral declivity on which strial punctures are obsolete, by the abundant, short, confused declivital scales, and by the uniformly small declivital denticles.

FEMALE.— Length 1.7–2.3 mm, 2.5 times as long as wide; color very dark brown to almost black.

Frons as in *palatus* Wood.

Pronotum 1.1 times as long as wide; widest just behind middle, sides moderately arcuate on basal two-thirds, rather broadly rounded in front; anterior margin armed by 12–16 narrow, rather low serrations; summit rather broad, at middle; anterior slope rather coarsely, not closely asperate; entire surface reticulate except asperities; posterior areas with fine, shallow, widely spaced punctures. Vestiture of fine, rather sparse, moderately short hair.

Elytra 1.5 times as long as wide; 1.3 times as long as pronotum; sides almost straight and parallel on basal half, then gradually narrowed to just before rather broadly rounded apex; disc occupying slightly less than basal half of elytral length; striae 1 slightly, others weakly to feebly impressed, punctures rather small, close, moderately deep; interstriae smooth, shining, about three times as wide as striae, punctures fine, uniseriate, replaced by tubercles toward base of declivity. Declivity gradual, broadly, subconcavely impressed; all margins rounded; declivital face with dense, fine, confused squamiferous punctures, striae obsolete; interstriae 1–9, on basal and lateral margins each armed by about two to four sharply pointed denticles, length of largest about equal to one-half width of an interstriae, those on posterolateral margin continuing almost to suture. Vestiture on disc of rows of fine strial and interstrial hair; on declivity of small scales, each scale about one and one-half to two times as long as wide.

DISTRIBUTION.— Chiapas to Brazil.

MEXICO: **Chiapas**: 8 km SW El Bosque, 3-VII-69, D. E. Bright. GUATEMALA: Palín, Esquintla, 19-V-64, 300 m, No. 684, *Inga*, S. L. Wood; Cerro Zunil, G. C. Champion. COSTA RICA: Cartago, Cartago, 30-X-63, 1900 m, No. 249, tree seedling, S. L. Wood; Tapantí, Cartago, 2-VII-63, 1300 m, No. 10, *Conostegia oerstediana*, S. L. Wood. OTHER COUNTRIES: Colombia, Venezuela, Brazil.

HOSTS.— *Conostegia oerstediana*, *Inga*, etc.

BIOLOGY.— Specimens were taken from material 5–8 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 87 other specimens.

### 15. *Xyleborus* (*Neoxyleborus*) *spinulosus* Blandford

*Xyleborus spinulosus* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):201 (Lectotype, female; San Geronimo, Guatemala; British Mus. Nat. Hist., present designation)

*Xyleborus fusciseriatus* Eggers, 1934, Ent. Blätt. 30:82 (Holotype, female; La Caja, 8 km W San José, San José, Costa Rica; Berlin Mus.); Wood, 1979, Great Basin Nat. 39:137. *Synonymy*

*Xyleborus spinosulus* Schedl, 1934, Stylops 3:178 (Holotype, female; Honolulu, Hawaiian Islands; F. C. Hadden Coll.); Wood, 1966, Great Basin Nat. 26:32. *Synonymy*

*Xyleborus artespinulosus* Schedl, 1935, Arch. Inst. Biol. Veg. Río de Janeiro 2:93 (Syntypes, females; Hamburgfarm on Río Reventazón, Santa Clara, Limón, Costa Rica; Schedl and Nevermann colls.); Wood, 1979, Great Basin Nat. 39:137. *Synonymy*

DIAGNOSIS.— This species is distinguished from *ferox* Blandford by the smaller average size, by the more variable, more numerous, shorter, stouter declivital spines, and by the less strongly excavated declivity.

FEMALE.— Length 1.8–2.6 mm, 2.6 times as long as wide; color dark brown to almost black.

Frons and pronotum as in *palatus* Wood except curvature of anterior margin of pronotum variable, armed by 8–12 low serrations; reticulation on pronotal disc more conspicuous, smooth areas often obsolete.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; sides almost straight and subparallel on slightly less than basal half, gradually tapered to half its width; apex shallowly emarginate on median third of elytral width; disc occupying basal 40 percent of elytral length; striae not impressed, punctures small, moderately impressed; interstriae smooth, shining, three to four times as wide as striae, punctures rather small, widely spaced, uniseriate. Declivity gradual, rather broadly excavated; striae 1 and 2 clearly indicated by punctures similar to those on disc; suture weakly elevated, 2 strongly impressed, gradually ascending to broad, rounded, moderately elevated summit on 3 and 4 (much higher than suture), elevation continued to apical margin in line with striae 2; interstriae 1 and 2 armed by one to three small, pointed denticles at base, minute granules may also continue to middle of declivity, 3 armed by about six denticles of increasing size, lower one usually much larger, almost equal in length to width of a discal interstriae, located near middle of declivity; 4 and 5 with series of very small denticles continuing to near apex of lateral elevation, apex of lateral elevation armed by one to three larger spines similar to major spine on 3; these major spines may vary within series, between series, and on opposite sides of one specimen. Vestiture consisting of interstrial rows of hair on disc, of rows of scales on declivity; each scale about four to six times as long as wide, about half to two-thirds as long as distance between rows.

MALE.— Length 1.5 mm; basically similar to female except pronotal summit indefinite, asperities obsolete, anterior area punctured, broadly convex, anterior margin unarmed; elytral declivity much less strongly impressed, all granules and denticles obsolete; all characters less perfectly formed.

DISTRIBUTION.— Jalisco to Brazil, and Hawaii.

MEXICO: Chiapas: Ocozocoautla. Jalisco: Atenquique. Nayarit: San Blas. Veracruz: Dos Amates, Lago Catemaco, Sontecomapan. GUATEMALA: Palín in Esquintla. HONDURAS: Zamorano. COSTA RICA: Cañas and Liberia in Guanacaste, Dominical and Rincón de Osa in Puntarenas, San Isidro del General, Santa Ana, Río Damitas (Dota Mts.), and Playón in San José, Beverley and Guápiles in Limón. OTHER AREAS: Venezuela, Brazil, Hawaii.

HOSTS.— *Bursera simarubra, Cecropia* sp., *Ochroma* sp., *Terminalia* sp., etc.

BIOLOGY.— Unthrifty, cut, or broken seedlings, limbs, and branches of trees and lianas are infested by this species. The tunnels evidently are similar to those of *Xylosandrus*.

NOTES.— The above treatment was based on the type series of *spinulosus*, on the syntype of *artespinulosus* in the Schedl collection and one in the Eggers collection, on the "paratype" of *spinosulus* in the Schedl collection, and on 157 American and 21 Hawaiian additional specimens, several of which were compared directly to the type material. Of the 5 syntypes now in the British Museum (Natural History), the first, a female from San Gerónimo, Guatemala, was labeled "Type" many years ago but has never officially been so designated. I here designate that female as the lectotype of *spinulosus* Blandford.

### 16. *Xyleborus* (*Neoxyleborus*) *ferox* Blandford

*Xyleborus ferox* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):201 (Holotype, female; Bugaba, Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— The exceedingly large declivital spines distinguish this species; other features are mentioned in the key and in the diagnosis of *spinulosus* Blandford.

FEMALE.— Length 2.4–2.9 mm, 2.5 times as long as wide; color very dark brown.

Frons and pronotum as in *spinulosus*; anterior margin of pronotum armed by 10–14 low serrations; shining areas may predominate on pronotal disc.

Elytra as in *spinulosus* except disc occupying basal 50 percent of elytral length, declivity very slightly steeper, much more broadly excavated; declivity with strial punctures clearly impressed on 1 and 2, a few punctures on 3 and 4 indicated; interstriae 1, 2, 3, and 4 each with one or two small pointed denticles on basal margin, 3 also bearing an extremely large major spine just above middle of declivity, spine at least two and one-half times as long as its basal width and equal in length to distance from discal suture to striae 3; interstriae 5 with about three denticles on lateral margin, 6 with about three similar denticles followed near apex by another very large major spine similar to that on 3, a final minor denticle on posteromesal side of major spine. Vestiture sparse, consisting of rows of interstrial hair on disc, of sparse rows of scales on declivity; each small scale about six to eight times as long as wide, about half as long as distance between rows; all vestiture commonly abraded.

DISTRIBUTION.— Costa Rica to Colombia.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 55, *Ochroma*, S. L. Wood; Playón, San José, 9-VIII-63, 50 m, No. 120, *Ochroma*, S. L. Wood; Beverley, Limón, 26-VIII-63, 10 m, No. 154, liana, S. L. Wood; Finca La Lola, Limón, 15-III-63, *Theobroma cacao*, J. L. Saunders. PANAMA: Concepción, Chiriquí, 7-I-64, 100 m, No. 37, *Ochroma*, S. L. Wood; Pearl Island, 9-VIII-44, at light, J. P. Morrison. COLOMBIA: Finca Montegrande, Caicedonia, Valle de Cauca, 19-VI-59, *Coffea arabica*, J. Restrepo; Atanguea, 10-XI-31, *T. cacao*, D. Villegas.

HOSTS.— *Coffea arabica*, *Ochroma* sp., *Theobroma cacao*.

BIOLOGY.— Specimens were taken from dying limbs 5–15 cm in diameter.

NOTES.— The above treatment was based on the holotype of *ferox* and on 30 other specimens.

### 17. *Xyleborus* (*Coptoborus*) *vespatorius* Schedl

*Coptoborus emarginatus* Hopkins, 1915 (nec Eichhoff, 1878), U.S. Dept. Agric. Rept. 99:53 (Holotype, female; Livingston, Guatemala; U.S. Nat. Mus., 7636)

*Xyleborus vespatorius* Schedl, 1931, Ann. Mag. Nat. Hist. (10)8:339 (Holotype, female; San Ignacio, Argentina; Schedl Coll.); Wood, 1972, Great Basin Nat. 32:200. *Synonymy*

*Xyleborus corniculatus* Schedl, 1949, Rev. Brasil Biol. 9:275 (Holotype, female; Santa Catarina, Brazil; Schedl Coll.); Schedl, 1952, Ent. Blätt. 47–48:163. *Synonymy*

*Xyleborus corniculatulus* Schedl, 1949, Rev. Brasil Biol. 9:275 (Holotype, female; Trinidad; Schedl Coll.); Wood, 1972, Great Basin Nat. 32:200. *Synonymy*

DIAGNOSIS.— This species is not closely related to other species treated here. It differs by the narrowly, strongly excavated elytral declivity with its lateral margins armed by a series of rather coarse denticles.

FEMALE.— Length 2.3–2.7 mm, 3.2–3.4 times as long as wide; color reddish brown.

Frons broadly convex; surface reticulate, punctures small, shallow, moderately abundant, partly replaced on lower half by fine granules.

Pronotum 1.3 times as long as wide; sides almost straight and parallel on basal two-thirds; summit well in front of middle; anterior third strongly declivous, coarsely asperate; anterior margin armed by about 6–10 low serrations; posterior areas mostly smooth, shining, with some indications of reticulation in most specimens, punctures very small, sparse, shallow. Vestiture hairlike, largely confined to marginal areas.

Elytra 2.1 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on slightly more than basal third, gradually tapered to level of sutural apex to half greatest elytral width, then abruptly rounded and obtusely, rather deeply emarginate at suture; disc occupying very slightly more than basal half of elytral length; striae not impressed, punctures small, shallow, distinct; interstriae almost smooth, shining, about three to four times as wide as striae, punctures uniseriate, rather widely spaced, fine to almost obsolete. Declivity gradual, rather narrowly, strongly excavated, lateral margins weakly elevated at base, becoming strongly elevated toward apex; striae 1 and 2 indicated by very shallow punctures, each

very slightly larger than on disc; suture feebly elevated, interstriae 2 impressed on median side, gradually ascending to narrow summit on 3; interstriae 2 with one or two granules at base, 3 armed by three to five denticles and, usually, a few minor granules, largest denticle usually slightly below middle of declivity, lowest denticle near apex. Vestiture of rows of erect, moderately long hair, rather stout on declivity.

MALE.— Length 1.8 mm; similar to female, with all characters rather poorly formed, except anterior third of pronotum shallowly concave on median two-thirds; pronotal asperities reduced in concave area, a slight median tubercle on unarmed anterior margin.

DISTRIBUTION.— Veracruz to Argentina.

MEXICO: Veracruz: El Palmar, 22-III-57, *Hevea brasiliensia*, E. Topote, COSTA RICA: Turrialba, Cartago, 5-VII-63, 700 m, No. 22, tree branch, S. L. Wood; Guápiles, Limón, 22-VIII-66, 100 m, No. 102, tree bole 30 cm diameter, S. L. Wood; Pandora, Limón, 23-VIII-63, 50 m, No. 135, tree bole 15 cm diameter, S. L. Wood; Finca La Lola, Limón, 14-VIII-62, *Theobroma cacao*, J. L. Saunders. OTHER COUNTRIES: Colombia, Venezuela, Trinidad, Brazil, Argentina.

HOSTS.— *Hevea brasiliensis*, *Theobroma cacao*, etc.

BIOLOGY.— This species was taken from dying and recently cut limbs and boles 10–30 cm in diameter. The simple entrance tunnel was expanded by the brood into a small tabular cavity that followed the grain of the wood.

NOTES.— The holotypes of *emarginatus*, *vespatorius*, *corniculatus*, and *corniculatulus* were examined and the latter three were all compared to one another as well as to my specimens. Although small differences do occur between the unique types, all fall well within the limits of variation of this species. The declivital denticles on the holotype of *vespatorius* have been damaged, presumably from the chewing of siblings, thereby making its recognition a bit more difficult. The above treatment was based on 36 specimens in addition to the types.

### 18. *Xyleborus* (*Coptoborus*) *catulus* Blandford

*Xyleborus catulus* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):215 (Holotype, female; Volcán de Chiriquí, Chiriquí, Panama; British Mus. Nat. Hist.)

*Xyleborus intricatus* Schedl, 1949, Rev. Brasil. Biol. 9:274 (Holotype, female; Santa Catarina, Brazil; Schedl Coll.); Wood, 1975, Great Basin Nat. 35:23. *Synonymy*

DIAGNOSIS.— This species could easily be placed in the subgenus *Xyleborus* near *volvulus* Fabricius; however, the small, slender form, the slender scutellum, and the declivity suggest a closer relationship to *cuneatus* Eichhoff. It is distinguished from *cuneatus* by the slightly steeper elytral declivity, with the apex slightly more broadly rounded and the marginal granules near the apex much smaller.

FEMALE.— Length 1.6–1.7 mm, 2.9 times as long as wide; color yellowish brown.

Frons essentially as in *vespatorius*. Pronotum 1.14 times as long as wide; essentially as in *vespatorius* except anterior margin very feebly serrate.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on slightly more than basal half, gradually converging on posterior half, narrowly rounded behind; disc occupying basal two-thirds; striae not impressed, punctures moderately large, shallow; interstriae smooth, shining, twice as wide as interstriae, punctures uniseriate, varying from minute to small on an interstriae. Declivity moderately steep, convex; strial punctures slightly larger than on disc, some punctures on 1 and 2 not in rows; interstriae 2 flat, not impressed, 1 and 3 each armed by two to four small denticles and usually two or three additional smaller granules, 2 with one to four minute granules, lateral interstriae with a few small granules and a total of about three small denticles; posterolateral margin rounded, subacute, and with two or three very small granules at apex of interstriae 1 and 2; apex not produced, more broadly rounded than in *cuneatus*. Vestiture largely confined to sides and declivity; on declivity of stout, rather short interstrial bristles, longest bristles about as long as distance between rows.

DISTRIBUTION.— Panama to Brazil.

PANAMA: Limón Bay, Canal Zone, 30-XII-63, 3 m, No. 354, tree limb, S. L. Wood; "Panama wood with orchids," intercepted at Mobile, Alabama, 24-V-49; Volcán de Chiriquí, G. C. Champion. VENEZUELA: 20 km SW El Vigía, Merida, 21-XI-69, 50 m, No. 149 in tree limb, 10-XII-69, No. 187 in liana, S. L. Wood; 9 km S Barrancas, Barinas, 5-XI-69, 150 m, No. 100, *Guazuma*

*ulmifolia*, S. L. Wood. BRAZIL: Nova Teutonia, Santa Catarina, 1944.

HOSTS.— *Guazuma ulmifolia*, etc.

BIOLOGY.— Specimens were taken from new tunnels in recently cut limbs and in boles 5–20 cm in diameter.

NOTES.— The above treatment was based on the holotypes of *catulus* and *intricatus*, and on seven other specimens.

### 19. *Xyleborus* (*Coptoborus*) *pseudotenuis* Schedl
Fig. 184

*Xyleborus pseudotenuis* Schedl, 1936, Arch. Inst. Biol. Veget. 3:109 (Holotype, female; Brazil; Schedl Coll.)

*Xyleborus tenuis* Schedl, 1949, Rev. Brasil Biol. 9:269 (Holotype, female; Cordova, presumably Mexico; Schedl Coll.); Wood, 1976, Great Basin Nat. 36:349. *Synonymy*

*Xyleborus exilis* Schedl, 1934, Ent. Blätt. 30:209 (Holotype, female; Halbinsel Osa, Costa Rica; Schedl Coll.). *Possible synonym*

DIAGNOSIS.— This species is distinguished from the very similar *cuneatus* Eichhoff by the more narrowly produced elytral apices, with the posterolateral margin of the apex of interstriae 1 and 2 acutely elevated and almost entirely devoid of serrations.

FEMALE.— Length 1.8–2.2 mm, 2.9 times as long as wide; color yellowish brown.

Frons and pronotum as in *catulus* Blandford except pronotum 1.16 times as long as wide.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on slightly less than basal half, gradually converging to about one-third of greatest elytral width just before narrowly rounded posterior margin; disc confined to slightly more than anterior half; striae not impressed, punctures very small, shallow, spaced within a row by about two diameters of a puncture; interstriae almost smooth, shining, about four times as wide as striae, punctures uniseriate, shallow, very fine. Declivity gradual, convex; strial punctures shallow, much larger than on disc; interstriae 2 feebly impressed, 1 with about two small denticles and about three to five additional fine granules, 3 with about three small denticles and about three to six additional fine granules, these denticles and those in lateral areas of same size and position as in *catulus*; subapical posterolateral margin subacutely elevated at apices of interstriae 1 and 2, except shallowly, narrowly emarginate at suture, summit of elevation with one to three feeble granules indicated. Vestiture as in *catulus*.

DISTRIBUTION.— San Luis Potosí and Veracruz to Venezuela and Brazil.

MEXICO: San Luis Potosí: 8 km or 5 miles N Tamazunchale, 22-XII-48, H. B. Leech. Veracruz: El Palmar, 22-III-58, *Hevea brasiliensis*, E. Topete; 5 km or 3 miles W Gutierrez Zamora, 25-VI-53, 70 m, S. L. Wood; Lago Catemaco. COSTA RICA: Guápiles, Limón, 22-VIII-66, 100 m, No. 120, *Cordia*, S. L. Wood; Pandora, Limón, 23-VIII-63, 50 m, No. 135, small log, S. L. Wood; Finca Los Diamantes, 7-II-63, *Theobroma cacao*, J. L. Saunders. PANAMA: Curundu, Canal Zone, 9-X-57, at light. OTHER AREAS: Brazil, Venezuela.

HOSTS.— *Cordia* sp., *Hevea brasiliensis*, *Theobroma cacao*, etc.

BIOLOGY.— Specimens were taken from material 5–20 cm in diameter.

NOTES.— The above treatment was based on 24 specimens, one of which was compared by me to the holotype of *tenuis* and on the holotype of *pseudotenuis*.

The female holotype of *exilis* Schedl (2.1 mm) probably is of this species; however, the elytral declivity is very slightly steeper. Because this species varies in size, in steepness of the elytral declivity, in the size of certain declivital tubercles, and in the coarseness of the elytral vestiture, it appears best to await the collection of additional material before establishing synonymy of these two forms because the doubtful one bears the senior name.

### 20. *Xyleborus* (*Coptoborus*) *cuneatus* Eichhoff

*Xyleborus cuneatus* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:380 (Holotype, female; "Varinas, Nova Grenada," which presumably now is Barinas, Barinas, Venezuela; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from the closely allied *pseudotenuis* Schedl by the slightly less strongly produced elytral apices, with the posterolateral margin rounded and obscurely elevated throughout and armed by three or four rather coarse, somewhat widely spaced granules.

FEMALE.— Length 1.6–1.7 mm, 2.9 times as long as wide; color yellowish brown.

Frons and pronotum about as in *catulus* Blandford except pronotum 1.24 times as long as wide.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, then tapered, rather narrowly rounded behind; striae not impressed, punctures moderately coarse, rather shallow, spaced within a row by slightly more than diameter of a puncture; interstriae smooth, shining, slightly more than twice as wide as striae, punctures uniseriate, rather widely spaced. Declivity moderately steep, convex; striae not impressed, punctures equal in size to those on disc, very shallow; interstriae 2 somewhat flattened and devoid of granules except toward base, 1 with two small denticles; one near middle, one on lower fourth, a few granules toward base, 3 usually without denticles (one on left side of one specimen), about two to six small granules may be present; subapical ventrolateral margin rounded, weakly elevated, armed by three small denticles, one in line with each interstriae 1–3; shallowly emarginate at suture. Vestiture about as in *pseudotenuis*.

DISTRIBUTION.— Panama to Peru.

PANAMA: Fort Sherman, Canal Zone, 10-XI-57, at light. PERU: Monson Valley, Tingo María, 10-XI-54, E. I. Schlinger and E. S. Rose. The type presumably is from Barinas, Venezuela.

NOTES.— The above treatment was based on the holotype and on two other specimens. Evidently it is an extremely rare species.

### 21. *Xyleborus* (*Coptoborus*) *exutus* Wood

*Xyleborus exutus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):36 (Holotype, female; Turrialba, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the allied *tolimanus* Eggers by the complete absence of denticles on the elytral declivity.

FEMALE.— Length 1.9 mm, 3.0 times as long as wide; color reddish brown, pronotum more yellowish brown.

Frons about as in *catulus* Blandford but surface finely granulate to well above eyes. Pronotum 1.2 times as long as wide; basically as in *catulus* except anterior margin rather narrowly rounded and more coarsely serrate.

Elytra 1.9 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal half, acutely converging to one-fifth greatest elytral width at narrowly, shallowly emarginate apex; striae not impressed, punctures small, shallow, distinct, spaced within a row by twice diameter of a puncture; interstriae smooth, shining, three to four times as wide as striae, punctures fine, uniseriate, rather widely spaced. Declivity gradual, narrowly convex; striae feebly impressed, punctures slightly larger than on disc; all interstriae equally sculptured, punctures distinct, regularly, rather closely spaced, anterior margin of each rather broadly, weakly granulate; interstriae 1 weakly elevated near acuminate apex; posterolateral margin weakly elevated and rather narrowly rounded near apex, becoming more broadly rounded anteriorly, entirely devoid of granules and denticles. Vestiture entirely abraded except for a few hairlike setae on sides.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Turrialba, Cartago, 9-III-64, 700 m, No. 468, in a fence post, S. L. Wood.

NOTES.— The above treatment was based on the holotype.

### 22. *Xyleborus* (*Coptoborus*) *tolimanus* Eggers

*Xyleborus tolimanus* Eggers, 1928, Arch. Inst. Biol. Sao Paulo 1:97 (Lectotype, female; Tolima, Colombia; U.S. Nat. Mus., 60765, subsequent designation by Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:34)

DIAGNOSIS.— This species has the acutely acuminate elytral apex of *exutus* Wood, but it is distinguished by the acutely pointed denticles on declivital interstriae 1–3 and, particularly, on the posterolateral margin near the apex.

Frons and pronotum as in *exutus* except serrations on anterior margin of pronotum slightly larger and disc more nearly reticulate.

Elytra 2.0 times as long as wide, 1.6 times as long as pronotum; outline about as in *exutus* except serrate at apex; disc occupying basal half; striae not impressed, punctures small, moderately deep, spaced by almost twice diameter of a puncture; interstriae smooth, shining, punctures uniseriate, shallow, almost as large as those of striae, rather widely spaced. Declivity rather gradual, narrowly convex; striae very weakly impressed, punctures shallow, slightly larger than on

disc; interstriae 1–3 (and to a lesser extent those in lateral areas) armed by rather closely spaced, small, pointed denticles, much smaller toward base, largest near apex; subapical margin strongly, acutely produced near suture, its posterolateral margin acute at apex, becoming rounded anteriorly, armed by a series of closely set, acutely pointed denticles that appear continuous with those of interstriae 3, final denticle at suture usually larger and often forming a flattened cusp. Vestiture confined to sides and declivity; on declivity consisting of rows of minute strial hair and rows of erect, rather coarse, interstrial hair, becoming more abundant and confused near apex, length of longest setae equal to up to almost twice distance between interstrial rows.

MALE.— Length 1.6 mm; pronotum 1.2 times as long as elytra and 1.7 times as long as wide; pronotum devoid of asperities, anterior third strongly excavated, anterior margin acutely elevated, almost straight except for obtuse median extension; elytra resembling female but stouter, with all characters poorly formed.

DISTRIBUTION.— Veracruz to Brazil.

COSTA RICA: Dominical, Puntarenas, 9-XII-63, 3 m, No. 296, liana, S. L. Wood; Turrialba, Cartago, 14-VIII-62, *Theobroma cacao*, J. L. Saunders; Finca Los Diamantes (Limón?), 7-II-63, *Theobroma cacao*, J. L. Saunders; Guápiles, Limón, 22-VIII-66, 100 m, No. 120, *Cordia*, S. L. Wood. PANAMA: Cerro Campana, Cocle, 26-VIII-66, tree branch, S. L. Wood. OTHER AREAS: Venezuela, Brazil.

HOSTS.— *Cordia* sp., *Theobroma cacao*, etc.

BIOLOGY.— Specimens were taken from material 5–15 cm in diameter.

NOTES.— The above treatment was based on the lectotype and on 29 other specimens, several of which were compared directly to the lectotype.

### 23. *Xyleborus* (*Ambrosiodmus*?) *obliquus* (LeConte)

*Pityophthorus obliquus* LeConte, 1878, *in* Schwarz, Proc. American Philos. Soc. 17:432 (Holotype, female; Enterprise, Florida; Mus. Comp. Zool., 1288)

*Ambrosiodmus obliquus*: Blackman, 1928, Bull. New York St. Coll. For., Syracuse, Tech. Pub. 25:148

*Xyleborus gilvipes* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):205 (Holotype, female; Zapote, Guatemala; British Mus. Nat. Hist.); Wood, 1975, Great Basin Nat. 35:394. *Synonymy*

*Ambrosiodmus linderae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:56 (Holotype, female; Rosslyn, Virginia; U.S. Nat. Mus., 7418); Bright, 1968, Canadian Ent. 100:1301. *Synonymy*

*Xyleborus brasiliensis* Eggers, 1928, Arch. Inst. Biol. 1:96 (Lectotype, female; Blumenau, Santa Catarina, Brazil; U.S. Nat. Mus., 60712, designated by Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:7); Wood, 1975, Great Basin Nat. 35:394. *Synonymy*

*Xyleborus mexicanus* Eggers, 1931, Ent. Blätt. 27:19 (Holotype, female; Maravatio, presumably Michoacán, Mexico; Zool. Mus. Berlin); Wood, 1972, Great Basin Nat. 32:198. *Synonymy*

*Xyleborus illepidus* Schedl, 1941, Rev. Zool. Bot. Afr. 34:402 (Holotype, female; Deutsch-Ostafrika; Schedl Coll.; Wood, 1975, Great Basin Nat. 35:394. *Synonymy*

DIAGNOSIS.— This species is distinguished from the very similar *rubricollis* Eichhoff by the smaller average size, by the smaller, confused asperities on the pronotal disc, by the much smaller declivital strial punctures, and by the more broadly convex elytral declivity. However, the antennal club is larger and has two sutures marked on the apical third of the posterior face.

FEMALE.— Length 2.2–2.4 mm, 2.3 times as long as wide; color reddish brown.

Frons and pronotum as in *rubricollis* except asperities on pronotal disc slightly smaller, confused.

Elytra as in *rubricollis* except interstrial punctures on disc not granulate, declivity more broadly convex, very weakly impressed on interstriae 2; strial punctures on declivity not larger than on disc; declivital interstriae three times as wide as striae; ventrolateral declivital costa almost smooth.

MALE.— Length 1.5 mm, 1.4 times as long as wide; head about as in female except eye reduced; pronotum 0.80 times as long as wide, very weakly convex, devoid of asperities, reticulate, with very obscure punctures; elytra arched from base, striae and interstriae as in female except feebly impressed, declivity evenly convex, devoid of granules; ventrolateral declivital costa absent.

DISTRIBUTION.— Mississippi and Virginia to Florida and Brazil.

USA: **District of Columbia**: "DC." **Florida**: Enterprise, Gainesville, St. John Co., Suwannee Co. **Georgia**: Millner. **Mississippi**: Nicholson. **Virginia**: Falls Church, New Iberia, Rosslyn. MEXICO: **Michoacán**: Maravatio. GUATEMALA: Zapote. OTHER COUNTRIES: Colombia, Brazil, Congo, Deutsch-Ostafrika (Zambia).

HOSTS.— *Betula* sp., *Castenia dentata*, *Lindera* sp., "Ironwood."

NOTES.— The above treatment was based on the holotypes of *obliquus*, *gilvipes*, *linderae*, *illepidus*, and *mexicanus*, on the lectotype of *brasiliensis*, and on 138 other specimens. This species has been carried through commerce over a broad area. Although its origin is not known at present, its arrival in Africa apparently is recent.

### 24. *Xyleborus* (*Ambrosiodmus*?) *devexulus* Wood

*Xyleborus devexus* Wood, 1977 (nec Schedl 1977) Great Basin Nat. 37:219 (Holotype, female; Homestead, Florida; Wood Coll.)

*Xyleborus devexulus* Wood, 1978, Great Basin Nat. 38:398. *Replacement name*

DIAGNOSIS.— This species is distinguished from *obliquus* (LeConte) by the smaller size, by the coarser, deeper elytral punctures, and by the absence of tubercles on declivital interstriae 1 and 3.

FEMALE.— Length 1.8–2.1 mm, 2.5 times as long as wide; color very dark brown.

Frons and pronotum as in *obliquus*.

Elytra as in *obliquus* except declivity slightly steeper, less strongly convex; punctures on disc larger, deeper, interstriae twice as wide as striae; interstrial punctures near declivity not granulate. Declivity more distinctly impressed between interstriae 3, interstriae 1–3 without granules. Vestiture as in *obliquus*.

DISTRIBUTION.— Florida, Puerto Rico.

USA: **Florida:** Homestead, Lake Co., Manatee Co., Orange Co., Orange Heights, Pinellas Co. PUERTO RICO: Vega Alta, Río Grande.

HOSTS.— *Carya* sp., *Cedrella mexicana*.

NOTES.— The above treatment was based on 31 specimens.

### 25. *Xyleborus* (*Ambrosiodmus*) *devexus* Schedl

*Xyleborus devexus* Schedl, 1977, Zeitschr. Arb. Österr. Ent. 29:45 (Holotype, female; Metapán, El Salvador; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *rusticus* Wood by characters summarized in the above key.

FEMALE.— Length 2.7 mm, 2.5 times as long as wide; color very dark brown.

As in *rusticus* except punctures on discal interstriae finer, not as deep, interstriae three to four times as wide as interstriae, declivity shallowly bisulcate, with its punctures fine, granules present only on basal half.

DISTRIBUTION.— El Salvador.

EL SALVADOR: Metapán, 20-XII-1974, 1600–2200 m, *Quercus*, H. Schmutzenhofer.

NOTES.— The above treatment was based on the holotype.

### 26. *Xyleborus* (*Ambrosiodmus*) *scalaris* Schedl

*Xyleborus scalaris* Schedl, 1935, Archiv. Inst. Biol. Veget. Río de Janeiro 2:95 (Holotype, female; Turrialba, Cartago, Costa Rica; Schedl Coll.)

DIAGNOSIS.— Among the American *Ambrosiodmus* this species is distinguished by the feebly asperate posterior third of the pronotum, by the evenly convex elytral declivity with all interstriae equally granulate, and by the uniformly short elytral vestiture.

FEMALE.— Length 4.0–4.3 mm, 2.3 times as long as wide; color reddish brown.

Frons as in *rusticus* Wood except more strongly reticulate, all punctures obscure.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on basal half, rather broadly rounded anteriorly; summit distinctly behind middle; rather finely, closely asperate on anterior half, asperities gradually decreasing in size posteriorly to base, minute on basal third; surface between asperities minutely reticulate. Vestiture hairlike, largely confined to marginal areas.

Elytra 1.4 times as long as wide, 1.4 times as long as pronotum; outline and disc as in *rusticus* except interstrial punctures not granulate. Declivity more broadly convex and not quite as steep as in *rusticus*; strial punctures twice as wide as on disc; interstriae one and one-half times as wide as striae, granules rather small, of equal size on all interstriae, mostly confused toward base, uniseriate on lower half. Vestiture of moderately coarse, interstrial hair of uniform length on disc and declivity, each seta about two-thirds as long as distance between rows on declivity; strial setae minute.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Moravia, Cartago, 11-III-64, 500 m, No. 491, log, S. L. Wood; Turrialba, Cartago, Schild.

BIOLOGY.— The Moravia specimen was taken from a new tunnel in a log 90 cm in diameter.

NOTES.— The above treatment was based on my female homotype that was compared by me directly to the holotype.

### 27. *Xyleborus* (*Ambrosiodmus*) *rusticus* Wood

*Xyleborus rusticus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):36 (Holotype, female; 10 km NE Teziutlan, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *rubricollis* Eichhoff by the larger size, by the proportionately smaller punctures on the declivital striae, and by the uniformly convex elytral striae.

FEMALE.— Length 3.3–3.5 mm, 2.3 times as long as wide; color dark brown.

Frons broadly, irregularly convex; surface reticulate, shining, punctures rather coarse, close, moderately deep above, obscure below; vestiture sparse, inconspicuous.

Pronotum 0.98 times as long as wide; subcircular, all margins about equally arcuate, widest slightiy behind middle; summit distinctly behind middle; entire surface closely, rather coarsely asperate to base, slightly finer on posterior third; surface between asperities reticulate, dull. Vestiture of fine, rather long, moderately abundant hair.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides straight on basal two-thirds, slightly wider at base of declivity, broadly rounded behind; disc occupying basal two-thirds; striae 1 feebly, others not impressed, punctures rather small, moderately deep, spaced within row by one to two diameters of a puncture; interstriae about four times as wide as striae, almost smooth, shining, punctures small, moderately confused, their anterior margins finely granulate. Declivity steep, evenly, broadly convex; strial punctures slightly wider than on disc; interstriae three times as wide as striae, granules on all interstriae distinctly larger, pointed. Vestiture of short strial hair and fine, long, abundant interstrial hair; interstrial setae in almost uniseriate rows on declivital interstriae 1 and 2, confused elsewhere.

DISTRIBUTION.— Puebla to Chiapas.

MEXICO: **Chiapas**: 8 km SW El Bosque, 3-VII-69, *Pinus*, D. E. Bright; 32 km N Bochil, 10-VI-69, D. E. Bright. **Puebla**: 10 km NE Teziutlan, 27-VI-53, No. 49, log, and 2-VII-67, 1600 m, No. 150, log, S. L. Wood.

BIOLOGY.— Both specimens were taken from new tunnels in logs about 30 cm in diameter.

NOTES.— The above treatment was based on the two females in the type series and on one other specimen.

### 28. *Xyleborus* (*Ambrosiodmus*) *rubricollis* Eichhoff

*Xyleborus rubricollis* Eichhoff, 1875, Ann. Soc. Ent. Belgique 18:202 (Holotype, female; Japan; presumably in Brussels Mus.); Bright, 1968, Canadian Ent. 100: 1302 (First American record).

DIAGNOSIS.— This species is distinguished from *rusticus* Wood by the smaller size, by the moderately impressed declivital striae 1, by the proportionately larger strial punctures on the declivity, and by the distribution.

FEMALE.— Length 2.4–2.6 mm, 2.4 times as long as wide; color reddish brown.

Frons as in *rusticus*.

Pronotum 1.0 times as long as wide; slightly more nearly quadrate than *rusticus*, anterior asperities distinctly larger, asperities posterior to summit somewhat oriented to form low, continuous, transverse ridges.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; outline as in *rusticus*; striae 1 feebly, others not impressed, punctures rather coarse, moderately deep; interstriae smooth, shining, twice as wide as striae, punctures small, shallow, moderately confused on 2, uniseriate on 1 to 9, minutely granulate. Declivity rather steep, broadly convex; striae 1 weakly impressed, punctures one and one-half to two times as large as those on disc; interstriae 1 to 7 uniseriately granulate, granules pointed, somewhat irregular in size, 8 subacutely elevated, obscurely serrate. Vestiture of rows of fine, long, interstrial hair, and minute strial setae.

DISTRIBUTION.— Connecticut to Alabama; Japan and Malaya.

USA: **Alabama**: Corona Mine, 6-VIII-76, B. A. Hawkins. **Connecticut**: Norwalk, 9-VIII-70, dogwood, R. H. Perry. **Florida**: Ocala, 11-IX-77. **Maryland**: Ridgely, 15-IX-42, oak stump, W. H. Anderson. **Pennsylvania**: Delaware Co., 7-VIII-80, *Carya glabrata*, G. Stevens. **Tennessee**: Nashville, 23-IX-80, *Juglans nigra*, B. C. Weber. **Virginia**: Chesapeake, 16-V-70, pecan trunk, M. A. Smith.

BIOLOGY.— The American series were taken from boles and stumps of trees. In Japan it has been taken from many hosts, including *Acacia*, *Castanea*, *Carya*, *Ilex*, *Hovea*, *Lygustrum*, *Machilus*, *Morus*, *Myrica*, and *Rhus*. American records add *Carya*, *Cornus*, *Prunus*, and *Quercus*.

NOTES.— The above treatment was based on 44 American specimens, more than 100 from Japan, and one from Malaya.

### 29. *Xyleborus* (*Ambrosiodmus*) *opimus* Wood

*Xyleborus opimus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):37 (Holotype, female; Sebring, Florida, Wood Coll.)

DIAGNOSIS.— This species is distinguished from *lecontei* (Hopkins) by the slightly smaller size, by the more strongly arcuate anterior and lateral margins of the pronotum, by the finer, less numerous asperities on the pronotal disc, by the convex elytral declivity, and by the different arrangement of declivital tubercles.

FEMALE.— Length 2.4 mm, 2.2 times as long as wide; color reddish brown.

Frons as in *lecontei*. Pronotum 1.0 times as long as wide, as in *lecontei* except anterior and lateral margins more strongly arcuate, summit slightly higher, and asperities behind summit slightly smaller and evidently less numerous.

Elytra 1.36 times as long as wide; outline and disc as in *lecontei* except strial punctures not larger near declivity, interstrial punctures near declivity granulate. Declivity rather broadly, evenly convex, steep; strial punctures as large as on disc, deep, smaller than in *lecontei*; interstriae 1 bearing a row of granules on basal half, those near base rather coarse, 2 with several pointed tubercles on basal half, one or two at or slightly below middle distinctly larger, 3 with three to five smaller tubercles; all tubercles smaller than major tubercles of *lecontei*. Vestiture as in *lecontei*.

DISTRIBUTION.— Florida.

USA: **Florida**: Sebring, 20-VI-51, at light, S. L. Wood.

NOTES.— The above treatment was based on the unique female holotype.

### 30. *Xyleborus* (*Ambrosiodmus*) *lecontei* (Hopkins)

*Ambrosiodmus lecontei* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:56 (Holotype, female; Keene, Florida; U.S. Nat. Mus., 7419)

*Xyleborus gundlachi* Eggers, 1931, Ent. Blätt. 27:20 (Holotype, female; Cuba; Zool. Mus. Berlin); Wood, 1972, Great Basin Nat. 32:199. *Synonymy*

DIAGNOSIS.— This species is distinguished from *opimus* Wood as indicated in the above key and in the diagnosis of *opimus*.

FEMALE.— Length 2.5–3.0 mm, 2.3 times as long as wide; color rather dark reddish brown.

Frons broadly, irregularly convex, shining, with some indications of reticulation, punctures coarse, deep, close, obscure on lower half; vestiture sparse, inconspicuous.

Pronotum 1.0 times as long as wide, obscurely subquadrate, anterior and lateral margins rather weakly arcuate; summit broadly rounded, slightly behind middle; asperities continued to base, those behind summit moderately coarse, confused; surface of disc between asperities reticulate. Vestiture of fine, moderately long hair.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; sides straight on basal three-fourths, slightly wider at base of declivity, broadly rounded behind and with declivital denticles projecting; striae not impressed, punctures coarse, deep, close, about twice as long near declivity as at base; interstriae almost smooth, shining, as wide as striae near declivity, twice as wide at base, punctures small, shallow, uniseriate except slightly confused on 2. Declivity broadly convex, shallowly impressed between interstriae 3, steep; interstriae 1 unarmed, punctured, impressed, 2 ascending toward 3, armed by two or three coarse, pointed denticles on middle two-thirds, 3 broadly rounded, armed by one to three smaller denticles, 4, 5, and 6 with a few smaller granules, 7 subacutely elevated to apex, its crest almost smooth. Vestiture of fine, moderately long rather abundant hair.

MALE.— Length 1.4 mm; as in male *obliquus* except pronotum with a few minute asperities and elytral punctures coarse, moderately deep, strial and interstrial punctures almost equal in size; declivital interstriae each with three or four granules, those on 2 slightly larger.

DISTRIBUTION.— Florida and Louisiana to Puerto Rico.

USA: **Florida**: Bevard Co., Biscayne Bay, Brookville, Everglades N.P., Gulfport, Hillsboro, Homestead, Indian River, Key Largo, Key West, Lake Worth, Marion Co., Miami, Oceola Co., Orange Co., Orlando, Pinellas Co., Plant City, Seminole. **Louisiana**: "Delta area." OTHER AREAS: Cuba, Dominican Republic, Puerto Rico.

HOSTS.— *Bishofia javanica*, *Carya* sp., *Dacryodes* sp., *Diphysia robinoides*, *Ichthyomethia communis*, *Persea borbonea*, *Pinus occidentalis*, *Pleiogynum* sp., *Terminalia* sp.

BIOLOGY.— Specimens were taken at ground level from stems 3–5 cm in diameter and from tree branches of similar diameter. The main adult gallery consists of a radial entrance tunnel and a transverse biramous gallery that follows a growth ring, in both directions, thus forming an almost complete ring around the stem about 1 cm below the surface of the wood.

NOTES.— The above treatment was based on the holotype and on 74 other specimens.

### 31. *Xyleborus* (*Ambrosiodmus*) *guatemalensis* (Hopkins)

*Ambrosiodmus guatemalensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:56 (Holotype, female; Trece Aguas, Alta Verapaz, Guatemala; U.S. Nat. Mus. 7652)

*Xyleborus anisandrus* Schedl, 1954, Dusenia 5:44 (Syntypes, female; Río Claro, Brazil; Schedl Coll.); Wood, 1972, Great Basin Nat. 32:198. *Synonymy*

DIAGNOSIS.— This species is distinguished from *lecontei* Hopkins by the much finer punctures on the elytra, by the less strongly arched elytral declivity, and by the smaller denticles on the declivity.

FEMALE.— Length 2.4–2.8 mm, 2.3 times as long as wide; color reddish brown.

Frons and pronotum essentially as in *lecontei*.

Elytral proportions and outline as in *lecontei*; striae not impressed, punctures small, shallow; interstriae smooth, shining, three times as wide as striae, punctures usually distinctly smaller than those of striae, uniseriate. Declivity moderately steep, broadly convex, and shallowly sulcate between interstriae 3; sutural interstriae feebly elevated, unarmed (an occasional minute granule sometimes present); rather broadly, shallowly impressed in area of striae 2; interstriae 2 moderately ascending, armed by two or three denticles similar to but smaller than in *lecontei*, 3 broadly rounded, with one or two smaller denticles; lateral areas with a few scattered granules; strial and interstrial punctures shallow, similar to those on disc; interstriae 7 subacutely elevated to apex. Vestiture of fine, rather abundant hair of moderate length; strial setae almost as long as those of interstriae.

DISTRIBUTION.— Oaxaca and Veracruz to Brazil.

MEXICO: **Oaxaca**: Oaxaca. **Veracruz**: 37 and 29 km N Matías Romero. GUATEMALA: Trece Aguas in Alta Verapaz. HONDURAS: Zamorano. COSTA RICA: Guápiles in Limón, Playón and Santa Ana in San José. PANAMA: El Hato del Volcán in Chiriquí. OTHER COUNTRIES: Brazil, Colombia, Venezuela.

HOSTS.— *Cedrella mexicana*, *Mar gifera indica*, *Ochroma* sp., *Terminalia* sp., *Theobroma cacao*.

BIOLOGY.— As in *lecontei* except all specimens were taken from limbs and branches or the bole of trees 3–5 cm in diameter.

NOTES.— The above treatment was based on the holotype of *guatemalensis*, on my homotype of *anisandrus* that was compared directly to Schedl's syntypes, and on 26 other specimens.

### 32. *Xyleborus* (*Ambrosiodmus*) *tachygraphus* Zimmermann

*Xyleborus tachygraphus* Zimmermann, 1868, Trans. American Ent. Soc. 2:144 (Holotype, female; square tan tag signifying southern states, published as North Carolina; Mus. Comp. Zool., 990)

DIAGNOSIS.— This species is almost indistinguishable from *coffeiceus* Schedl (from Surinam); it is very slightly larger, the interstrial punctures on the disc are less distinctly impressed, and the sutural interstriae on the declivity are slightly narrower, not elevated, and have their surface less smooth.

FEMALE.— Length 3.4–3.8 mm, 2.3 times as long as wide; color dark reddish brown to almost black.

Frons and pronotum essentially as in *lecontei* (Hopkins), except pronotum slightly narrower anteriorly.

Elytra 1.5 times as long as wide, 1.5 times as long as pronotum; outline as in *obliquus*; striae not impressed, punctures small, shallow, distinct; interstriae four times as wide as striae, shining, minutely, rather obscurely

subrugose, punctures small, obscure, uniseriate except confused on 2. Declivity broadly convex, steep; interstriae 1 flat, its surface irregular, usually marked by obscure, irregular lines, 2 ascending slightly and armed on middle half by two widely spaced, rather coarse, pointed denticles, 3 not higher than 2, broadly rounded, armed by about one to three smaller denticles, lateral areas with a few minute granules, 7 subacutely elevated to apex. Vestiture of moderately abundant, fine, long hair.

DISTRIBUTION.— Illinois and Pennsylvania to Alabama and Georgia.

USA: **Alabama**: Mobile. **District of Columbia**: Washington. **Georgia**: Macon. **Illinois**: Pine Hills Field Station in Union Co. **Maryland**: Bell, Bowie, Plummer's Island. **New Jersey**: Anglesia. **North Carolina**: Black Mtn., Cedar Mtn., Chadbourn, Durham, Southern Pines, Tryon. **Pennsylvania**: Castle Rock. **South Carolina**: Holly Hill, Myrtle Beach. **Virginia**: Falls Church, Ft. Monroe, Rosslyn, Vienna. **West Virginia**: Dellslow.

HOSTS.— *Betula* sp., *Carya* sp., *Castanea dentata*, *Juglans* sp., *Rhus* sp.

BIOLOGY.— As in *lecontei*.

NOTES.— The above treatment was based on the holotype and on 104 other specimens.

### 33. *Xyleborus* (*Ambrosiodmus*) *rugicollis* Blandford

*Xyleborus rugicollis* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):207 (Holotype, female; Cerro Zunil, Quezaltenango, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *tachygraphus* Zimmermann by the larger size, by the slightly larger and deeper elytral punctures, and by the slightly larger minor granules on the elytral declivity.

FEMALE.— Length 4.9 mm, 2.6 times as long as wide; color black.

As in *tachygraphus* except for the larger size and coarser elytral sculpture.

DISTRIBUTION.— Guatemala.

GUATEMALA: Cerro Zunil, Quezaltenango, 4000–5000 ft, G. C. Champion.

NOTES.— The above treatment was based on the unique holotype.

### 34a. *Xyleborus fornicatus* Eichhoff

*Xyleborus fornicatus* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:151 (Syntypes: Ceylon; not located)

*Xyleborus fornicatior* Eggers, 1923, Zool. Meded. 7:184 (Syntypes; Peradeniya, Ceylon; Hamburg Mus. and Eggers Coll.); Beeson, 1930, Indian For. Rec. 14:59. *Variety*

DIAGNOSIS.— The contiguous procoxae and one suture on the posterior face of the antennal club distinguish this from most species; from *validus* Eichhoff it is distinguished by the smaller size and by the more strongly procurved, more strongly serrate anterior margin of the pronotum.

FEMALE.— Length 1.9–2.5 mm, 2.3 times as long as wide; color dark brown to almost black.

Head and outline of pronotum about as in *obliquus* (LeConte).

Pronotum as long as wide; sides on basal half weakly arcuate, subparallel, semicircularly rounded in front; anterior margin armed by eight or more rather coarse serrations; summit slightly behind middle; surface (except asperities) reticulate; rather coarsely asperate in front of summit, smooth behind, except for reticulation, punctures rather sparse, fine, but irregular in size. Hairlike vestiture limited to sides and asperate area.

Elytra 1.2 times as long as wide, 1.3 times as long as pronotum; sides almost straight and subparallel on basal two-thirds, broadly rounded behind; striae not impressed, punctures rather fine, distinct, shining; interstriae three to four times as wide as striae, smooth, shining, punctures uniseriate, fine, most of them at least finely granulate except at base. Declivity commencing at middle, broadly, evenly arched; subapical margin narrowly costate from apex to interstriae 7; striae not noticeably curved toward suture, very feebly impressed; sculpture about as on disc except interstrial granules slightly larger. Vestiture of rows of moderately long interstrial hair, each seta distinctly longer than distance between rows or between setae within a row.

MALE.— Length 1.5–1.6 mm; head and elytra somewhat similar to female, pronotum less strongly declivous in front, asperities greatly reduced in size, anterior margin unarmed; declivity occupying two-thirds of elytral length.

DISTRIBUTION.— Panama, Hawaii to southern Asia, Africa.

PANAMA: Canal Zone, VII-79, tree branch.

NOTES.— The above treatment was based on 42 specimens in my collection that agree

with specimens in the Blandford, Eggers, and Schedl collections.

### 34b. *Xyleborus validus* Eichhoff

*Xyleborus validus* Eichhoff, 1875, Ann. Soc. Ent. Belgique 18:202 (Syntypes, female; Japan; apparently Brussels Mus.)

DIAGNOSIS.— The presence of a suture on the posterior face of the antennal club, a conspicuous segment 2 on the anterior face, and 12 socketed protibial teeth distinguish this introduced species from native American species. From *fornicatus* Eichhoff it is distinguished by the larger size and by the more nearly quadrate pronotum, with the serrations on the anterior margin absent or greatly reduced.

FEMALE.— Length 3.4–3.8 mm, 2.4 times as long as wide; color dark brown to almost black.

Head and pronotum about as in *fornicatus* except anterior margin of pronotum much more broadly rounded, serrations reduced to almost absent, sides less strongly arcuate.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on more than basal two-thirds, rather broadly rounded behind; striae weakly impressed, punctures rather small, distinctly impressed; interstriae two to three times as wide as striae, smooth, brightly shining, small, uniseriate punctures replaced by fine granules except at base. Declivity moderately steep, very broadly convex, sutural profile feebly convex; striae on apical fourth curved toward suture; strial punctures distinctly larger than on disc except near apex; sculpture about as on disc except tubercles distinctly larger; tubercles on lower half of interstriae 2 usually obsolete.

MALE.— Length 2.3 mm; basically similar to female except pronotal asperities greatly reduced, anterior margin unarmed; declivity commencing anterior to middle; all features less perfectly formed.

DISTRIBUTION.— New York to Pennsylvania, northern Japan.

USA: **New York**: Old Westway, Nassau Co., 12-V-1976, *Fagus*. **Pennsylvania**: Newton Square, Delaware Co., 2-VII-80, *Quercus velutina*, G. Stevens.

BIOLOGY.— In Japan it breeds in logs, stumps, and unthrifty material larger than 8 cm in diameter from 14 broadleaf host genera as well as *Abies* and *Picea*. In southern Japan and throughout southeast Asia to Sri Lanka, it is replaced by the superficially similar *interjectus* Blandford, with which it is easily confused.

NOTES.— The above treatment was based on the holotype and 67 other specimens from Japan and on 6 from the United States.

### 34c. *Xyleborus spathipennis* Eichhoff
Fig. 184

*Xyleborus spathipennis* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:145 (Syntypes, female; Peru and Brazil; lost with Hamburg Mus.)

*Xyleborus coronatus* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:348 (Holotype, male; Brasilia interior; Brussels Mus.); Wood, 1972, Great Basin Nat. 32:199. *Synonymy*

*Boroxylon burgdorfi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:59 (Holotype, female; Costa Rica; U.S. Nat. Mus., 7653); Wood, 1972, Great Basin Nat. 32:199. *Synonymy*

*Xyleborus curtus* Eggers, 1928, Archiv. Inst. Biol. São Paulo 1:94 (Lectotype, female; Cachabé, Equador; U.S. Nat. Mus., 60694, subsequent designation by Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:11); Wood, 1972, Great Basin Nat. 32:199. *Synonymy*

*Xyleborus femoratus* Eggers, 1928, Archiv. Inst. Biol. São Paulo 1:95 (Lectotype, female; Bahia, Brazil; Berlin Mus., present designation); Schedl, 1960, Coleopt. Bull. 14:12. *Synonymy*

DIAGNOSIS.— This species is distinguished from *princeps* Blandford by the smaller size, by the stouter body, by the irregularly serrate anterior margin of the pronotum, and by the equal development of small granules on all declivital interstriae.

FEMALE.— Length 4.4–5.3 mm, 2.2 times as long as wide; color dark brown to black.

Frons weakly convex, with median line weakly elevated; surface reticulate, subshining, coarsely punctured, closely above, sparsely below; vestiture sparse, hairlike.

Pronotum 1.0 times as long as wide; sides weakly arcuate and subparallel on slightly more than basal half, rather broadly rounded in front; anterior margin irregularly serrate; summit slightly behind middle; anterior slope rather coarsely asperate; posterior areas smooth to weakly reticulate, punctures fine, deep, rather close. Vestiture confined to margins, sparse.

Elytra 1.2 times as long as wide, 1.3–1.5 times as long as pronotum; disc occupying basal half; sides weakly arcuate, widest slightly behind middle, broadly rounded

behind; striae sinuate, narrowly impressed, punctures small, rather shallow, very close; interstriae 1 narrow at base, becoming twice as wide at base of declivity, 2 and 3 similarly but less strongly narrowed toward base, surface smooth and shining, punctures very fine, confused, those few bearing setae larger and on 1 and 2 these punctures weakly granulate. Declivity gradual, broadly convex except a broad, weak, transverse impression on lower fourth; surface dull; all striae curve strongly toward sutural apex on apical fourth; all interstrial punctures minute granulate, setiferous granules on odd-numbered interstriae distinctly larger. Vestiture of sparse, widely spaced interstrial bristles mostly on odd-numbered interstriae; minute granules usually bearing minute, very short, hairlike setae on younger specimens.

MALE.— Length 4.0–5.0 mm; head somewhat similar to female except with a conspicuous, wide, median sulcus, and eye reduced; elytra essentially as in female; pronotum 1.3 times as long as wide, slightly wider than elytra, its sides straight and parallel on basal nine-tenths; slightly less than anterior half very deeply, broadly, concavely excavated, anterolateral angles strongly produced into lateral lobes, median third of anterior margin strongly produced into a blunt process; anterior areas devoid of asperities.

DISTRIBUTION.— Nicaragua to Bolivia and Brazil.

NICARAGUA: Intercepted from Nicaraguan mahogany, 9-IX-38. COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 3 in Euphorbiaceae log, No. 51 in *Bursera simarubra* log, S. L. Wood; Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 79, palm log, S. L. Wood; Río Damitas, Dota Mts., San José, 22-VIII-63, 250 m, No. 123, log, S. L. Wood; Hamburgfarm on Río Reventazón, Limón, 26-V-35, F. Nevermann. OTHER COUNTRIES: Colombia, Venezuela, British Guiana, Equador, Peru, Bolivia, Brazil.

HOSTS.— Numerous tree species.

BIOLOGY.— This species occurs in wet lowland forests in almost any souring log that is in contact with the soil. The elongate gallery system branches and rebranches and anastomoses with other systems. Few other Scolytidae tolerate the wet souring conditions where this species breeds.

NOTES.— The above treatment was based on the holotypes of *coronatus* and *burgdorfi*, on the lectotypes of *curtus* and *femoratus*, on the Chapuis "syntypes" of *spathipennis*, and on 74 other specimens.

Five females from Cayenne, in the Chapuis Collection, bear the determination label of Eichhoff and a type label. Nevertheless, because they do not come from either Peru or Brazil, they cannot be syntypes. If authentic syntypes cannot be found, the first Chapuis specimen in this series should be designated as the neotype because it was determined by Eichhoff. The first of three syntypes in the Berlin Museum is designated as the lectotype of *femoratus*.

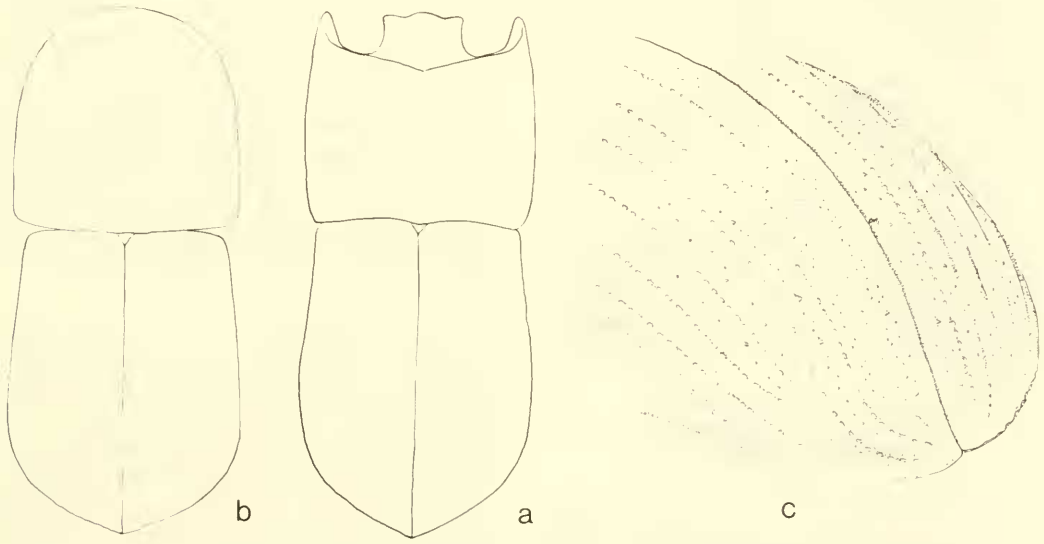



Fig. 184. *Xyleborus spathipennis*: a, Male; b, female; c, female declivity, setae omitted.

### 35. *Xyleborus princeps* Blandford
Fig. 185

*Xyleborus princeps* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):208 (Lectotype, female; Volcán Chiriquí, Chiriquí, Panama; British Mus. Nat. Hist., present designation)

*Xyleborus spathipennis* var. *ohausi* Hagedorn, 1912, Rev. Zool. Afr. 1:345 (Syntypes; Pucay, Equador; lost with Hamburg Mus.); Eggers, 1933, Ent. Nachrbl. 7:20. *Synonymy*

DIAGNOSIS.— This is the largest known American *Xyleborus*. It is distinguished from *spathipennis* Eichhoff as indicated in the above key and in the diagnosis of *spathipennis*.

FEMALE.— Length 5.1–5.9 mm, 2.5 times as long as wide; color very dark brown to almost black.

Frons and pronotum as in *spathipennis* except pronotum more nearly quadrate, 1.0 times as long as wide, anterior margin much more broadly rounded and feebly, if at all, serrate.

Elytra 1.7 times as long as wide, 1.8 times as long as pronotum; sides straight on basal two-thirds, widest two-thirds elytral length from base, rather narrowly rounded behind; discal sculpture restricted to basal third of elytral length; elytral sculpture as in *spathipennis* except declivity more gradual but transversely more narrowly convex, particularly on apical third, strial punctures on declivity slightly larger, and setiferous declivital granules distinctly larger.

DISTRIBUTION.— Nicaragua to Ecuador.

NICARAGUA: Chontales, Janson. COSTA RICA: Río Negro, 25 km NE La Union, Puntarenas, 20-II-65, log, J. B. Karren; Tapantí, Cartago, 17-IX-63, 1300 m, No. 179, log, S. L. Wood. PANAMA: Volcán de Chiriquí, G. C. Champion. OTHER COUNTRIES: Colombia, Ecuador.

BIOLOGY.— Evidently as in *spathipennis*, but much less common.

NOTES.— The above treatment was based on Blandford's three female syntypes, and on eight other specimens. The first syntype in the series from Volcán Chiriquí, Panama, is here designated as the lectotype of *princeps* Blandford.

### 36. *Xyleborus asper* Eggers
Fig. 185

*Xyleborus asper* Eggers, 1933, Trav. Lab. Ent. Mus. Nat. Hist. Nat., Mém. 1(1):30 (Holotype, female; Nouveau Chantier; Paris Mus.)

*Xyleborus amoenus* Schedl, 1949, Rev. Brasil. Biol. 9:282 (Holotype, female; Hamburgfarm on Río Reventazón, Limón, Costa Rica; Schedl Coll.); Wood, 1972, Great Basin Nat. 32:196. *Synonymy*

DIAGNOSIS.— This species is not closely allied to any other North or Central American species. It is distinguished by the subquadrate pronotum, by the declivital slope and sculpture that commence less than one-third of the elytral length from the base, by the dull declivity, and by the equally granulate declivital interstriae.

FEMALE.— Length 2.7–2.8 mm, 2.5 times as long as wide; very dark brown.

Frons essentially as in *spathipennis*.

Pronotum 1.08 times as long as wide; subquadrate, anterior and lateral margins weakly arcuate, anterior submargin weakly serrate; summit slightly in front of middle; anterior slope rather coarsely asperate, posterior areas almost smooth, feebly reticulate, punctures minute, sparse. Vestiture confined to margins, sparse.

Elytra 1.4 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather narrowly subangulate behind; disc confined to basal third of elytral length; striae not impressed, punctures small, moderately deep, spaced within row by two diameters of a puncture; interstriae smooth, shining, about four times as wide as striae, punctures very small, uniseriate. Declivity commencing one-third elytral length from base, slope gradual on its basal half, steeper behind; surface dull; striae distinctly impressed, punctures rather coarse, close; interstriae smooth, dull, one and one-half to twice as wide as striae, uniseriately granulate; pointed granules variable, small ones bearing a minute, short, hairlike seta, approximately alternating with distinctly larger ones bearing coarse bristles; longest bristles slightly longer than distance between rows, more widely spaced within a row.

MALE.— Length 2.1 mm, 2.3 times as long as wide; head and elytra about as in female but with all characters poorly formed; pronotum 1.2 times as long as wide, 1.1 times as long as elytra, with asperities greatly reduced in size and number, slightly more than anterior half shallowly, broadly concave, sides rounded, anterior margin medially produced to a point.

DISTRIBUTION.— Costa Rica to Colombia and French Guiana.

COSTA RICA: Hamburgfarm on Río Reventazón, Limón, 23-III-34, *Virola warburgii*; Finca La Lola, Limón, 22-VI-63, *Theobroma cacão*, J. L. Saunders; Guápiles, Limón, 22-VIII-66, 100 m, No. 101, tree limb, S. L. Wood. PANAMA: Barro Colorado Island, Canal Zone, 27-XII-63, 70 m, No. 351 in tree branch, also in a log, S. L. Wood. OTHER COUNTRIES: Colombia, Venezuela, French Guiana.

HOSTS.— *Couma macrocarpa* (Colombia), *Pithacellobium pinnatum* (Venezuela), *Theobroma cacao, Toulicia pulvinata* (Venezuela), *Virola warburgii*, etc.

BIOLOGY.— This species breeds in the larger branches, limbs, and bole of a wide variety of hosts.

NOTES.— The above treatment was based on the holotype of *asper*, on my homotypes of *amoenus* that were compared by me directly to the type, and on 37 other specimens.

### 37. *Xyleborus caraibicus* Eggers

*Xyleborus caraibicus* Eggers, 1941, Arb. Morph. Taxon. Ent. Berlin-Dahlem 8:103 (Holotype, female; Guadeloupe; U.S. Nat. Mus., 60681)

*Xyleborus trinidadensis* Schedl, 1961, Ann. Mag. Nat. Hist. (13)3:530 (Holotype, female; River Estate, Trinidad; British Mus. Nat. Hist.); Wood, 1972, Great Basin Nat. 32:197. *Synonymy*

DIAGNOSIS.— This species is distinguished from *commixtus* Blandford by the more strongly, more narrowly convex elytral declivity, with the ventrolateral margin more obtusely elevated, and by the more strongly impressed discal striae.

FEMALE.— Length 3.2–4.1 mm, 2.5 times as long as wide; color dark brown to almost black.

Frons broadly convex, broad median line weakly elevated; surface reticulate, with rather coarse, obscurely impressed punctures.

Pronotum 1.05 times as long as wide; subquadrate, margins rather weakly arcuate; summit at middle; moderately asperate on anterior slope; posterior areas almost smooth, punctures minute, obscure, sparse. Glabrous except for a few hairlike setae at margins.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae weakly impressed, punctures rather coarse, shallow; interstriae two and one-half times as wide as striae, weakly convex, almost smooth, punctures very fine, shallow, almost uniseriate.

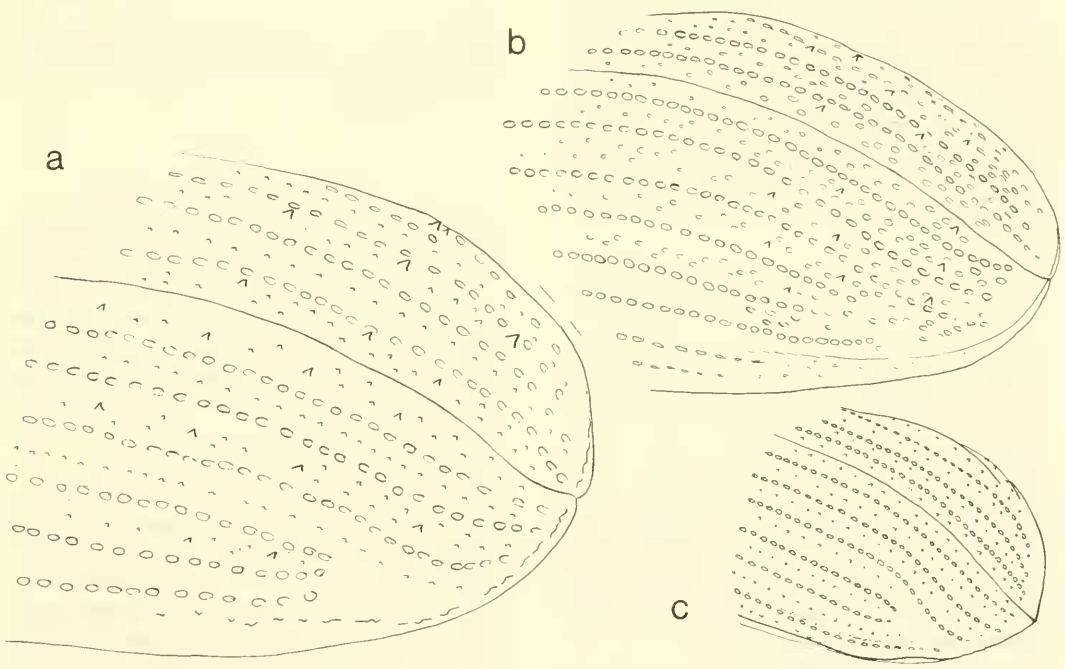



Fig. 185. *Xyleborus* spp., female declivities with setae omitted: a, *princeps*; b, *commixtus*; c, *asper*.

Declivity steep, rather broadly convex; striae 1 more distinctly impressed on middle half; strial punctures about as on disc, becoming smaller on apical fifth; apical fifth near suture slightly inflated; interstriae shining to slightly dull in some specimens, each armed by a uniseriate row of granules, minute and moderately coarse granules mixed in a row; ventrolateral margin obtusely elevated, median side of this elevation flat, not concave. Vestiture confined to declivity, of interstrial bristles mostly two-thirds as long as distance between rows, more widely spaced within a row.

DISTRIBUTION.— Costa Rica to Brazil.

COSTA RICA: Turrialba, Cartago, 18-IV-63, *Theobroma cacao*, J. L. Saunders; Rincon de Osa, Puntarenas, 11-VIII-66, 30 m, No. 55, *Ochroma*, S. L. Wood; Pandora, Limón, 23-VIII-63, 50 m, No. 135, log, S. L. Wood; Guapiles, Limón, 22-VIII-66, 100 m, No. 102, log, S. L. Wood. PANAMA: Barro Colorado Island, Canal Zone, 27-XII-63, 70 m, No. 335, tree branch, S. L. Wood; Limón Bay, Canal Zone, 30-XII-63, 3 m, No. 351, tree branch, S. L. Wood. OTHER COUNTRIES: Colombia, Venezuela, Trinidad, Brazil, Guadeloupe.

HOSTS.— *Ochroma* sp., *Theobroma cacao*, etc.

BIOLOGY.— This species breeds in the bole, limbs, and larger branches of trees in wet, tropical, lowland areas.

NOTES.— The above treatment was based on the holotypes of *caraibicus* and *trinidadensis* and on 24 other specimens. The Costa Rican specimens tend to have the declivital striae less strongly impressed and the granules slightly smaller; however, the differences are so slight and inconsistent they are considered to be minor variations within the population.

### 38. *Xyleborus commixtus* Blandford

Fig. 185

*Xyleborus commixtus* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):208 (Lectotype, female, Bugaba, Chiriquí, Panama; British Mus. Nat. Hist., present designation).

DIAGNOSIS.— This species is distinguished from *caraibicus* Eggers by the larger average size, by the more gradual, more broadly convex elytral declivity, with the posterolateral margin more strongly, more acutely elevated, a slight concavity between its crest and the remainder of the declivity.

FEMALE.— Length 3.7–4.0 mm, 2.5 times as long as wide; color dark brown.

Frons and pronotum essentially as in *caraibicus* except pronotal disc and sides reticulate.

Elytral outline and disc as in *caraibicus* except striae not impressed, punctures smaller, interstriae three to four times as wide as striae. Declivity not as steep as in *caraibicus*, more broadly convex, suture on lower half straight; striae not impressed, punctures larger (1.5 times) than on disc; sutural interstriae slightly impressed on basal half; interstrial granules similar to *caraibicus* but averaging slightly smaller; ventrolateral margin rather strongly, acutely elevated, distinctly concave between its crest and remainder of declivity, more conspicuous laterally. Vestiture confined to declivity, of slender interstrial bristles, each bristle about one and one-half times as long as distance between rows, spaced within a row by length of a bristle.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 52 in a log, and No. 53 in *Pouteria*, S. L. Wood. PANAMA: Bugaba, Chiriquí, G. C. Champion.

HOSTS.— *Pouteria* sp., etc.

BIOLOGY.— Specimens were taken from logs 35 cm in diameter.

NOTES.— The above treatment was based on Blandford's two syntypes and on four other specimens. The first syntype, from Bugaba, Panama, has long been regarded as the type, although it has not been so designated. I here designate it as the lectotype of *commixtus* Blandford.

### 39. *Xyleborus lacunatus* Wood

*Xyleborus lacunatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):37 (Holotype, female; Turrialba, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *commixtus* Blandford by details in sculpture of the elytral declivity as indicated in the description.

FEMALE.— Length 4.0 mm, 2.5 times as long as wide; color dark brown.

Frons, pronotum, and elytral disc as in *commixtus*. Elytral declivity essentially as in *commixtus* except rather strongly, transversely impressed on lower third; suture distinctly concave on lower two-thirds; strial punctures larger; interstriae about twice as wide as striae; posterolateral margin much more strongly, acutely elevated than in

*commixtus*, rather strongly concave from its crest to suture on lower third of declivity. Vestiture as in *commixtus*.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Turrialba, Cartago, 18-IV-63, *Theobroma cacao*, J. L. Saunders; Peralta, Cartago, 10-III-64, 500 m, flight, S. L. Wood.

HOST.— *Theobroma cacao*.

NOTES.— The above treatment was based on the female holotype and on one other specimen.

### 40. *Xyleborus politus* Hagedorn

*Xyleborus politus* Hagedorn, 1905, Bull. Mus. d'Hist. Nat. 6:413 (Lectotype, female; Placêrs du Carsevenne, French Guiana; Paris Mus., present designation)

DIAGNOSIS.— This species is distinguished from *mutabilis* Schedl by the smaller size, by the smaller strial punctures, particularly on the declivity, by the narrower declivity, which is transversely convex, by the smaller, more numerous declivital granules, and by the more abrupt posterolateral margin of the declivity.

FEMALE.— Length 3.2–3.6 mm, 2.6 times as long as wide; color dark brown.

Frons and pronotum as in *caraibicus* Eggers.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; outline as in *mutabilis* except more narrowly rounded behind; striae feebly if at all impressed, punctures and interstriae as in *caraibicus*. Declivity rather steep, transversely rather broadly convex on median half; suture straight on lower half; striae not impressed, punctures rather large, shallow; interstriae slightly more than twice as wide as striae, smooth, shining, part of 2 feebly impressed near middle, granules rather small, pointed, irregular in size, about 12–15 on each interstriae; posterolateral margin obtusely subangulate, armed by several moderately coarse granules. Vestiture largely confined to declivity, of stout interstrial bristles, each slightly more than half as long as distance between rows, spaced within a row by one to two times length of a bristle.

DISTRIBUTION.— Costa Rica to Venezuela and French Guiana.

COSTA RICA: Rincón de Osa, Puntarenas 11-VII-66, 30 m, Nos. 52 and 89 in logs, No. 92 in a liana, S. L. Wood; Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 88, stump, S. L. Wood, Río Damitas, Dota Mts., San José, 22-VIII-63, 250 m, No. 124, stump, S. L. Wood; Guápiles, Limón, 22-VIII-66, 100 m, No. 101, tree limb, S. L. Wood. OTHER COUNTRIES: Venezuela.

BIOLOGY.— Specimens were taken from several unidentified lianas, limbs, and logs.

NOTES.— The above treatment was based on the "type" of *politus* and on 48 other specimens. The first of two syntypes in the Hagedorn series has been considered the type, although it has never been so designated. I here designate that specimen as the lectotype of *politus* Hagedorn.

### 41. *Xyleborus improvidus* Schedl

*Xyleborus improvidus* Schedl, 1935, Arch. Inst. Biol. Veg. Río de Janeiro 2:92 (Holotype, female; Moritz, 1858, Venezuela; Schedl Coll.)

*Xyleborus aclinis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):38 (Holotype, female; Cerro Punta, Chiriquí, Panama; Wood Coll.); Wood, 1979, Great Basin Nat. 39:136. *Synonymy*

DIAGNOSIS.— This species is distinguished from *mutabilis* Schedl by the much smaller size, by the more strongly convex declivity, and by the presence of only one tubercle on declivital interstriae 2.

FEMALE.— Length 3.1–3.3 mm, 2.9 times as long as wide; color dark brown.

Frons and pronotum as in *meridensis* except pronotum 1.14 times as long as wide.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; outline and disc as in *meridensis* except interstrial punctures more widely spaced. Declivity moderately steep, convex; suture feebly convex on lower half; striae not impressed, punctures little if any larger than on disc; interstriae smooth, shining, 1 and 3 each armed by about three to six pointed granules of variable size, 2 armed by one moderately coarse denticle one-third declivital length from apex, a few small granules in lateral areas; posterolateral margin as in *mutabilis*, narrowly rounded, its crest armed by several small, isolated granules. Vestiture confined to declivity, sparse, one short bristle arising from posterior basal margin of each granule, each bristle about half as long as width of an interstriae.

DISTRIBUTION.— Panama to Venezuela.

PANAMA: Cerro Punta near Volcán de Chiriquí, Chiriquí, 11-I-64, 1800 m, No. 386, tree stump, S. L. Wood.

BIOLOGY.— Specimens were taken from a stump 15 m in diameter.

NOTES.— The above treatment was based on the type series of four female specimens.

### 42. *Xyleborus dissimulatus* Wood

*Xyleborus dissimulatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):38 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *mutabilis* by the much smaller size, by the smaller strial punctures, by the much smaller granules on declivital interstriae 2, and by the more subangulate, subserrate posterolateral margin of the declivity. It is distinguished, with difficulty, from *posticus* Eichhoff by characters summarized in the above key.

FEMALE.— Length 2.2–2.3 mm, 2.6 times as long as wide; color brown.

Frons, pronotum, and elytral disc as in *posticus*.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; disc occupying basal 60 percent of elytral length. Declivity moderately steep, rather broadly convex; strial punctures much larger than on disc, very shallow; interstriae smooth, shining, as wide as striae, each with a sparse row of minute granules, 1 and 3 each with about two distinctly larger granules; posterolateral margin subacute, more continuously subserrate than in *posticus*. Vestiture largely confined to declivity, of very short, stout, and fine interstrial bristles, each bristle about one-third as long as distance between rows.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 2-VII-63, 1300 m, No. 9, *Miconia*, 17-IX-63, No. 184, *Miconia caudata*, No. 178, liana, S. L. Wood.

HOSTS.— *Miconia caudata*, *M.* sp., liana.

BIOLOGY.— Specimens were taken from material 8–10 cm in diameter.

NOTES.— The above treatment was based on the type series of five specimens.

### 43. *Xyleborus posticus* Eichhoff

*Xyleborus posticus* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:281 (Holotype, female; Caracas, Venezuela; presumably lost with Hamburg Mus.).

*Xyleborus novateutonicus* Schedl, 1954, Dusenia 5:47 (Syntypes, females; Nova Teutonia, Santa Catarina, Brazil; Schedl and Plaumann colls.); Schedl, 1962, Ent. Blätt. 58:207. *Synonymy*

DIAGNOSIS.— This species is distinguished from the very closely allied *dissimulatus* Wood by the shorter, steeper, more broadly convex declivity, which is usually dull, by the smaller strial punctures on the declivity, and by the much shorter declivital vestiture.

FEMALE.— Length 2.2–2.5 mm, 2.5 times as long as wide; color dark brown to almost black.

Frons as in *caraibicus* Eggers.

Pronotum 1.10 times as long as wide; usually subquadrate, with all margins rather weakly arcuate, some specimens with anterior margin more distinctly arcuate; summit at middle; anterior slope rather coarsely asperate, posterior areas reticulate, punctures minute, shallow, sparse. Vestiture confined to margins.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal three-fourths, then rather abruptly rounded, obtusely subangulate behind; striae not impressed, punctures moderately large, shallow; interstriae three times as wide as striae, subshining, smooth, punctures uniseriate, rather small (sometimes irregular in size). Declivity occupying posterior 25 percent of elytral length, steep, broadly convex; surface dull (less commonly shining); striae feebly impressed, punctures very slightly larger than on disc; interstriae twice as wide as striae, each uniseriately, rather sparsely granulate (about 6–8 granules on each), granules rather small, usually pointed, often irregular in size, smaller to obsolete on apical fourth; posterolateral margin abruptly rounded, a few small, scattered granules on its crest. Vestiture of fine, moderately long, interstrial hair, often abraded on disc and sides; each seta on declivity up to twice as long as distance between rows.

MALE.— Length 1.7 mm; similar to female except eye reduced in size, anterior margin of pronotum more broadly rounded; asperities smaller, summit flat or feebly impressed; all details of sculpture poorly formed.

DISTRIBUTION.— Veracruz to Brazil.

MEXICO: **Chiapas**: Palenque Ruins. **Veracruz**: Coatzocoalcos, Lago Catemaco. GUATEMALA: Volcán Pacaya in Esquintla. COSTA RICA: Finca Gromaco on Río Coto Brus, Rincón de Osa, and Volcán in Puntarenas, Río Damitas (Dota Mts.) and San José in San José, Tapantí and Volcan Irazu in Cartago, Guápiles and Finca La Lola in Limón. PANAMA: Barro Colorado Island and Gatun Dam in the Canal Zone, Volcán Chiriquí in Chiriquí.

HOSTS.— *Erythrina costaricensis, Ficus* sp., *Spondias purpurea, Theobroma cacao,* and numerous other trees, shrubs, and lianas.

BIOLOGY.— This is an abundant, moderately aggressive species that has caused considerable economic loss to horticultural crops and to the lumber industry in Central and South America. It occurs in rather moist areas and it may breed in almost any material larger than about 8 cm in diameter. It is evidently more successful on slightly drier sites or areas of a log than is normal for *ferrugineus* (Fabricius) or *affinis* Eichhoff.

NOTES.— The above treatment was based on 116 specimens, two of which were compared to Eggers's material that he had compared to a cotype of *posticus.* Schedl's syntypes of *novateutonicus* were examined, but comparative notes were not recorded. Two specimens in the U.S. National Museum were sent by Eichhoff to Riley; they were labeled "posticus, Mexico, Reitter." These specimens undoubtedly were examined by Eichhoff, but were not part of his original series and cannot be considered syntypes. They are entirely typical of the species and have the dull declivity.

Many specimens assigned to this species from southern South America have the elytral declivity brightly shining. No attempt was made to determine if that form represents a normal variation within a population or a sibling species.

### 44. *Xyleborus concentus* Wood

*Xyleborus concentus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):39 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *parallelocollis* Eggers by the more narrowly convex declivity on the transverse axis, by the serrate posterolateral margin of the declivity, and by the shorter interstrial bristles on the declivity.

FEMALE.— Length 2.5–2.7 mm, 2.7 times as long as wide; color dark brown.

Frons and pronotum as in *caraibicus* Eggers except pronotum 1.15 times as long as wide.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on slightly less than basal two-thirds, tapered, then narrowly rounded behind; striae not impressed, punctures rather small, distinctly impressed; interstriae twice as wide as striae, punctures very fine, uniseriate. Declivity gradual, transversely convex, suture very feebly convex on lower half; surface rather dull in most specimens; striae not impressed, punctures larger than on disc; interstriae flat, slightly wider than striae, granules small, of uniform size, spaced by distances less than width of an interstriae; posterolateral margin abrupt, subacute, finely serrate. Vestiture largely confined to declivity, consisting of short, stout, interstrial bristles, each bristle equal in length to about one-third width of an interstriae; a few similar, much longer bristles on disc.

DISTRIBUTION.— Costa Rica and Venezuela.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 9, liana; Volcán, Puntarenas, 11-XII-63, 1000 m, No. 308, tree limb; Tapantí, Cartago, 26-XI-63, 1300 m, No. 265, *Phoebe mexicana*; Guápiles, Limón, 22-VIII-66, 100 m, No. 101, tree limb. VENEZUELA: 30 km E Palmar, Bolivar, 12-VI-70, 200 m, No. 556, *Alexa imperatricis.* All were taken by me.

HOSTS.— *Alexa imperatricia, Phoebe mexicana,* etc.

BIOLOGY.— Limbs and the boles of trees and lianas from 8 to 20 cm in diameter were attacked.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 45. *Xyleborus quadratus* Blandford

*Xyleborus quadratus* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):209 (Lectotype, female; Bugaba, Chiriquí, Panama; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished from *concentus* Wood by the larger size, by the longer declivital bristles, and, possibly, by the slightly less narrowly rounded posterior margin of the elytra.

FEMALE.— Length 3.6 mm, 2.8 times as long as wide; color very dark brown.

As in *concentus* except declivital bristles slightly more slender, each almost as long as distance between rows.

DISTRIBUTION.— Panama.

PANAMA: Bugaba, Chiriquí, G. C. Champion.

NOTES.— The first of two female syntypes in the Blandford series of *quadratus* is here designated as the lectotype of this species. The above treatment was based on the lectotype.

### 46. *Xyleborus parallelocollis* Eggers
Fig. 186

*Xyleborus parallelocollis* Eggers, 1933, Mém. Trav. Lab. d'Ent. Mus. Nat. d'Hist. Nat., Paris 1(1):33 (Holotype, female; Nouveau Chantier, French Guiana; Paris Mus.)

DIAGNOSIS.— This species is distinguished from *concentus* Wood by the transversely impressed, more broadly convex elytral declivity, and by the more acutely elevated, almost smooth, posterolateral margin of the declivity.

FEMALE.— Length 2.3–2.7 mm, 2.6 times as long as wide; color dark brown.

Frons and pronotum as in *caraibicus* except pronotum 1.11 times as long as wide, its posterior areas subreticulately etched.

Elytra 1.5 times as long as wide, 1.4 times as long as pronotum; outline slightly stouter than in *concentus*. Declivity moderately steep, broadly convex, suture straight on lower half; surface smooth and shining; strial punctures and interstrial granules as in *concentus*; posterolateral margin acutely, strongly elevated, its crest almost smooth, devoid of denticles, a feebly concave impression between crest and remainder of declivity. Vestiture largely confined to declivity, consisting of interstrial bristles, each bristle equal in length to from half to two-thirds distance between rows, bristles interspersed with minute hair; sparse setae on disc fine, about twice as long as on declivity.

DISTRIBUTION.— Costa Rica and French Guiana.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 52, log, S. L. Wood; Río Damitas, San José, 18-II-64, 250 m, No. 438, log, S. L. Wood; Tapantí, Cartago, 17-IX-63, 1300 m, No. 178, liana, S. L. Wood; Turrialba, Cartago, 9-III-64, 700 m, No. 497, liana, S. L. Wood; Finca La Lola, 27-VI-63, *Theobroma cacao*, J. L. Saunders. OTHER COUNTRIES: French Guiana.

HOSTS.— *Theobroma cacao*, and other trees and lianas.

BIOLOGY.— Specimens were taken from lianas 10 cm in diameter and from logs up to 1 m in diameter.

NOTES.— The above treatment was based on the holotype and on 20 other specimens.

### 47. *Xyleborus discretus* Eggers

*Xyleborus discretus* Eggers, 1933, Mém. Trav. Lab. d'Ent. Mus. Nat. d'Hist. Nat., Paris 1(1):29 (Holotype, female; Marcapata, Peru; U.S. Nat. Mus., 60670)

*Xyleborus usticus* Wood, 1968, Great Basin Nat. 28:3 (Holoype, female; Bartica District, British Guiana; British Mus. Nat. Hist.); Wood, 1972, Great Basin Nat. 32:198. *Synonymy*

DIAGNOSIS.— This species is distinguished from *semipunctatus* Eggers by the distinctly larger size, by the steeper elytral declivity, and by the variable size of the interstrial granules on the declivity.

FEMALE.— Length 2.9–3.3 mm, 2.5 times as long as wide; color dark brown to almost black.

Frons and pronotum as in *caraibicus* except frons and posterior areas of pronotum more distinctly reticulate; pronotum 1.05 times as long as wide.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; disc and outline as in *semipunctatus*. Declivity confined to posterior 40 percent, rather steep, broadly convex; transversely impressed on lower third, sutural area distinctly concave on lower half of declivity; striae and interstriae as in *semipunctatus* except interstrial granules with one or two very minute granules alternating with moderately coarse granules; posterolateral margin subacutely elevated, distinctly impressed between its crest and remainder of declivity. Vestiture as in *parallelocollis* except shorter; length of declivital bristles distinctly shorter than half distance between rows, often abraded.

MALE.— Length 2.7 mm; head and elytra essentially as in female, but with all characters poorly formed; pronotum as in male *asper* Eggers except anterior area somewhat more strongly concave.

DISTRIBUTION.— Veracruz to French Guiana and Peru.

MEXICO: Chiapas: Palenque Ruins. COSTA RICA: Rincon de Osa, Puntarenas, 11-VIII-66, 30 m, No. 52, log, S. L. Wood. OTHER COUNTRIES: Venezuela, British Guiana, French Guiana, Peru.

HOSTS.— *Alexa imperatricia* (Venezuela), etc.

BIOLOGY.— Specimens were taken from logs 30 to 100 cm in diameter.

NOTES.— The above treatment was based on the holotype of *discretus*, on a topotypic paratype of *usticus*, and on 71 other specimens, 2 of which were compared to the holotype of *discretus*.

### 48. *Xyleborus schildi* Schedl

*Xyleborus schildi* Schedl, 1935, Archiv. Instit. Biol. Veg. 2:94 (Holotype, female; Turrialba, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species superficially resembles a small *spathipennis* Eichhoff except that the anterior margin of the pronotum is unarmed. It is distinguished from the distantly related *tribulatus* Wood as indicated in the above key.

FEMALE.— Length 3.4–4.0 mm, 2.4 times as long as wide; color dark brown.

Frons and pronotum as in *tribulatus*.

Elytra 1.5 times as long as wide; outline as in *tribulatus* except stouter; disc occupying slightly less than basal half, shining, except striae and interstriae 1 dull; striae feebly impressed, punctures very fine, shallow, interstriae smooth, four to five times as wide as striae, interstriae becoming distinctly wider toward declivity, punctures confused, almost as large as those of striae. Declivity gradual, broadly convex, dull; very similar to *tribulatus* except more broadly convex, surface smooth but shagreened; striae not impressed, punctures as on disc; interstrial punctures uniseriate except confused on 1, two or three punctures on each interstriae finely granulate; posterolateral margin less acute than in *tribulatus*. Vestiture restricted to one short, stout bristle at each declivital granule.

DISTRIBUTION.— Costa Rica to Colombia.

COSTA RICA: Turrialba, 800 m, S. L. G. Schild. COLOMBIA: 8 km S Colonia, Valle de Cauca, 9-VII-70, 30 m, No. 647, *Rheedia madruño*, S. L. Wood.

NOTES.— The above treatment was based on the holotype and on one other specimen.

### 49. *Xyleborus tribulatus* Wood

*Xyleborus tribulatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):39 (Holotype, female; Río Damitas, Dota Mts., San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *semipunctatus* Eggers except as noted in the following description.

FEMALE.— Length 3.8 mm, 2.4 times as long as wide; color very dark brown.

Frons and pronotum as in *semipunctatus* except punctures on posterior half of pronotum distinctly larger, closer.

Elytra as in *semipunctatus* except discal striae 2 distinctly sinuate; interstriae 2 and 3 on disc distinctly confused; strial punctures on disc and declivity distinctly larger, interstriae on disc three times as wide as striae (four times as wide in *semipunctatus*). Declivity as in *sempunctatus* except as noted.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Río Damitas, Dota Mts., San José, 22-VIII-63, 250 m, No. 126, liana, S. L. Wood.

NOTES.— The above treatment was based on the female holotype.

### 50. *Xyleborus semipunctatus* Eggers

*Xyleborus semipunctatus* Eggers, 1933, Mém. Trav. Lab. d'Ent. Mus. Nat. d'Hist. Nat., Paris 1(1):30 (Holotype, female; St. Laurent du Maroni, French Guiana; Paris Mus.)

DIAGNOSIS.— This species is distinguished from *discretus* Eggers by the smaller size and by the more gradual declivity with the interstrial granules of uniformly small size.

FEMALE.— Length 2.3–2.6 mm, 2.4 times as long as wide; color dark brown.

Frons and pronotum as in *caraibicus* Eggers, pronotum 1.1 times as long as wide.

Elytra 1.5 times as long as wide, 1.7 times as long as pronotum; disc as in *parallelocollis* Eggers; outline as *parallelocollis* except more broadly rounded at basal and lateral margins of declivity; suture weakly, distinctly concave on lower half of declivity; declivital striae weakly impressed, punctures and interstrial granules as in *parallelocollis*; posterolateral margin as in *parallelocollis* except more distinctly impressed between its crest and remainder of declivity. Vestiture as in *concentus* Wood but slightly shorter, finer.

DISTRIBUTION.— Costa Rica and Colombia to French Guiana.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 90, liana, S. L. Wood. COLOMBIA: San Marcos, Valles, VII-59, 550 m, C. Ramos. VENEZUELA: 30 km E Palmar, Bolivar, 12-VI-70, No. 543 in *Jacaranda copaia*, No. 556 in *Alexa imperatricia*, S. L. Wood.

HOSTS.— *Alexa imperatricia*, *Jacaranda copaia*, etc.

BIOLOGY.— Specimens were taken from material 5 to 30 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 11 other specimens, several of which were compared directly to the type. Apparently a cotype in the Eggers collection and other specimens in the Schedl collection are of *parallelocollis* and do not agree with the holotype.

### 51. *Xyleborus tumucensis* Hagedorn

*Xyleborus tumucensis* Hagedorn, 1905, Bull. Mus. d'Hist. Nat., Paris 6:414 (Lectotype, female; Rivière Lunier, Tumuc-Humac, French Guiana; Paris Mus., present designation)

*Xyleborus guayanensis* Eggers, 1933, Mém. Trav. Lab. d'Ent. Mus. Nat. d'Hist. Nat., Paris 1(1):28 (Syntypes, male and female; Nouveau Chantier, French Guiana; Paris Mus.); Wood, 1972, Great Basin Nat. 32:200. *Synonymy*

DIAGNOSIS.— This species is distinguished form *geayi* Hagedorn by the larger size, by the confused strial punctures on both disc and declivity, and by the slightly stouter body form.

FEMALE.— Length 3.5–3.8 mm (lectotype 3.7 mm), 2.4 times as long as wide; color dark reddish brown.

Frons as in *caraibicus* Eggers.

Pronotum 1.11 times as long as wide; widest one-third length from base, sides weakly arcuate and converging anteriorly, rather narrowly rounded in front; summit distinctly behind middle; anterior slope rather coarsely asperate; posterior half with lateral areas reticulate, becoming subreticulate to shining behind summit, punctures fine, shallow, moderately close. Vestiture confined to margins, sparse.

Elytra 1.4 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; disc occupying basal two-thirds of elytral length; striae not impressed, punctures rather small, rather strongly confused except near base; interstriae at base three times as wide as striae, punctures uniseriate, finely granulate, almost as large as those of striae. Declivity rather steep, rather broadly flattened; strial punctures moderately large, shallow, confused; interstriae marked only by pointed tubercles, about three or four tubercles on each interstriae except 2 usually armed only near base and apex; posterolateral margin subacute, armed by a few fine granules. Vestiture of interstrial bristles, those on declivity slightly shorter than distance between rows, longer on disc.

DISTRIBUTION.— Costa Rica and French Guiana.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 63, *Bursera simarubra*, No. 52, log, S. L. Wood.

HOST.— *Bursera simarubra*, etc.

BIOLOGY.— Specimens were taken from logs 30 to 100 cm in diameter.

NOTES.— The first of three female syntypes of *tumucensis* has been labeled type. It is in the Paris Museum and is here designated as the lectotype of *tumucensis* Hagedorn. The lectotype of *tumucensis*, the male syntype and two female cotypes of *guayanensis*, and nine other specimens were used as the basis for the above treatment. The female syntype of *guayanensis* is not in the Paris Museum, where it was originally deposited. Eggers (1933) incorrectly applied the name *tumucensis* to specimens of *geayi* Hagedorn and, as a result, named the synonym *guayanensis*.

### 52. *Xyleborus geayi* Hagedorn

*Xyleborus geayi* Hagedorn, 1905, Bull. Mus. d'Hist. Nat., Paris 6:413 (Lectotype, female; Camopi, French Guiana; Paris Mus., present designation)

DIAGNOSIS.— This species is distinguished from *tumucensis* Hagedorn by the smaller size, by the more slender body form, and by the uniseriate strial punctures on both disc and declivity.

FEMALE.— Length 2.8–3.1 mm (lectotype 2.8 mm), 2.55 times as long as wide; color dark brown to almost black.

Frons and pronotum as in *tumucensis* except pronotum 1.15 times as long as wide; posterior area rather dull, obscurely or not at all reticulate, punctures smaller.

Elytra 1.5 times as long as wide, 1.35 times as long as pronotum; outline about as in *tumucensis* except more slender; striae not impressed, punctures rather small, shallow, very close, slightly confused on posterior half of disc; interstriae almost smooth, three to four times as wide as striae, punctures uniseriate, almost as large as those of striae, granulate on anterior margins. Declivity about as in *tumucensis*, strial punctures much larger than on disc, in rows, tubercles similarly placed but slightly smaller. Vestiture as in *tumucensis* except slightly longer, obsolete on declivital face except where tubercles arise.

DISTRIBUTION.— Costa Rica and Colombia to French Guiana.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 52, log, S. L. Wood; Río Damitas, Dota Mts., San José, 22-VIII-64, 250 m, tree stump, S. L. Wood. OTHER COUNTRIES: Colombia, Venezuela, British Guiana, and French Guiana.

HOST.— *Sloania multiflora* (Colombia), etc.

BIOLOGY.— Specimens were cut from logs 20 to 80 cm in diameter.

NOTES.— The above treatment was based on the first female syntype, labeled type, in the Hagedorn series at the Paris Museum, and on 43 other specimens. The first syntype of *geayi* Hagedorn in the Paris Museum has been regarded as the type, although it has not been so designated; I here designate it the lectotype of this species.

### 53. *Xyleborus grandis* Eichhoff

*Xyleborus grandis* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:281 (Holotype, female; Colombia; Brussels Mus.)

DIAGNOSIS.— The true affinities of this species are uncertain. It is distinguished from *tumucensis* Hagedorn and *geayi* Hagedorn by the more gradual declivity, by the minute subgranular irregularities on the pronotal disc, and by the confused punctures on declivital interstriae 1, 2, and 3.

FEMALE.— Length 4.2–4.4 mm, 2.5 times as long as wide; color dark brown.

Frons as in *caraibicus* Eggers.

Pronotum 1.10 times as long as wide; widest slightly behind middle, sides weakly arcuate on basal two-thirds, broadly rounded in front; anterior margin subserrate; summit slightly behind middle; finely, closely asperate on anterior half, asperities gradually decreasing in size posteriorly to base, area behind summit shining, very closely, shallowly punctured, posterior margins of punctures subgranulate. Vestiture confined to marginal areas, sparse.

Elytra 1.5 times as long as wide, 1.5 times as long as pronotum; sides straight on basal half, slightly wider at base of declivity, rather broadly rounded, then rather narrowly rounded behind; disc confined to basal half; striae weakly impressed, punctures very close, rather large, shallow; interstriae about twice as wide as striae, smooth, shining, punctures fine, confused, moderately abundant, somewhat uniseriate toward base on odd-numbered interstriae. Declivity commencing at middle, gradual, very broadly convex; striae not impressed, punctures uniseriate on disc, usually slightly confused near middle of declivity; interstrial punctures confused, larger than on disc except on 1, their anterior margins usually feebly granulate; about four widely spaced, pointed tubercles on each interstriae on basal two-thirds, except only two on 2; posterolateral margin narrowly rounded, its crest finely granulate. Vestiture of rather widely spaced, slender, interstrial bristles, each one and one-half to two times length of a bristle.

Only available male with anterior third of pronotum severed, evidently resembling male *spathipennis*.

DISTRIBUTION.— Costa Rica to Colombia.

COSTA RICA: Tapantí, Cartago, 17-IX-63, 1300 m, No. 181, log, S. L. Wood.

BIOLOGY.— Specimens were removed from a decaying log 80 cm in diameter.

NOTES.— The above treatment was based on the holotype and on seven other specimens.

### 54. *Xyleborus vismiae* Wood

Fig. 186

*Xyleborus vismiae* Wood, 1974, Brigham Young Univ. Sci. Bull. Biol. Ser. 19(1):39 (Holotype, female; Río Damitas, Dota Mts., San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *costaricensis* Blandford by the shorter, steeper declivity, which is strongly, transversely impressed on the lower half, by the smooth, shining declivital surface, and by the larger declivital granules. The *costaricensis* group of species is characterized by the slightly protuberant, smooth, peculiarly reticulate frons that is devoid of punctures, by the tapered posterior half of the elytra, and by the long, rather narrow declivity.

FEMALE.— Length 3.3–3.7 mm, 2.6 times as long as wide; color dark brown.

Frons shallowly, transversely impressed between eyes, weakly inflated below; surface smooth, with very fine reticulation below, more coarsely reticulate toward vertex, punctures rather small, sparse, mostly confined to lateral areas, none on lower third; vestiture very sparse, hairlike, inconspicuous.

Pronotum 1.13 times as long as wide; sides almost straight and parallel on basal half,

rather narrowly rounded in front; summit at middle; anterior half rather finely asperate; posterior areas very finely subreticulate, punctures minute, distinct, rather sparse.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal half, then rather strongly tapered, rather narrowly rounded behind; striae not impressed, punctures small, distinct, spaced within a row by one to two diameters of a puncture; interstriae smooth, moderately shining, punctures very minute, distinct, uniseriate. Declivity occupying slightly more than posterior third, strongly, transversely impressed on lower half; transversely flat; longitudinally concave; striae curved toward suture near apex, punctures almost twice as large as on disc; interstriae shining, armed by rows of small granules, alternate granules slightly larger; posterolateral margin narrowly rounded, its crest with a few feeble granules.

DISTRIBUTION.— Costa Rica and Venezuela.

COSTA RICA: Río Damitas, Dota Mts., San José, 22-VIII-63, 250 m, No. 126, *Vismia guayanensis*, S. L. Wood. VENEZUELA: Rancho Grande in Pittier Nat. Pk., Aragua, 9-IV-70, 1100 m, No. 433, Guttiferae (very near but apparently not *Vismia*), S. L. Wood.

HOSTS.— *Vismia guayanensis*, and Guttiferae sp.

BIOLOGY.— Specimens were taken from small, cut trees 6–10 cm in diameter.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 55a. *Xyleborus demissus* Wood

*Xyleborus demissus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):40 (Holotype, female; Rincón de Osa, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *deplanatus* Eggers by the more slender body form, by the shorter declivity, by the two sizes of interstrial tubercles on the declivity, and by the less strongly serrate posterolateral margin of the declivity.

FEMALE.— Length 2.0 mm, 2.9 times as long as wide; color dark brown.

Frons and pronotum as in *deplanatus* except pronotum 1.21 times as long as wide.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal half, then slightly tapered, narrowly rounded behind, weakly emarginate at suture; disc occupying slightly more than basal half; striae not impressed, punctures small, shallow, distinct; interstriae smooth, shining, three times as wide as striae, punctures uniseriate, slightly smaller than those of striae, their anterior margins feebly granulate at base, becoming more distinctly granulate posteriorly. Declivity rather gradual, moderately convex on both axes; striae not impressed, punctures slightly larger than on disc, lateral margins of punctures on 2 and 3 weakly granulate; interstriae shining, about twice as wide as striae, each armed by a row of granules, granules mostly small except on 2 and 3 distinctly larger granules alternate with small ones. Vestiture of rows of fine, short, strial hair, and interstrial rows of short, almost scalelike bristles, each bristle one-third to one-half as long as distance between rows, slightly closer within a row, each three to five times as long as wide.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 70, log 20 cm in diameter, S. L. Wood.

NOTES.— The above treatment was based on the holotype.

### 55b.—*Xyleborus praestans* Wood

*Xyleborus praestans* Wood, 1980, Great Basin Nat. 40:358 (Holotype, female; Cerro Punta, Chiriquí, Panama; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *meritus* Wood by the larger size, by the different elytral declivity, and by other characters cited below.

FEMALE.— Length 3.9 mm, 2.9 times as long as wide; color dark brown.

Frons and pronotum as in *meritus* except pronotal summit more subacutely elevated.

Elytra about as in *meritus* except declivity slightly steeper, more nearly convex, more broadly rounded behind; interstrial punctures on disc more nearly obsolete, irregular interstrial lines on disc more conspicuous; strial punctures on declivity more distinct, not larger than those on disc, interstrial tubercles on 1 and 2 not as close, very slightly larger.

DISTRIBUTION.— Panama.

PANAMA: Cerro Punta, Chiqiruí, 31-V-72, 2000–2500 m, T. L. and L. J. Erwin.

NOTES.— The above treatment was based on the holotype.

### 56. *Xyleborus meritus* Wood
Fig. 186

*Xyleborus meritus* Wood, 1972, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):40 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *vismiae* Wood by the slightly larger size, by the more gradual, more nearly flattened elytral declivity, and by the much finer interstrial granules on the declivity.

FEMALE.— Length 2.8–3.4 mm, 2.8 times as long as wide; color very dark brown.

Frons, pronotum (1.13 times as long as wide), and elytral disc as in *vismiae*.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; outline as in *vismiae*. Declivity occupying slightly less than posterior half of elytral length, its lower half very shallowly concave; striae not impressed, curving toward suture near apex, punctures almost twice as large as on disc; interstriae smooth, shining, with widely spaced fine granules, those on lower half of 2 and 3 smaller, sometimes almost obsolete. Vestiture sparse, of fine hair, length on declivity equal to about half width of an interstriae.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 1300 m, 2-VII-63, No. 7, liana, 3-VII-63, No. 17, *Conostegia oerstediana*, 17-IX-63, No. 182, tree branch, No. 184, *Miconia caudata*, 26-XI-63, No. 265, *Phoebe mexicana*, S. L. Wood; 14 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 204, *Miconia globuliflora*, No. 200, *Myrica pubescens*, S. L. Wood.

HOSTS.— *Conostegia oerstediana*, *Miconia caudata*, *M. globuliflora*, *Myrica pubescens*, and *Phoebe mexicana*.

BIOLOGY.— This species was taken from material 6–15 cm in diameter.

NOTES.— The above treatment was based on the type series of 25 specimens.

### 57. *Xyleborus costaricensis* Blandford
Fig. 186

*Xyleborus costaricensis* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):210 (Holotype, female; Volcán Irazu, Costa Rica; British Mus. Nat. Hist.)

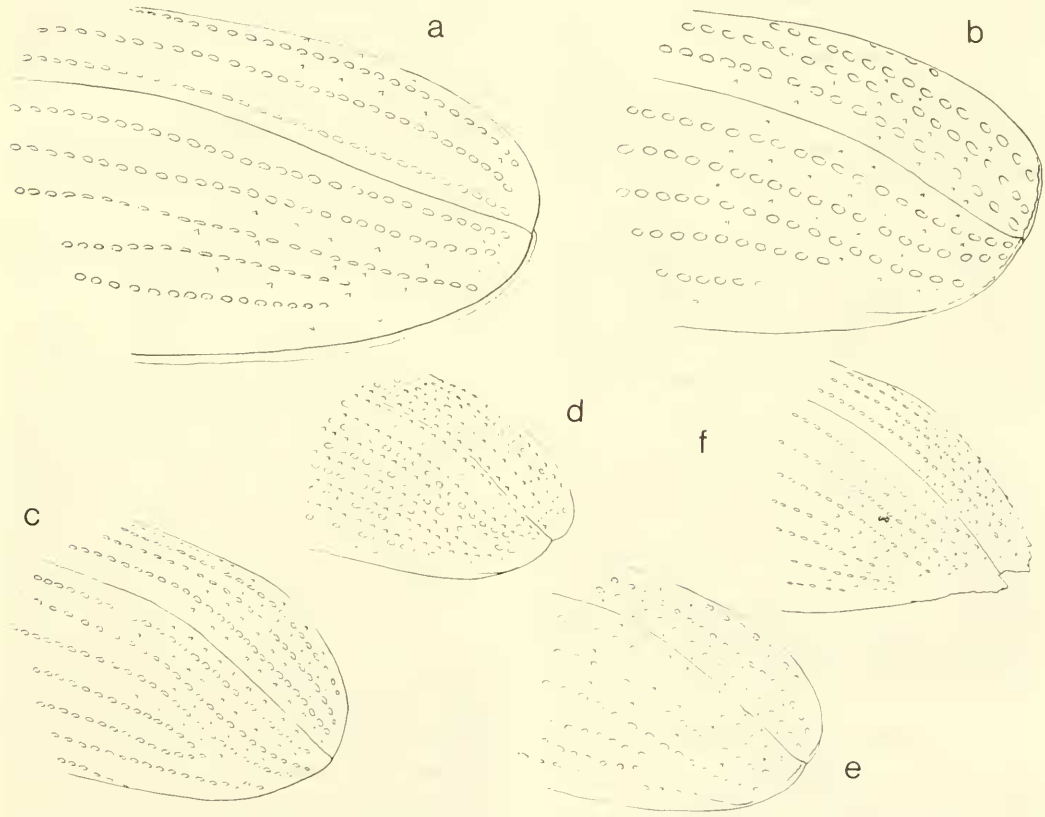



Fig. 186. *Xyleborus* spp., female declivities with setae omitted: a, *prolatus*; b, *costaricensis*; c, *vismiae*; d, *parallelocollis*; e, *meritus*; f, *pseudotenuis*.

*Xyleborus nevermanni* Schedl, 1935, Archiv. Inst. Biol. Veget., Río de Janiero 2:93 (Syntypes, females; Vara Blanca, Heredia, Costa Rica; Schedl and Nevermann Coll.); Wood, 1979, Great Basin Nat. 39:136. *Synonymy*

DIAGNOSIS.— This species is distinguished from *meritus* Wood by the larger size and by the longer, dull, more flattened elytral declivity.

FEMALE.— Length 4.0–4.4 mm, 2.8 times as long as wide; color dark brown.

Frons and pronotum as in *meritus*.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; outline about as in *meritus* except more broadly rounded behind; disc occupying very slightly less than basal half; striae not impressed, punctures rather small, shallow; interstriae three times as wide as striae, smooth, shining punctures minute, virtually obsolete. Declivity rather gradual, narrowly flattened toward base, more broadly, subconcavely flattened on lower third to striae 3; surface dull; strial punctures almost twice as wide as on disc; interstriae twice as wide as striae, smooth, with small uniseriate, sparse granules on each interstriae from base to apex; spacing for granules about equal to width of an interstriae. Vestiture confined to declivity, of sparse rows of interstrial hairlike setae, each seta about equal in length to distance between rows, one to two times length of a seta within a row.

DISTRIBUTION.— Costa Rica and Panama.

COSTA RICA: Volcán Irazu, G. C. Champion; 14 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 194, log, S. L. Wood; Tapantí, Cartago, 17-X-63, 1300 m, No. 178, liana, 24-X-63, No. 265, *Phoebe mexicana*, S. L. Wood. PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, No. 386, tree stump, S. L. Wood; Potrerillos, Chiriquí, 18-IV, 20-V-33.

HOSTS.— *Phoebe mexicana*, etc.

BIOLOGY.— Specimens were taken from recently cut material 8–30 cm in diameter.

NOTES.— The above treatment was based on 38 specimens, 2 of which were compared directly to the holotype of *costaricensis*. The Schedl syntype and the syntype in the U.S. National Museum of *nevermanni* were examined and are of this species.

## 58. *Xyleborus prolatus* Wood

Fig. 186

*Xyleborus prolatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):41 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *costaricensis* Blandford by the larger size, by the longer, more strongly impressed declivity, and by the near absence of granules on declivital interstriae 1 and 2.

FEMALE.— Length 4.0–4.4 mm, 2.8 times as long as wide; color dark brown.

Frons and pronotum as in *costaricensis*.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; outline about as in *costaricensis* except more strongly tapered on posterior half, more narrowly rounded behind; disc confined to basal third, as in *costaricensis*. Declivity very gradual, shallowly, broadly bisulcate; surface dull; strial punctures twice as large as on disc; interstriae almost twice as wide as striae, smooth, 1 distinctly elevated toward suture, 2 broadly, subconcavely impressed, 3 distinctly, gradually elevated toward broad summit at striae 4, 3 and 4 each with a row of widely spaced, moderately large granules, 1 and 2 sometimes with one or two smaller granules near apex (one paratype with five granules on 2 on left side). Vestiture as in *costaricensis* except almost entirely absent on declivital interstriae 1 and 2.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 24-X-63, 1300 m, No. 265, *Phoebe mexicana*, S. L. Wood.

BIOLOGY.— This species was taken from a cut limb 6–10 cm in diameter.

NOTES.— The above treatment was based on the type series of nine specimens.

## 59. *Xyleborus sparsipilosus* Eggers

*Xyleborus sparsipilosus* Eggers, 1933, Mém. Trav. Lab. d'Ent. Mus. Nat. d'Hist. Nat. Paris 1(1):34 (Holotype, female; Nouveau Chantier, French Guiana; Paris Mus.)

*Xyleborus inconveniens* Schedl, 1948, Rev. de Ent., Río de Janeiro 19:577 (Holotype, female; Hamburgfarm on Río Reventazón, Limón, Costa Rica; Schedl Coll.); Wood, 1972, Great Basin Nat. 32:199. *Synonymy*

DIAGNOSIS.— This species is distinguished from *productus* Hagedorn by the smaller size, by the more broadly rounded elytral apex, which is not produced on the apical fourth of the declivity, and by the smaller major denticle on declivital interstriae 3.

FEMALE.— Length 2.2–2.4 mm, 2.9 times as long as wide; color very dark reddish brown.

Frons broadly convex, epistomal margin weakly elevated; surface reticulate, punctures rather sparse, shallow, not sharply impressed, irregular in size.

Pronotum 1.2 times as long as wide; widest on basal half, sides weakly arcuate and almost subparallel on slightly more than basal half, rather narrowly rounded in front; summit at middle; anterior slope rather coarsely asperate; posterior areas almost smooth and shining, with irregular, sometimes obscure areas of reticulation, punctures fine, sparse. Vestiture sparse, confined to marginal areas.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; disc occupying basal two-thirds; striae not impressed, punctures rather small, close; interstriae twice as wide as striae, smooth, shining, punctures uniseriate, one or two minute punctures alternating with one larger, subgranulate puncture. Declivity moderately steep, broadly convex on transverse axis; suture straight on lower half; strial punctures distinctly larger than on disc; interstriae slightly wider than striae; interstriae 1 armed by about five pointed granules, one on upper third and one on lower third slightly larger, 2 entirely unarmed, with a row of closely placed punctures, 3 armed by two to seven granules, two on middle third larger, about equal in size to those on 1; lateral areas with a few fine granules; posterolateral margin subacute, crest sinuate, unarmed. Vestiture consisting of very minute strial hair and rows of interstrial setae; one or two minute interstrial setae alternate with long, coarse, interstrial bristles, bristles each about twice as long as distance between rows, spaced within a row by length of a bristle; bristles absent on declivital interstriae 2.

DISTRIBUTION.— Costa Rica and Panama to French Guiana.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 52, log, S. L. Wood; Finca Gromaco in Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 62, *Ficus*, S. L. Wood; Río Damitas, Dota Mts., San José, 22-VIII-63, 250 m, No. 124, tree stump, 18-II-64, No. 430, in flight, S. L. Wood; Moravia, Cartago, 11-III-64, 500 m, No. 470, log, S. L. Wood; Turrialba, Cartago, 9-III-64, 700 m, No. 496, tree limb, S. L. Wood; Hamburgfarm on Río Reventazón, Limón, 28-VI-34, fliegend bei *Virola warburgii*, F. Nevermann. PANAMA: Cerro Campana, 2-VIII-70, 900 m.

HOSTS.— *Ficus* sp., *Virola warburgii*, etc.

BIOLOGY.— Specimens were taken from material 10–60 cm in diameter.

NOTES.— The above treatment was based on the holotype of *sparsipilosus*, on my homotype that was compared directly to the holotype of *inconveniens*, and on 20 other specimens.

### 60. *Xyleborus productus* Hagedorn

*Xyleborus productus* Hagedorn, 1905, Bull. Mus. d'Hist. Nat., Paris 6:414 (Lectotype, female; Bas. Mahury, French Guiana; Paris Mus., present designation)

DIAGNOSIS.— This species is distinguished from *sparsipilosus* Eggers by the larger size, by the narrowly produced apical third of the elytral declivity, and by the slightly enlarged denticle on declivital interstriae 3.

FEMALE.— Length 2.5–2.7 mm (lectotype 3.0 mm), 2.7 times as long as wide; color very dark reddish brown.

Frons and pronotum as in *sparsipilosus* except frons more coarsely punctured, pronotum more broadly, subangulately rounded in front, posterior areas more uniformly reticulate.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal two-thirds, subacutely acuminate behind; disc occupying basal two-thirds of elytral length; disc as in *sparsipilosus*. Declivity moderately steep, broadly convex on upper half, median area of apical fourth produced to sutural apex; striae about as on disc except punctures less distinct; interstriae 1 armed by about five granules, one sometimes distinctly larger, 2 irregular, punctures sometimes feebly granulate, 3 armed by one to about three granules, one near middle of declivity distinctly larger, usually larger than those on 1; lateral areas with a few smaller granules; posterolateral margin narrowly rounded, its crest sometimes bearing two or three granules. Vestiture as in *sparsipilosus* except difference in long and short interstrial setae less pronounced; one or more long setae on declivital interstriae 2.

DISTRIBUTION.— Costa Rica to French Guiana.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 1 m, No. 79, *Rhizophora mangle*, S. L. Wood. PANAMA: Summit Gardens, Canal Zone, 9-V-71, E. G. Riley.

BIOLOGY.— Specimens were taken from a dying mangrove tree 20 cm in diameter. The galleries appeared identical to those of *ferrugineus* (Fabricius).

NOTES.— The above treatment was based on 28 specimens that were compared directly to Hagedorn's type; the type is distinctly larger, but agrees in all other respects. Hagedorn labeled his first of three syntypes as the type; I here designate that specimen as the lectotype of *productus* Hagedorn.

### 61. *Xyleborus titubanter* Schedl

*Xyleborus titubanter* Schedl, 1948, Rev. de Ent. 19:578 (Holotype, female; Mexico; Schedl Coll.)

*Xyleborus dissidens* Wood, 1972, Brigham Young Univ. Sci. Bull., Biol. Ser. (Holotype, female; 9 km NE Teziutlan, Puebla, Mexico; Wood Coll.); Wood, 1975, Great Basin Nat. 35:23. *Synonymy*

DIAGNOSIS.— This species is placed here because of the slender pronotum and steep elytral declivity; nevertheless, it probably is more closely related to the species placed in the subgenus *Euwallacea*. In addition to the slender pronotum with its procurved anterior margin, this species has the elytral declivity steep, convex, and interstriae 1–3 equally armed by pointed granules.

FEMALE.— Length 3.0–3.2 mm, 3.0 times as long as wide; color black.

Frons as in *costaricensis* Blandford but with lower area less strongly inflated.

Pronotum 1.22 times as long as wide; as in *sparsipilosus* except posterior areas subreticulate.

Elytra 1.8 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on slightly more than basal two-thirds, rather broadly rounded behind; disc occupying slightly more than basal two-thirds; striae not impressed, punctures rather small, distinct, spaced within a row by diameter of a puncture; interstriae smooth, shining, twice as wide as striae, punctures uniseriate, minute, distinct, almost obsolete. Declivity steep, rather broadly convex; striae about as on disc; interstriae 1–3 each equally armed by six to ten pointed granules of slightly irregular size; posterolateral margin obtuse, abrupt. Vestiture confined to declivity, of rows of rather coarse, interstrial setae, each seta about one and one-half times as long as distance between rows, more widely spaced within a row.

DISTRIBUTION.— Puebla.

MEXICO: Puebla: 9 km NE Teziutlan, 2-VII-67, 1500 m, No. 141 in *Alnus*, No. 151 in a log, No. 147 in flight, by S. L. Wood.

BIOLOGY.— Specimens were taken from cordwood 40 cm in diameter.

NOTES.— The above treatment was based on the holotype of *titubanter* and on the type series of six specimens of *dissidens*.

### 62. *Xyleborus imbellis* Blandford

*Xyleborus imbellis* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):211 (Holotype, female; San Juan, Verapaz, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This unique species is distinguished from other American representatives of the genus by the large size, by the small, deep, confused elytral punctures on both disc and declivity, by the short, fine, abundant elytral hair, and by the different pronotum.

FEMALE.— Length 4.4–4.7 mm, 2.9 times as long as wide; color reddish brown.

Frons moderately convex; surface with close, flat, shining, moderately coarse granules, almost subaciculate, median line smooth, shining; vestiture fine, rather long, epistomal brush conspicuous. Antennal club with one obscure suture on anterior face, none on posterior face.

Pronotum 1.2 times as long as wide, slightly wider than elytra; widest at middle, sides feebly arcuate from base, rather broadly rounded in front; anterior margin unarmed; summit indefinite, anterior to middle; anterior slope rather steep, asperities on its anterior fourth resembling granules, those at and near summit resembling scales; posterior areas smooth, shining, punctures deep, rather close, of irregular, small size. Vestiture of fine, moderately abundant hair.

Elytra 1.7 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal half, slightly tapered to base of declivity, then rather broadly rounded behind; disc occupying basal 65 percent of elytral length; striae usually not indicated, punctures may be in rows or confused, only slightly larger than those of interstriae; interstriae smooth, shining, punctures small, deep, rather abundant, confused except almost uniseriate near declivity in some specimens.

Declivity moderately steep, lower two-thirds almost flat on median half; posterolateral margin rounded; surface smooth, shining, punctures confused, as on disc. Vestiture of fine, rather short hair from base to apex, somewhat more abundant on declivity.

DISTRIBUTION.— Veracruz to El Salvador.

MEXICO: Veracruz: El Palmar, 4-IV-57, *Hevea brasiliensis*, R. Coronado. GUATEMALA: San Juan in Verapaz, G. C. Champion. EL SALVADOR: San Salvador, 2-IV-30, No. 102, S. Calderon.

NOTES.— The above treatment was based on the holotype and on four other specimens.

## 63. *Xyleborus ferrugineus* (Fabricius)

Figs. 187–188

*Bostrichus ferrugineus* Fabricius, 1801, Systema eleutheratorum 2:388 (Lectotype, female; America meridionali; Copenhagen Mus., present designation)

*Xyleborus ferrugineus*: Ferrari, 1867, Forst- und Baumzuchtschädlichen Borkenkäfer, p. 23

*Tomicus trypanaeoides* Wollaston, 1867, Coleoptera Hesperidum, p. 114 (Syntypes, females; S. Iago and Fogo, Cape Verde Islands; British Mus. Nat. Hist.); Schedl, 1960, Coleopt. Bull. 14:9. *Synonymy*

*Xyleborus fuscatus* Eichhoff, 1868, Berliner Ent. Zeitschr. 11:400 (Syntypes; Carolina and Colombia; presumably lost with Hamburg Mus.); Schedl, 1960, Coleopt. Bull. 14:8. *Synonymy*

*Xyleborus impressus* Eichhoff, 1868, Berliner Ent. Zeitschr. 11:400 (Syntypes?; Massachusetts; one "type" in Brussels Mus.); Schedl, 1960, Coleopt. Bull. 14:8. *Synonymy*

*Xyleborus confusus* Eichhoff, 1868, Berliner Ent. Zeitschr. 11:401 (Lectotype, female; Valli do Caracas, Venezuela; Brussels Mus., present designation); Schedl, 1957, Ann. Mus. Congo Belge (8) Ser. Zool. 56:16. *Synonymy*

*Xyleborus retusicollis* Zimmermann, 1868, Trans. Amer. Ent. Soc. 2:146 (Holotype, male; Maryland; Mus. Comp. Zool.); Bright, 1968, Canadian Ent. 100:1312. *Synonymy*

*Xyleborus bispinatus* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:146 (Syntypes; Brazil; eight syntypes in Brussels Mus.); Schedl, 1960, Coleopt. Bull. 14:8. *Synonymy*

*Xyleborus amplicollis* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:280 (Syntypes?; Puerto Rico; one female syntype in Brussels Mus.); Schedl, 1960, Coleopt. Bull. 14:8. *Synonymy*

*Xyleborus insularis* Sharp, 1885, Trans. Roy. Dublin Soc. (2)3:193 (Syntypes?; Hawaii; British Mus. Nat. Hist.?); Schedl, 1960, Coleopt. Bull. 14:8. *Synonymy*

*Xyleborus tanganus* Hagedorn, 1910, Deutsche Ent. Zeitschr. 1:8 (Syntypes; Tangana, Deutsch-Ostafrika; presumably lost with Hamburg Mus.); Schedl, 1960, Coleopt. Bull. 14:9. *Synonymy*

*Xyleborus soltani* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:66 (Holotype, female; New Orleans, Louisiana; U.S. Nat. Mus., 7415); Bright, 1968, Canadian Ent. 100:1312. *Synonymy*

*Xyleborus nyssae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:66 (Holotype, female; Nichols, South Carolina; U.S. Nat. Mus., 7417); Schedl, 1960, Coleopt. Bull. 14:9. *Synonymy*

*Xyleborus hopkinsi* Beeson, 1929, Insects of Samoa, Coleopt. 4:246 (Holotype, female; Malololelei, Samoan Islands; British Mus. Nat. Hist.); Schedl, 1960, Coleopt. Bull. 14:8. *Synonymy*

*Xyleborus argentinensis* Schedl, 1931, Ann. Mag. Nat. Hist. (10)8:345 (Holotype, San Ignacio, Argentina; Schedl Coll.); Schedl, 1960, Coleopt. Bull. 14:8. *Synonymy*

*Xyleborus schedli* Eggers, 1934, Ent. Blätt. 30:83 (Holotype, female; 12 km from Atlantic Ocean, Limón, Costa Rica; U.S. Nat. Mus., 60768); Schedl, 1960, Coleopt. Bull. 14:9. *Synonymy*

*Xyleborus notatus* Eggers, 1941, Arb. Morph. Taxon. Ent. Berlin. Dahlem 8:107 (Holotype, female; 3-Riv., Guadeloupe; U.S. Nat. Mus., 60766); Schedl, 1960, Coleopt. Bull. 14:8. *Synonymy*

*Xyleborus subitus* Schedl, 1949, Rev. Brasil. Biol. 9:280 (Holotype, female; Chiapas, Mexico; Schedl Coll.); Schedl, 1960, Coleopt. Bull. 14:9. *Synonymy*

DIAGNOSIS.— This is one of the most widely distributed, common, economically important ambrosia beetles in the world. It is easily recognized by the rather slender form, by the reddish brown color, and by the moderately steep, flattened elytral declivity that is armed on interstriae 3 by one pair of rather prominent denticles.

FEMALE.— Length 2.0–3.3 mm, 2.7–3.0 times as long as wide; color reddish brown.

Frons broadly convex; surface reticulate, subshining, punctures rather sparse, small, not sharply impressed; vestiture of sparse, inconspicuous hair.

Pronotum 1.2 times as long as wide; sides almost straight and parallel on basal two-thirds, rather narrowly rounded in front; summit at middle; anterior slope rather coarsely, closely asperate; posterior areas mostly smooth, shining, often with obscure indications of reticulation laterally, particularly near asperate areas, punctures fine, sparse, shallow. Sparse hairlike vestiture confined to marginal areas.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, then slightly tapered, rather broadly rounded behind; disc occupying basal two-thirds; striae feebly if at all impressed, punctures moderately coarse,

rather deep; interstriae about one and one-half times as wide as striae, smooth, shining, punctures moderately coarse to minute or obsolete, uniseriate, usually widely, irregularly placed. Declivity rather steep, essentially flat (a slight convexity in some specimens); strial punctures usually slightly larger than on disc; interstriae 1 and 2 flat, unarmed except for one or two pointed granules at base of 1, 3 often feebly elevated, armed by one rather

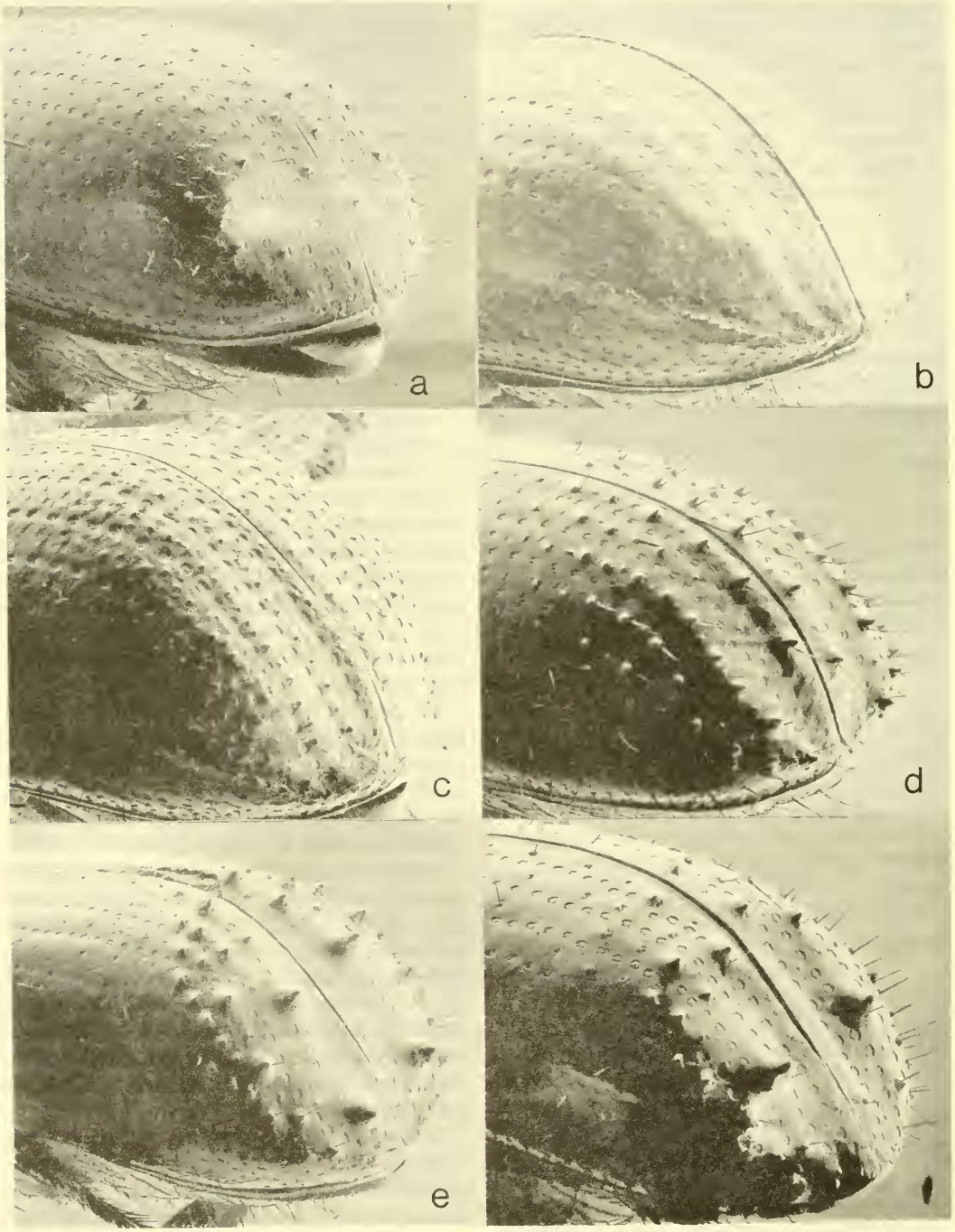



Fig. 187. *Xyleborus* and *Xyleborinus*, female declivities: a, *Xyleborus obesus*; b, *Xyleborus sayi*; c, *Xyleborus dispar*; d, *Xyleborinus saxeseni*; e, *Xyleborus celsus*; f, *Xyleborus ferrugineus*. (After Bright 1976:132.)

coarse denticle at middle of declivity, one to three smaller pointed granules often present on basal half; a few rounded granules usually present in lateral areas; posterolateral margin narrowly rounded, its crest usually armed by a series of granules. Vestiture of moderately long interstrial hair, mostly obsolete on declivity.

MALE.— Length 1.8 mm; head and elytra essentially as in female except vertex with a distinct median sulcus, and major denticle on declivity not larger than other granules, all features poorly formed; elytra 1.3 times as long as pronotum; pronotum with asperities almost obsolete, anterior third concavely excavated, lateral margins of concavity rather narrowly rounded, anterior margin obtusely produced with a short acute spine medially.

DISTRIBUTION.— Michigan and Massachusetts to S Arizona and Argentina; tropical Africa; Hawaii to Micronesia.

USA: Alabama, Arizona, Arkansas, District of Columbia, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and West Virginia. MEXICO: Chiapas, Guerrero, Jalisco, Nayarit, Oaxaca, Puebla, Quintana Roo, San Luis Potosí, Sinaloa, Sonora, and Veracruz. CENTRAL AMERICA: British Honduras, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama.

HOSTS.— Schedl (1962) records 168 host species. The following new American host records are added to his list: *Bombacopsis quintana*, *Cedrela* sp., *Citrus* sp., *Couma macrocarpa*, *Dendropana arboreum*, *Eschweilera corrugata*, *Fagara* sp., *Fissicalyx fendleri*, *Inga* sp., *Lecythia* sp., *Licania* sp., *Lonchocarpus margaritensis*, *Melicoccora bijugata*, *Ochroma* sp., *Pithacellobium pinnatum*, *Pouteria anibaefolia*, *Protium* sp., *Sacoglothia procera*, *Spondias purpurea*, *Swietenia macrophylla*, and *Vismia* sp.

BIOLOGY.— This is probably the most destructive species of Scolytidae in tropical areas of the world from sea level to an elevation of about 1500 m. It attacks virtually all species of woody plants, although it is rare in conifers. Normally, it attacks material larger than 10 cm in diameter, but on rare occasions it has been taken from sugar cane and other small stems. It usually attacks cut, broken, unthrifty trees, or stumps either on or near the ground. On certain occasions it attacks slightly injured, living trees and either hastens or causes the death of its host. Its greatest economic effect is produced on cut logs either in the forest or in temporary storage or docking areas, where the tunnels may render all sapwood totally useless within a very few weeks. They are able to tolerate unusually high temperatures and excessive moisture.

In addition to their activities of perforating sapwood, they are the principal vector of *Ceratocystis fimbriata*, which causes a wilt disease of Cacao (Saunders 1965).

As in other *Xyleborus*, only the female flies to seek a new host. Flight activity occurs primarily at night. The multibranching tunnels usually penetrate all of the sapwood of the host whether it is 2 or 30 cm in depth; their galleries are less common in the heartwood. In addition to the deep galleries, this species may form shallow tunnels that are visible on the surface of wood from which the bark has been peeled; however, these surface tunnels are not always present.

Saunders and Knoke (1967) successfully cultured this species in vitro on an artificial medium in the absence of the symbiotic fungus.

NOTES.— In the Copenhagen Museum there are four original Fabricius specimens of *ferrugineus*. One of these is the Kiel specimen examined by Eggers, one is of *affinis*

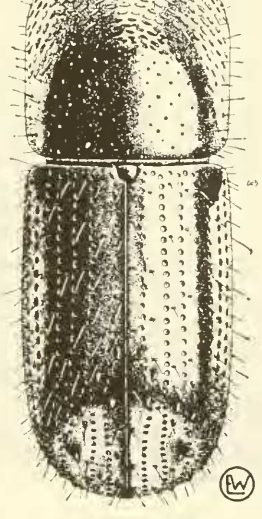


Fig. 188a. *Xyleborus ferrugineus*, female. (After Schedl 1962:425.)

Eichhoff, and two are of *torquatus* Eichhoff. A presumed syntype conspecific with the Kiel specimen is in the Berlin Museum. Although the Kiel specimen is in very poor condition and probably is not the specimen on which the original description was based (the *torquatus* specimens fit more precisely), I here designate the Kiel specimen as the lectotype of *ferrugineus* Fabricius to retain the established concept of this species. I have also examined the syntypes of *trypanaeoides*, *bispinatus*, *confusus*, *impressus*, *amplicollis*, and *insularis*, and the holotypes of *soltaui*, *nyssae*, *argentinensis*, *hopkinsi*, *scheldi*, *notatus*, and *subitus*. The first of four syntypes of *confusus* in the Brussels Museum is here designated as the lectotype of that species.

This species is somewhat variable in size and in certain details of elytral structure. Much of this variation is evidently due to environmental factors, but some of it apparently results from genetic differences. Two or more parthenogenetically produced "clones" occupying the same log can be very strikingly different.

Detailed studies on the biology and genetics of this species are seriously needed.

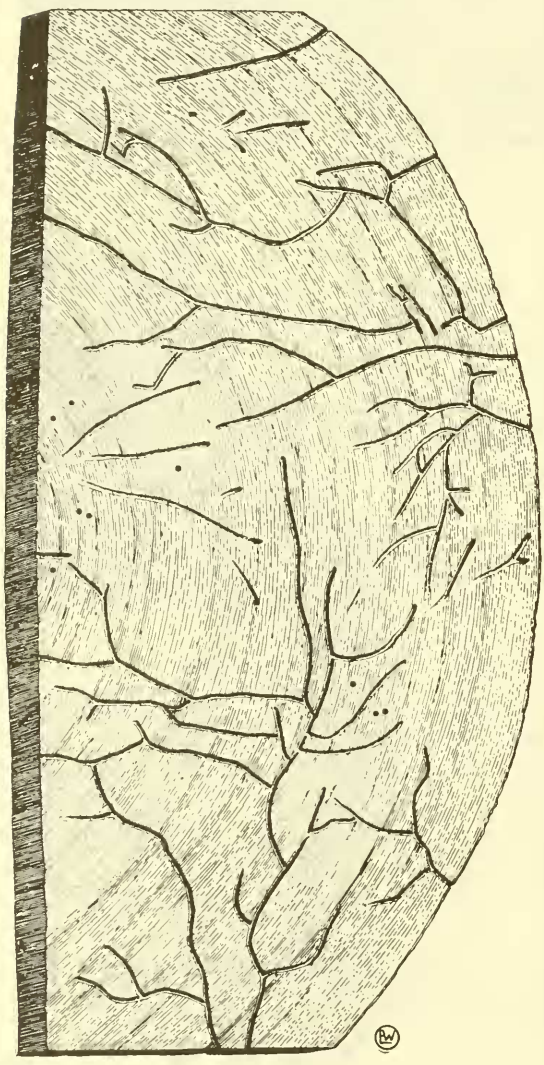


Fig. 188b. *Xyleborus ferrugineus*, galleries. (After Schedl 1962:453, 455.)

### 64. *Xyleborus affinis* Eichhoff

Fig. 189–190

*Xyleborus affinis* Eichhoff, 1868, Berliner Ent. Zeitschr. 11:401 (Syntypes; America boreali and Cuba; presumably lost with Hamburg Mus., presumed syntypes in U.S. Nat. Mus.)

*Xyleborus affinis* var. *parvus*, var. *mascarensis*, var. *fuscobrunneus* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:372 (Syntypes?: no data; one presumed syntype of *fuscobrunneus* in Schedl Coll.); Schedl, 1959, Trans. Roy. Ent. Soc. London 111:504 (*Synonymy* of *parvus*, *fuscobrunneus*); Wood, 1960, Insects of Micronesia 18(1):71 (*Synonymy* of *mascarensis*)

*Xyleborus sacchari* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:64 (Holotype, female; St. Vincent, West Indies; U.S. Nat. Mus., 7407); Schedl, 1959, Trans. Roy. Ent. Soc. London 111:504. *Synonymy*

*Xyleborus subaffinis* Eggers, 1933, Mém. Trav. Lab. d'Ent. Mus. Nat. d'Hist. Nat., Paris 1(1):36 (Holotype, female; Nouveau Chantier, French Guiana; Paris Mus.); Schedl, 1959, Trans. Roy. Ent. Soc. London 111:504. *Synonymy*

*Xyleborus proximus* Eggers, 1943, Parc Nat. Albert, Mission C. F. de Witte 1933–1935, fasc. 43(10):66 (Holotype, female; Leopoldville, Congo; Terveuren Mus.); Schedl, 1962, Rev. Ent. Mocambique 5:331. *Synonymy*

DIAGNOSIS.— This abundant pantropical species is distinguished from *ferrugineus* (Fabricius) by the more gradual, more convex elytral declivity, which has a dull surface, and by the equal, small granules on declivital interstriae 1 and 3.

FEMALE.— Length 2.0–2.7 mm, 2.6–2.9 times as long as wide; yellowish to reddish brown.

Frons and pronotum as in *ferrugineus* except reticulation more evident.

Elytra about 1.7 times as long as wide, 1.5 times as long as pronotum; outline about as in *ferrugineus*; disc occupying slightly less than basal two-thirds of elytral length; striae

not impressed, punctures rather small; interstriae about twice as wide as striae, smooth, shining, punctures uniseriate, moderately close to rather sparse, fine to moderately coarse. Declivity moderately steep, feebly convex on sutural axis, moderately convex on transverse axis; surface dull; striae as on disc; interstriae 1 and 3 feebly elevated, 2 weakly impressed and about equal in width to 1 and 3, 1 and 3 each armed by about two to four rather small, pointed granules with a few minute granules interspersed in a uniseriate row, 2 usually with a small, pointed granule near base and another near apex, with a sparse row of very minute granules between, lateral interstriae each with about 1–3 small, pointed granules; posterolateral margin narrowly rounded, its crest armed by about four granules. Vestiture of very minute strial hair, and interstrial rows of coarse erect hair, distinctly coarser on declivity; each interstrial seta as long as distance between rows, similarly spaced within a row, often shorter or abraded on declivity.

MALE.— Head and elytra similar to female except all characters less perfectly formed; pronotum as in male *ferrugineus* except anterior slope evidently less strongly concave, median process on anterior margin much smaller. (Based on one badly shriveled specimen).

DISTRIBUTION.— Texas and Massachusetts to Argentina, Hawaii to Malaya, and tropical Africa.

USA: Alabama, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Texas, Virginia, and West Virginia. All states of Mexico and all countries of Central America.

HOSTS.— Schedl (1962) lists 248 host species. To his list are added: *Alexa imperatricia, Bombacopsis quinata, Brosimum* sp., *Bursera simarubra, Cecropia peltata, Cespedesia macrophyla, Clethra hondurensis, Couma macrocarpa, Dendropanax arboreum, Eschweilera corrugata, E. grata, Erythrina costaricensis, Icica allisima, Lecythia* sp., *Licania* sp., *Miconia globuliflora, Pouteria anibaefolia, P. egregia, Scaoglothia procera, Schizolobium* sp., *Sloanea multiflora, Spondias purpurea, Taxodium* sp., *Terminalia amazonia, Toulicia pulvinata,* and *Trichilia propingon.*

BIOLOGY.— The ecological distribution is almost identical to *ferrugineus* except that it apparently is somewhat less aggressive and may attack smaller material. It has caused a serious economic problem in sugar cane.

The gallery system is very similar to that of *ferrugineus,* except that surface tunnels on the peeled surface of the wood are a more common occurrence, with the surface tunnels usually more extensive. Moisture conditions evidently determine whether or not the surface tunnels are formed. Adjacent galleries often have connecting tunnels. More than one generation may inhabit and extend the gallery system.

NOTES.— The above treatment was based on the male and female supposed syntypes of *affinis* that are in the U.S. National Museum, on the holotypes of *sacchari* and *subaffinis,* on Schedl's syntype of *fuscobrunneus,* on cotypes of *proximus,* on Eggers's homotypes of *parvus* and *mascarensis,* and on 1,467 other

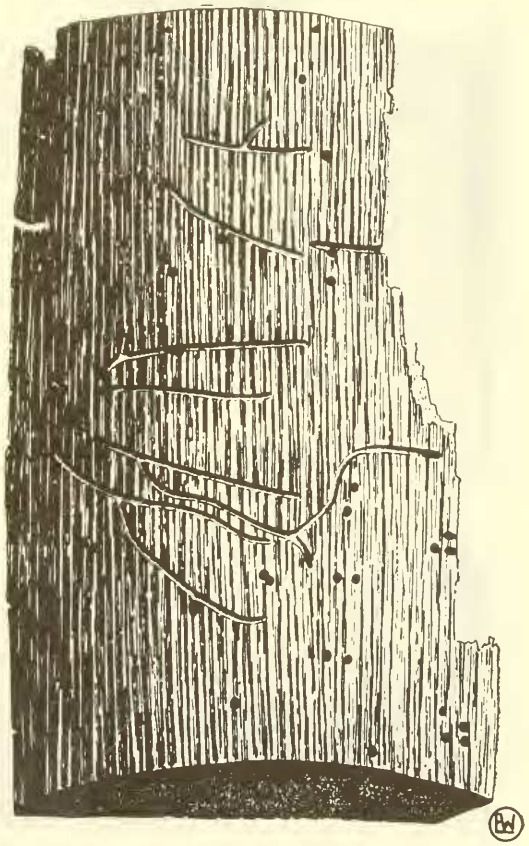


Fig. 188c. *Xyleborus ferrugineus,* galleries. (After Schedl 1962:453, 455.)

specimens. Most specimens of this species are 2.3–2.5 mm long. In the Ohio Valley it is not uncommon to find specimens as large as 2.7 mm, and occasional specimens as large as 2.8 mm. These larger specimens occur in series with those of average size. In some tropical areas specimens 2.1–2.3 mm are more common. Series from the eastern United States can be confusing, because small, dead, tropical specimens may be imported in tropical

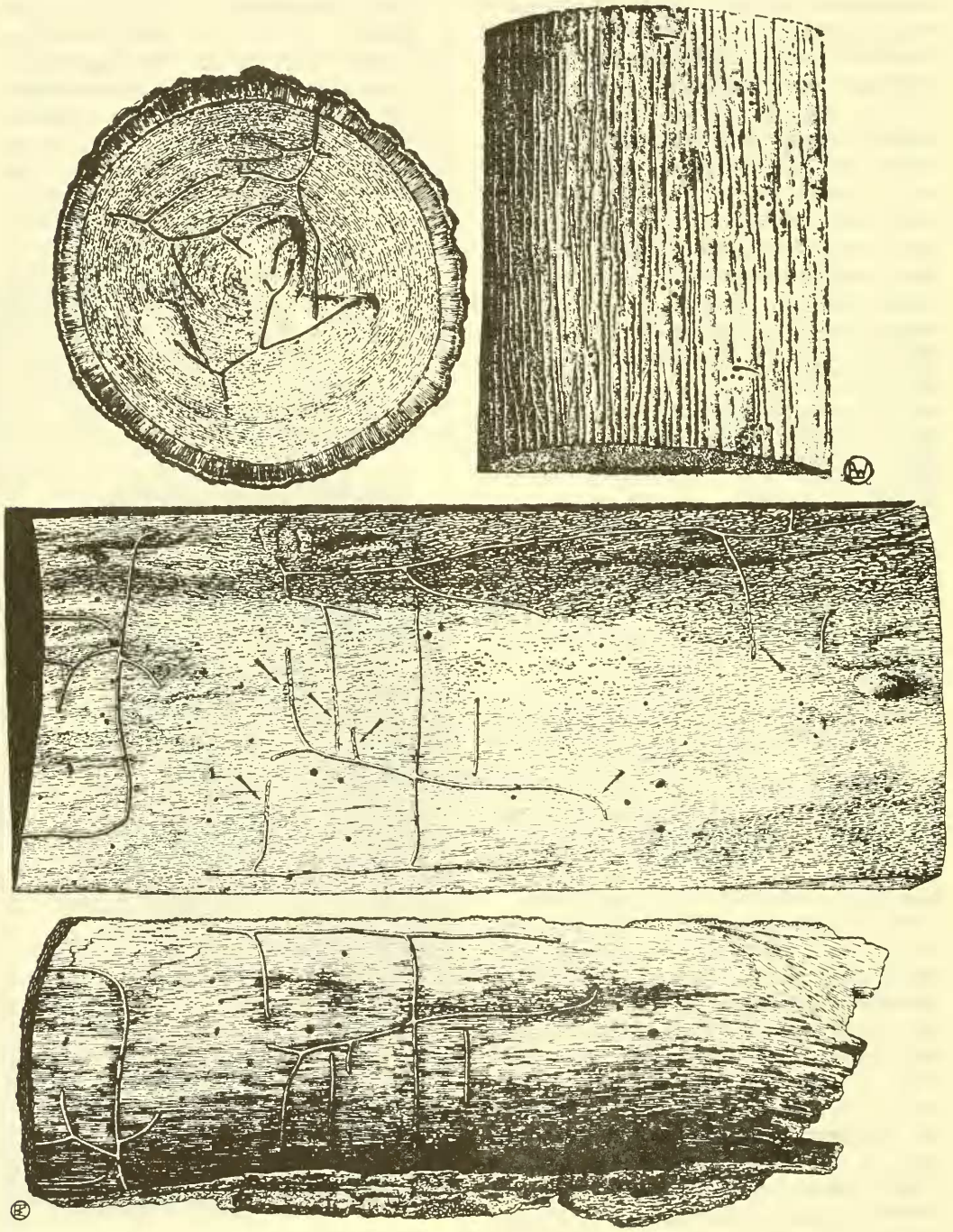


Fig. 189a,b. *Xyleborus affinis*, galleries, with (arrows note larvae) and without tunnels at cambium. (After Schedl 1962:364–365.)

woods, such as balsa, and may be given the same locality label as the larger native population. Other characters are much less variable.

The Hawaiian series named *nuuanus* Schedl (1941:114) is identical with *affinis* except that the declivity is smooth and brightly shining. It probably is a synonym, but proof of this must await studies of genetics.

### 65. *Xyleborus celsus* Eichhoff
Fig. 187

*Xyleborus celsus* Eichhoff, 1868, Berliner Ent. Zeitschr. 11:400 (Syntypes, female; American boreali; presumably lost with Hamburg Mus.)

*Xyleborus biographus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:160 (Holotype, male; Illinois; Mus. Comp. Zool., 988); Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:399 (*Synonymy?*); Hubbard, 1897, U.S. Dept. Agric. Div. Ent. Bull. (n.s.) 7:24. *Synonymy*

DIAGNOSIS.— This species is distinguished from the rather remotely allied *affinis* Eichhoff by the larger size, by the steep, flat declivity, and by the very wide declivital interstriae 1, with its enlarged tubercles strongly displaced laterally and apparently on striae 1 or even interstriae 2.

FEMALE.— Length 3.6–4.5 mm (male 2.3–3.0 mm), 3.0 times as long as wide; color reddish brown.

Frons and pronotum as in *ferrugineus* (Fabricius) except anterior margins more broadly rounded, and punctures on posterior areas very fine, closer.

Elytra 1.9 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal four-fifths, very broadly rounded behind; disc occupying basal three-fourths; striae feebly if at all impressed, punctures rather small, shallow; interstriae three times as wide as striae, smooth, shining, punctures fine, uniseriate except occasional specimens slightly confused on 2. Declivity steep, almost flat; basal margin of declivity armed by one or two pointed tubercles on each interstriae to about 7; surface dull; strial punctures rather small, very shallow, clearly marked, rows strongly curved toward suture near apex; interstriae 1 very wide, smooth, a few very minute punctures, armed by two rather coarse denticles, one each on upper and lower thirds, denticles on extreme lateral margin of interstriae 1, often appearing to be on striae 1; interstriae 2 almost as wide as 1, smooth, with a few very minute punctures, 3 with two or three pointed tubercles forming part of marginal armature; posterolateral margin obtusely subangulate, crest bearing two or three granules. Vestiture of minute strial hair, and interstrial rows of moderately long, rather fine hair on disc, long setae on declivity only where tubercles occur.

DISTRIBUTION.— Kansas, Iowa, and Vermont to Texas and Florida.

USA: Arkansas, Connecticut, District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Texas, Vermont, West Virginia.

HOST.— *Carya* spp.

BIOLOGY.— Evidently logs and stumps are attacked. According to Hubbard (1897) the gallery system is deep in the wood, with a palmate branching of tunnels from the end of the radial entrance tunnel.

NOTES.— The above treatment was based on 418 female specimens, of which one was compared to the male holotype of *biographus*. The description (Eichhoff 1878) of *celsus* is sufficiently clear that there is no question concerning the synonymy of this species with *biographus*.

### 66. *Xyleborus volvulus* (Fabricius)

*Bostrichus volvulus* Fabricius, 1775, Systema Entomologiae, p. 454 (Lectotype, female; America ligno Dom v. Rohr, presumably Cuba; Copenhagen Mus., present designation)

*Xyleborus volvulus*: Eggers, 1929, Wiener Ent. Zeit. 46:47

*Xyleborus torquatus* Eichhoff, 1868, Berliner Ent. Zeitschr. 12:146 (Lectotype, female; Brazil; Brussels Mus., present designation); Wood, 1960, Insects of Micronesia 18(1):69. *Synonymy*

*Xyleborus alternans* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:280 (Syntypes, female; Santo Domingo; one syntype in Brussels Mus.); Eggers, 1929, Weiner Ent. Zeit. 46:43. *Synonymy*

*Xyleborus badius* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:280 (Syntypes, female; St. Mauritius; presumably lost with Hamburg Mus.); Wood, 1960, Insects of Micronesia 18(1):69. *Synonymy?*

*Xyleborus kraatzii* var. *philippinensis* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:374 (Syntypes?, female; Philippine Islands; presumably lost with Hamburg Mus.); Eggers, 1925, Sbornik Ent. Odd. Mus. Praze 3:154. *Synonymy?*

*Xyleborus interstitialis* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:375 (Syntypes?, female; Mexico;

presumably lost with Hamburg Mus.). *New synonymy?*

*Xyleborus hubbardi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:65 (Holotype, female; Biscayne Bay, Florida; U.S. Nat. Mus., 7410); Schedl, 1952, Ent. Blätt. 47–48:164. *Synonymy*

*Xyelborus schwarzi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:65 (Holotype, female; Key West, Florida; U.S. Nat. Mus., 7411); Bright, 1968, Canadian Ent. 100:1318. *Synonymy*

*Xyleborus rileyi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:65 (Holotype, female; Capron, Florida; U.S. Nat. Mus., 7409); Bright, 1968, Canadian Ent. 100:1318. *Synonymy*

*Xyleborus grenadensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:65 (Holotype, female; Grenada, West Indies; U.S. Nat. Mus., 7408); Wood, 1972, Great Basin Nat. 32:200. *Synonymy*

*Xyleborus vagabundus* Schedl, 1949, Rev. Brasil Biol. 9:277 (Holotype, female; Mexico; Schedl Coll.); Wood, 1972, Great Basin Nat. 32:200. *Synonymy*

DIAGNOSIS.— This species is distinguished from *affinis* Eichhoff by the reddish brown color, by the steeper, more narrowly convex, shining elytral declivity, with the declivital tubercles slightly larger and the posterolateral margin more acute. See also the diagnosis of *morulus* Blandford.

FEMALE.— Length 2.1–2.8 mm, 2.7–2.9 times as long as wide; color reddish brown.

Frons and pronotum as in *ferrugineus* (Fabricius).

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; declivity confined to basal two-thirds; striae not impressed, with punctures small, shallow, widely spaced (northern) to distinctly, weakly impressed, with punctures rather small, moderately impressed, closely placed (southern); interstriae two to three times as wide as striae, smooth, shining, punctures uniseriate, small punctures more or less alternating with moderately large ones. Declivity moderately steep, rather broadly convex; surface almost smooth, shining; striae and punctures about as on disc, distinctly curving toward suture near apex; interstriae 2 feebly impressed, unarmed, punctures almost obsolete, 1 and 3 each armed by two to four widely spaced, pointed tubercles, each tubercle about as high as wide, lateral interstriae with similar, closer, but less regularly placed tubercles; posterolateral margin obtusely angulate, crest irregularly, finely subserrate.

MALE.— Length 1.9 mm; head and elytra approximately as in female, but with all characters poorly formed; pronotum as in male *ferrugineus* except anterior impression not as deep, asperities more distinct, anteromedian prominence less strongly developed.

DISTRIBUTION.— Florida and Baja California to Argentina; Hawaii to Australia and Malaya; tropical Africa and Madagascar.

USA: Florida. MEXICO: Baja California, Chiapas, Guerrero, Jalisco, Mexico, Morelos, Nayarit, Oaxaca, Puebla, Quintana Roo, San Luis Potosí, Tabasco, Yucatán. CENTRAL AMERICA: British Honduras, Costa Rica, Guatemala, Honduras, Nicaragua, Panama.

HOSTS.— Schedl (1962) lists 122 host species. To his list are added: *Anacardium excelsum, Astronium graveolens, Brownia* sp., *Bursera simarubra, Cedrela mexicana, Dendropanax arboreum, Enterolobium* sp., *Eschweilera, Ficus* sp., *Inga alba, Jacaranda copaia, Melicoccous bijugata, Pinus oocarpa, Pouteria egregia, P. guianensis, Terminalia amazonia, Theobroma cacao,* and *Vismia* sp.

BIOLOGY.— The habits of this species are evidently very similar to those of *ferrugineus* and *affinis,* although this species apparently is more successful in slightly drier habitats. The deep tunnels appear very similar to those of *ferrugineus* and *affinis*; however, the surface tunnels seen on wood from which the bark has been peeled are never present.

NOTES.— The above treatment was based on the study of the three identical female syntypes of *volvulus* in the Kiel material of the Fabricius collection in the Copenhagen Museum, on the holotypes of *hubbardi, schwarzi, rileyi, grenadensis,* and *vagabundus,* on syntypes of *alternans* and *torquatus,* on Eggers and Schedl homotypes of *badius,* and on 829 other specimens. The third syntype of *volvulus* is here designated as the lectotype of *Bostrichus volvulus* Fabricius, and the second syntype in the Chapuis collection is here designated as the lectotype of *torquatus.*

Originally this species apparently existed as two distinct geographical forms. The northern race occurred from the northern half of Mexico to Florida and Cuba, the southern race in Central and South America. The northern race is more slender, the strial punctures are smaller and more widely spaced, and the interstriae are flat. In the southern race the body form is slightly stouter, the discal striae are weakly impressed, the strial punctures are slightly larger, deeper, and closer. Through modern commerce

one or both forms have been spread throughout the tropical regions of the world and into the original territories of one another. The result has been that in most areas one or both forms may exist, but in other areas some or all of the population may be intermediate between the two. Although subspecific names might have been appropriate at one time, they now appear impractical even though a majority of the specimens from many areas can be distinguished on a morphological basis.

Specimens compared by Blandford to the type of *interstitialis* are rather small specimens of *volvulus* of the northern race in which the interstriae are almost impunctate. If Blandford's identification was accurate, then *interstitialis* is a junior synonym of *volvulus*.

### 67. *Xyleborus morulus* Blandford

*Xyleborus morulus* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):212 (Holotype, female; Costa Rica; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *volvulus* (Fabricius) as indicated in the following description.

FEMALE.— Length 2.7–2.9 mm, 2.9 times as long as wide; color very dark brown to black.

Exactly like northern race of *volvulus* except averaging larger, much darker in color, and with basal-most socketed tooth on lateral margin of anterior tibia not noticeably separated from others, occurring at 200–1500 m in elevation.

DISTRIBUTION.— Michoacán and Guatemala to Costa Rica.

MEXICO: **Michoacán**: Patuan, 1-XI-80, 1300 m, *Spondias mombin*, T. H. Atkinson. GUATEMALA: Palín, Esquintla, 19-V-64, 300 m, No. 590, *Bursera*; Rodeo, Esquintla, 4-VI-64, 200 m, No. 676, tree branch. COSTA RICA: Santa Ana, San José, 9-X-63, 1300 m, No. 227, log; San Ignacio de Acosta, San José, 5-VII-63, 1500 m, No. 30, *Erythrina costaricensis*; San José, San José, 22-X-63, 1300 m, No. 174, *E. costaricensis*; Tapanti, Cartago, 17-VIII-63, 1300 m, No. 104, *E. costaricensis*; all were taken by me.

HOSTS.— *Bursera* sp., *Erythrina costaricensis*, etc.

BIOLOGY.— The habits apparently are as in *volvulus* except that this species occurs at higher elevations, 200–1500 m.

NOTES.— The above treatment was based on the holotype and on 31 other specimens. Except for the apparent hybridization of races in *volvulus* and the sympatry of its southern race with *morulus*, *morulus* might be considered a geographical race of the almost identical northern race of *volvulus*. Under existing circumstances there is no alternative to full species status for *morulus*.

### 68. *Xyleborus planicollis* Zimmermann

*Xyleborus planicollis* Zimmermann, 1868, Trans. Amer. Ent. Soc. 2:145 (Holotype, female; Pennsylvania; Mus. Comp. Zool., 984)

DIAGNOSIS.— The head, pronotum, and elytral disc are as in *viduus* Eichhoff, except for slight deviations cited below; the declivity is almost identical to *xylographus* (Say) except it is not as steep and the strial punctures are smaller and have their interiors smooth and shining.

FEMALE.— Length 2.3–2.4 mm, 2.7 times as long as wide; color reddish brown.

Head, pronotum, and elytral disc as in *viduus* except pronotal impression not as strong, somewhat less extensive, punctures slightly smaller, hair in anterolateral areas finer, not as long; interstrial setae on elytral disc finer. Elytral declivity occupying 33 percent of elytral length, not as steep but more broadly flattened than in *xylographus*, surface reticulate-granulate about as in *xylographus*; strial punctures very small, weakly impressed, their interiors smooth, brightly shining; interstriae 2 feebly impressed, 1 as high as 3, 1–3 each with a row of fine granules; declivital vestiture as on disc, rows of setae on all interstriae, as long as on disc.

DISTRIBUTION.— Missouri and Pennsylvania.

USA: **Indiana**: W. Lafayette, 10-VII-81, trap, M. Deyrup. **Missouri**: 10 miles E Salem, Dent Co., 19-VII-77, #28, M. P. Roling. **Pennsylvania**: Pen Mar, 2-VIII, Hubbard and Schwarz.

NOTES.— Although the holotype of *planicollis* was examined, it was thought to be a male of *xylographus*; appropriate specimens were not then available for comparison. Bright (1968:1313) reached the same erroneous conclusion. When males of *xylographus* were available and the female of *viduus* was dissected, it became apparent that the holotype of *planicollis* is actually a female of a very distinctive species closely allied to *viduus*. Three specimens were examined.

### 69. *Xyleborus viduus* Eichhoff

*Xyleborus viduus* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:391 (Holotype, female; type locality uncertain, Brazil? or America septentrionali; apparently lost with Hamburg Mus.)

DIAGNOSIS.— This unique, rare species is distinguished by characters of the pronotum and elytral declivity as described below and in the above key.

FEMALE.— Length 2.0–2.5 mm, 2.7 times as long as wide; color reddish brown.

Frons essentially as in *xylographus* (Say).

Pronotum 1.14 times as long as wide; widest near middle, sides moderately arcuate on basal two-thirds, strongly, somewhat narrowly procurved in front; anterior slope extending to basal third, devoid of asperities, median half just anterior to middle somewhat flattened, this impression becoming a broad, shallow sulcus and extending to base on median fourth; surface smooth, brightly shining, punctures rather coarse, close, extending from base to anterior margin, those on anterior fourth smaller. Glabrous on basal third, median two-thirds of anterior areas with numerous, recumbent, short, rather stout hair, lateral areas with very long, rather coarse hair.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; disc as in *xylographus* except strial and interstrial punctures distinctly larger; deeper. Declivity occupying 38 percent of elytral length, very strongly sulcate on median half; striae 1 and 2 distinctly punctured to apex; interstriae 1 unarmed, its profile straight, 2 unarmed, ascending slightly laterally, 3 rather strongly elevated, armed by two coarse tubercles, 1 one-fourth declivital length from base, 2 at middle, one or two smaller tubercles on basal fourth and on apical fourth. Vestiture consisting of rows of interstrial hair to base, each slightly longer than distance between rows and between setae within a row.

DISTRIBUTION.— Missouri to Maryland and Florida.

USA: **Alabama**: Corona Mine near Oakman, 18-IX-76, Plot 75-5-T, B. A. Hawkins. **Florida**: Ocala, Marion Co., 21-5 to 9-VII-77, blacklight, M. C. Thomas. **Maryland**: Glen Echo, 12-VII-22, L. L. Buchanan. **Missouri**: Dent Co., 23-VIII-73, window trap, M. P. Roling. **Tennessee**: "Ten," Hubbard and Schwarz.

NOTES.— The identification of this species was based on the original description and on 10 specimens. Although specimens appear to be males, due to the "abnormal" pronotum, dissection has proven them to be females. The "male" type apparently is lost and no authentic specimens could be located. It is exceedingly rare, but apparently breeds in broadleaf trees.

### 70. *Xyleborus xylographus* (Say)
Fig. 190

*Bostrichus xylographus* Say, 1826, Acad. Nat. Sci. Philadelphia 5(2):256 (Presumably eastern USA, type data not published; type series lost); Bright, 1968, Canadian Ent. 100:1313 (Neotype, female; North Carolina; Canadian Nat. Coll., 9518)

*Xyleborus xylographus*: Zimmermann, 1868, Trans. Amer. Ent. Soc. 2:145

*Xyleborus inermis* Eichhoff, 1868, Berliner Ent. Zeitschr. 11:401 (Syntypes?, female; Cuba; presumably lost with Hamburg Mus.); Eichhoff, 1878, Mém. Soc. Roy. Liége (2)8:370. *Synonymy*

*Xyleborus canadensis* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):24 (Lectotype, female; Ile Perrot, Quebec: Canadian Nat. Coll., designated by Bright, 1967, Canadian Ent. 99:680); Wood, 1957, Canadian Ent. 89:403. *Synonymy*

DIAGNOSIS.— This species is distinguished from *pubescens* Zimmermann by the slightly stouter body form, by the more broadly convex elytral declivity, by the minutely rugose-reticulate, dull, declivital surface, and by the smaller declivital tubercles.

FEMALE.— Length 2.3–2.7 mm, 2.8 times as long as wide; color reddish brown.

Frons and pronotum essentially as in *ferrugineus* except punctures on pronotal disc distinctly larger, discal surface usually obscurely reticulate.

Elytra 1.6–1.7 times as long as wide, 1.4 times as long as pronotum; disc occupying basal two-thirds; sides almost straight and parallel on basal two-thirds, broadly rounded to obtusely subangulate behind; striae not impressed, punctures small, shallow; interstriae almost smooth, shining, three to four times as wide as striae, punctures uniseriate, shallow, distinctly smaller than those of striae. Declivity steep, very broadly convex; surface dull, finely rugose-reticulate; strial punctures distinctly larger than on disc, very shallow, each surrounded by a small, smooth, shining area; interstriae 1 and 3 each armed by about four widely spaced, small, blunt tubercles, a few

smaller tubercles in lateral areas; posterolateral margin rounded, its crest unarmed. Minute strial setae almost obsolete; vestiture consisting of interstrial rows of rather coarse, erect setae, each seta about as long as distance between rows and between setae within a row.

MALE.— Length 1.9 mm; head and elytra essentially as in female except all characters imperfectly formed; pronotum about as in *affinis* except concave area less strongly impressed, anterior margin obtusely produced and without a median tubercle.

DISTRIBUTION.— Minnesota and New Hampshire to Texas and Florida; California?, and Cuba.

CANADA: **Ontario**: "E Ont." **Quebec**: Isle Perrot. USA: **Arkansas**: Washington Co. **California**: China Flat, Eldorado Co., 28-VI-48, L. W. Quate (one specimen, introduction or labeling error?). **District of Columbia**: Washington. **Florida**: Gainesville, Key West. **Georgia**: Demorest. **Illinois**: Macomb, Monroe Co. **Indiana**: Perry Co. **Iowa**: Ames, Columbus, Iowa City. **Maine**: Portland. **Maryland**: Beltsville, Bladensburg, Plummers Island, Travilah. **Massachusetts**: Andover, Boston, Chicobee, Framingham. **Michigan**: Alma, Detroit. **Minnesota**: Hennepin Co., Houston Co., Redwing, Washington Co. **Missouri**: Salem. **New Hampshire**: Webster. **New Jersey**: Boonton, Browns Mills Junction, Palisades, Ramsey. **New York**: Huntington on Long Island, Ithaca, New York, Olcott, West Point. **North Carolina**: Tryon. **Ohio**: Columbus. **Pennsylvania**: Blair Co., Highspire, Pen Mar. **South Carolina**: Mt. Rest, Lumber. **Texas**: Liberty. **Virginia**: Falls Church, Mt. Vernon, Portsmouth. **West Virginia**: Bayard, Cantwell, Kanawha Station, Little Falls, Morgantown, Wood Co. **Wisconsin**: Beaver Dam, Buffalo Co., Clintonville, Madison, Middleton.

HOSTS.— *Quercus* spp., rare in other trees.

BIOLOGY.— The literature treating the name *xylographus* is so confused that it is uncertain which, if any, references actually refer to this species. The habits probably are similar to those of *volvulus*.

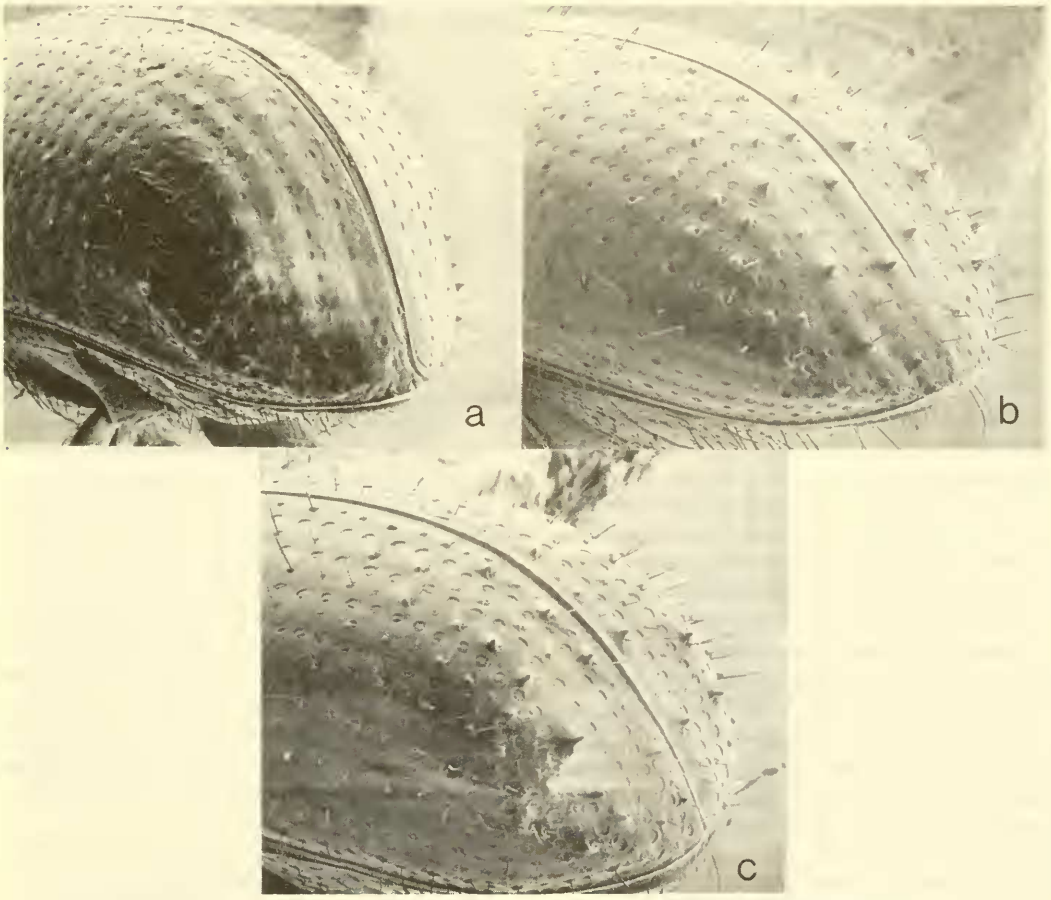



Fig. 190. *Xyleborus* spp., female declivities: a, *xylographus*; b, *affinis*; c, *pubescens*. (After Bright 1976:133.)

NOTES.— The above treatment was based on the neotype of *xylographus*, on the supposed syntypes of *inermis* sent by Eichhoff to Schwarz and now in the U.S. National Museum, on 7 supposed syntypes of *inermis* in the Chapuis Collection, on the lectotype of *canadensis*, and on 132 other specimens. Most of the literature treating *xylographus* actually refers to *Xyleborinus saxeseni* (Ratzeburg), which was thought to be the male of this species for many years. The "syntypes" of *inermis* in the Chapuis Collection are labeled as from Brazil, Santa Catherina, West Indies, and Boreal America; because most of them are obviously mislabeled and because none of them are from Cuba, they are not recognized here as syntypes.

### 71. *Xyleborus californicus* Wood

*Xyleborus californicus* Wood, 1975, Great Basin Nat. 35:399. (Holotype, female; Stanford University, Palo Alto, California; California Acad. Sci.)

DIAGNOSIS.— This species almost certainly was introduced into California from another area. It might be confused with *pubescens* Zimmermann, but it is distinguished by the smaller size, by the more abundant pubescence, and by the reticulate-granulate interiors of the strial punctures on the declivity. Allied species occur in southeast Asia and South America.

FEMALE.— Length 2.0–2.2 mm, 2.9 times as long as wide; color yellowish brown.

Frons rather strongly convex; surface strongly reticulate, a few small granules from epistoma to upper level of eyes. Vestiture of fine, sparse hair.

Pronotum 1.2 times as long as wide; sides almost straight and parallel on basal two-thirds, rather broadly rounded in front; anterior margin unarmed; summit in front of middle; anterior slope steep, rather coarsely asperate; posterior areas strongly reticulate, punctures small, shallow, rather close. Vestiture of fine, short, rather abundant hair.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; disc occupying basal three-fourths; striae not impressed, punctures small, shallow, distinct, in rows, spaced by diameter of a puncture; interstriae three to four times as wide as striae, almost smooth, shining, punctures fine, in indefinite rows in some specimens, distinctly confused on basal half in others. Declivity steep, convex, general contours as in *pubescens*; strial punctures large, shallow, distinct, their interior surfaces reticulate-granulate; interstriae only slightly wider than striae, their punctures mostly replaced by minute granules on all interstriae, a few granules on 1, 3, and lateral areas; posterolateral margin rounded, with an indefinite row of scattered granules. Vestiture of rather abundant, short, fine hair, distinctly longer on margins of declivity.

DISTRIBUTION.— California to Oregon.

USA: **California**: Knight's Landing in Yolo Co., 10-X-49, at light, J. R. Fowler; Stanford University, 15–25-III-44, C. D. Duncan. **Oregon**: St. Paul, Marion Co., 28-IV-80, trap, D. Overhulser.

NOTES.— The above treatment was based on the type series of seven specimens. The localized distribution of this species in an urban area near a major port strongly suggests that it was introduced from another area.

### 72. *Xyleborus pubescens* Zimmermann

Fig. 190

*Xyleborus pini* Say (??): Eichhoff, 1868, Berliner Ent. Zeitschr. 11:401 (Erroneous identification)

*Xyleborus pubescens* Zimmermann, 1868, Trans. Amer. Ent. Soc. 2:145 Lectotype, female; Southern States; Mus. Comp. Zool., 986, designated by Wood, 1973, Great Basin Nat. 33:187); Schedl, 1952, Ent. Blätt. 47–48:163 (Synonym of *pini* of Eichhoff)

*Xyleborus propinguus* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:281 (Lectotype, female; Amerique boreali; Brussels Mus., designated by Wood, 1973, Great Basin Nat. 33:187). *Synonymy*

DIAGNOSIS.— This species is distinguished from the northern race of *volvulus* (Fabricius) by the more coarsely punctured pronotal disc that has fine lines radiating from most of these punctures, by the larger strial punctures on the disc, by the finer declivital tubercles, and by the rounded posterolateral margin of the elytral declivity, its crest rounded and unarmed. It is distinguished from the more closely related *xylographus* (Say) by characters mentioned in the diagnosis of that species.

FEMALE.— Length 2.3–2.7 mm, 2.9 times as long as wide; color reddish brown.

Frons and pronotum as in *xylographus*.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, then slightly tapered, rather broadly rounded behind; disc confined to basal two-thirds; striae not impressed, punctures rather coarse; interstriae less than twice as wide as striae, almost smooth, shining, punctures rather fine, uniseriate. Declivity steep, rather narrowly convex; surface smooth, shining; strial punctures slightly larger than on disc, very shallow, interstriae 2 unarmed, punctures almost obsolete, 1 and 3 each armed by about three to five fine, pointed granules, lateral areas with a few similar granules; posterolateral margin rounded, its crest unarmed (except for usual fine granules on interstriae 3 and 4). Vestiture as in *xylographus*.

DISTRIBUTION.— Ontario to Texas and Florida.

CANADA: **Ontario**: Queenston. USA: **Alabama**: Birmingham. **Arkansas**: Hope, Hot Springs N.P. **District of Columbia**: Washington. **Florida**: Crescent, Dade Co., Duval, Enterprise, Gainesville, Lake Lucy, Marion Co., Oak Hill, Paradise Key, Royal Palms St. Pk., Tampa. **Georgia**: Atlanta, Clarke Co., Clyo, Demorest, Waycross. **Kentucky**: Morehead. **Louisiana**: Bogalusa, Tallulah. **Maryland**: Bladensburg, College Park, Travilah. **Mississippi**: Laurel, Ocean Springs. **New Jersey**: Fivemile Beach, New Lisbon, Orange Mtn. **New York**: Woodbury. **North Carolina**: Asheville, Biltmore, Southern Pines, Tryon. **Pennsylvania**: Angora, Laurel. **South Carolina**: Aiken, Clemson, Florence, Myrtle Beach, North Landing, Poinsett St. Pk. **Texas**: Bastrop, Call, Coldspring, Fedora, Nacogdoches. **Virginia**: Chase City, Falls Church, Ft. Monroe, Nelson Co. **West Virginia**: Kanawha Station, Roosevelt.

HOSTS.— *Pinus echinata*, *P. palustris*, *P.* spp.

BIOLOGY.— Probably similar to *volvulus*. It is attracted to light in large numbers in pine woods. Due to the taxonomic confusion of species, early references to this name are not reliable.

NOTES.— Eichhoff (1868) described this species under the questioned name *Xyleborus pini* Say. When it was recognized that Say's species belonged to a different genus, subsequent authors listed this species as *Xyleborus pini* Eichhoff, although this name has never been properly described. Article 49 of the International Code of Zoological Nomenclature invalidates names based on misidentification. For this reason, the oldest available name for this species, *pubescens* Zimmermann, must be used. Two syntypes of *pubescens*, a supposed cotype of "*pini*," the lectotype of *propinquus*, and 373 other specimens were examined.

## 73. *Xyleborus intrusus* Blandford

*Xyleborus intrusus* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):213 (Lectotype, female; San Geronimo. Guatemala; British Mus. Nat. Hist., present designation)

*Xyleborus howardi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:65 (Holotype, female; Washington, D.C.; U.S. Nat. Mus., 7412); Wood, 1972, Great Basin Nat. 32:198. *Synonymy*

*Xyleborus fitchi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:66 (Holotype, female; Hyslop, Long Island, New York; U.S. Nat. Mus., 7413); Bright, 1968, Canadian Ent. 100:1318. *Synonymy*

*Xyleborus scopulorum* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:66 (Holotype, female; Black Hills, South Dakota; U.S. Nat. Mus., 7414); Wood, 1972, Great Basin Nat. 32:198. *Synonymy*

DIAGNOSIS.— This species is distinguished from *pubescens* Zimmermann by the smaller strial punctures, by the larger declivital tubercles, and by the steeper declivity.

FEMALE.— Length 2.2–2.7 mm, 2.9 times as long as wide; dark reddish brown.

Frons and pronotum essentially as in *ferrugineus* (Fabricius) except punctures in posterior area slightly larger; surface of posterior area partly or mostly reticulate or subreticulate, smooth areas usually with minute lines or impressed points.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; disc confined to slightly more than basal two-thirds; striae feebly if at all impressed, punctures small, shallow; interstriae smooth, shining, two to three times as wide as striae, punctures fine and coarse, more or less alternating, uniseriate. Declivity very steep, rather strongly convex; strial punctures about as on disc; interstriae 2 feebly impressed, unarmed or with one or two small granules near base, punctures reduced, many obsolete, 1 and 3 each armed by three to six rather coarse tubercles, each as high as wide, lateral areas with a few similar small tubercles; posterolateral margin rounded, unarmed. Vestiture as in *xylographus* but finer, with some setae slightly longer.

DISTRIBUTION.— British Columbia and New York to Honduras.

CANADA: **British Columbia**: Aspen Grove. USA: **Arizona**: Chiricahua Mts., Flagstaff, Jacobs Lake, Pinal Mts., Prescott N.F., Williams. **California**: Jackson Creek in Plumas Co., Lake McK. in Fresno Co., Los Olivos, Mt. Laguna in Cleveland N.F., Madera Co., Pinecrest, Santa Barbara Co., Santa Rosa, Sequoia N.F., Shasta N.F., "Sylvana." **Colorado**: N Cheyenne Canyon. **District of Columbia**: Washington. **Idaho**: Moscow Mts. **Maryland**: Beltsville, Snow Hill. **Montana**: "Mont." **New Mexico**: Cloudcroft, Las Vegas Hot Springs, Los Alamos, Meek. **North Carolina**: Bent Creek. **Oregon**: Dever. **Pennsylvania**: Mt. Alto. **South Carolina**: Clemson. **South Dakota**: Pringle. **Utah**: Logan Canyon, Provo, Provo Canyon. **Virginia**: Falls Church. MEXICO: **Chiapas**: 20 km SW Cintalpa. **Distrito Federal**: 24 km S Guarda. **Durango**: El Salto. **Jalisco**: Volcán Colima. **Mexico**: Tlalmonalco, Toluca. **Morelos**: Cuernavaca, Xochimilco. **Oaxaca**: Oaxaca. **Puebla**: Puebla, Texmelucan. GUATEMALA: San Geronimo. HONDURAS: Zamorano.

HOSTS.— *Pinus contorta, P. coulteri, P. jeffreyi, P. leiophylla, P. mexicana, P. ponderosa,* and *Pseudotsuga menziesii.*

BIOLOGY.— This species attacks the base of recently killed, standing trees in which decay is well under way, at or near the ground level. The gallery system evidently is similar to that of *volvulus.*

NOTES.— The above treatment was based on Blandford's three syntypes of *intrusus*, on the holotypes of *howardi, fitchi,* and *scopulorum,* and on 162 other specimens. The first female syntype, from San Geronimo, Guatemala, in Blandford's series is here designated as the lectotype of *intrusus.*

The population from the eastern United States averages slightly smaller (2.2–2.5 mm) than those from western areas (2.3–2.7 mm). The pronotal and elytral characters mentioned by Bright (1968) are not consistent and occur in both populations.

## 74. *Xyleborus declivus* Eichhoff

*Xyleborus declivis* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:280 (Holotype, female; Teapa, Tabasco, Mexico; presumably lost with Hamburg Mus.)

*Xyleborus pseudoprocer* Schedl, 1949, Rev. Brasil. Biol. 9:279 (Holotype, female; Guatemala; Schedl Coll.); Wood, 1972, Great Basin Nat. 32:197. *Synonymy*

DIAGNOSIS.— This species is distinguished from *procer* Eichhoff by the narrower elytral declivity, which is feebly if at all impressed, and by the very minute declivital punctures. It is less closely allied to *celsus* Eichhoff, from which it is distinguished by the narrower declivity that has fewer marginal granules, and by the obsolete declivital striae.

FEMALE.— Length 4.0–4.4 mm, 3.2 times as long as wide; color reddish brown.

Frons broadly convex; finely rugose-reticulate, with small, isolated, moderately abundant granules below, granules sparse above eyes, vestiture fine, sparse, inconspicuous.

Pronotum 1.3 times as long as wide; sides straight and parallel on basal two-thirds, rather broadly rounded in front; summit well in front of middle; rather finely asperate on anterior two-thirds; posterior areas smooth, shining, punctures very minute, sparse. Vestiture sparse, confined to margins.

Elytra 1.9 times as long as wide, 1.46 times as long as pronotum; sides almost straight and parallel on basal two-thirds, then slightly tapered, rather narrowly rounded behind; declivity confined to slightly more than basal two-thirds; striae not impressed, punctures small, shallow; interstriae smooth, shining, punctures obsolete except very sparse on 1. Declivity rather steep, flattened on central half, otherwise convex; central half flat to feebly impressed, smooth, slightly dull, punctures fine, moderately abundant, confused, striae almost obsolete; upper and lower fourths on extreme lateral side of interstriae 1 armed by coarse, pointed tubercles positioned about as in *celsus*, basal and lateral areas with a few smaller tubercles; posterolateral margins rounded, unarmed. Vestiture confined to declivity and sides; consisting of rather sparse, moderately long, interstrial hair.

DISTRIBUTION.— Veracruz to Costa Rica.

MEXICO: **Veracruz**: Lago Catemaco, 1-3-V-69, D. E. Bright. GUATEMALA: Guatemala; Las Mercedes, Zapote, and Cerro Zunil by G. C. Champion. COSTA RICA: Pandora, Limón, 23-VIII-63, 50 m, No. 135, log, No. 138, at light, S. L. Wood.

BIOLOGY.— The only available specimen not collected at light was taken from a new tunnel in a tree limb 10 cm in diameter.

NOTES.— The above treatment was based on 20 specimens, including Blandford's series from Guatemala, the holotype of *pseudoprocer*, and three other specimens that were compared to the Blandford and Schedl specimens.

### 75. *Xyleborus macer* Blandford

*Xyleborus macer* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):218 (Lectotype, female; El Tumbador, Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished from *declivis* Eichhoff by the smaller size, by the larger strial punctures, and by the smaller flattened area on the declivity.

FEMALE.— Length 2.9–3.3 mm, 3.5 times as long as wide; color reddish brown.

Frons and pronotum as in *declivis* Eichhoff except frons with fewer granules.

Elytra 2.1 times as long as wide, 1.4 times as long as pronotum; outline and proportions as in *declivis*; disc as in *declivis* except strial punctures distinctly larger, interstriae about twice as wide as striae; declivity as in *declivis* except flattened area slightly smaller, tubercles averaging very slightly smaller.

DISTRIBUTION.— Veracruz to Panama and Venezuela.

MEXICO: Veracruz: Dos Amates, 3-V-69, D. E. Bright; Lago Catemaco, 4-V-69, D. E. Bright. GUATEMALA: Zapote and El Tumbador by G. C. Champion; Guatemala, 28-III-41, primavera log; Cuyotenango, 1-II-66, J. M. Campbell. NICARAGUA: Chontales, G. C. Champion. COSTA RICA: Dominical, Puntarenas, 9-XII-63, 3 m, in flight, S. L. Wood; Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 76, log, S. L. Wood; Turrialba, Cartago, 1970, R. I. Gara. PANAMA: Ft. San Lorenzo, Canal Zone, 10-X-57, at light; Tolé, G. C. Champion. COLOMBIA: Anchicaya, 27-VII-70, J. M. Campbell. VENEZUELA: Finca Monasterios, Cacagua, Miranda, 1971, *Theobroma cacao*.

HOSTS.— *Theobroma cacao*, etc.

BIOLOGY.— Specimens have been taken from logs and limbs.

NOTES.— Blandford's syntypic series of six specimens and 37 other specimens were examined. The first female syntype in Blandford's series, on a double mount, from El Tumbador, Guatemala, is here designated as the lectotype of *macer*. This specimen has been regarded as the type for many years, but it has not previously been so designated.

### *Xyleborus exaratus* Blandford

*Xyleborus exaratus* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):206 (Holotype, male; Bugaba, Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This male has not been associated with any known female. It superficially resembles *Xyleborus nobilus* Eggers.

MALE.— Length 4.5 mm, 2.4 times as long as wide; immature, color yellowish brown.

Head slightly enlarged, broad, frons convex, reticulate, punctures fine, obscure; mandibles moderately enlarged, stout. Eye reduced, entirely divided by an emargination. Antennal club moderately small, without evident sutures.

Pronotum 1.2 times as long as wide; subquadrate, sides straight and parallel on basal three-fourths, very broadly rounded in front; summit indefinite, on anterior third; anterior slope feebly declivous, asperities minute, almost obsolete on median two-thirds, fully formed only on anterolateral areas; surface almost smooth, subshining, punctures very small, moderately close. Glabrous except at margins.

Elytra 1.2 times as long as wide, 1.0 times as long as pronotum; disc occupying basal two-thirds; basal margins abrupt, precipitous; surface smooth, shining, strial punctures very small, in slightly irregular rows; interstrial punctures minute, almost obsolete, confused. Declivity abruptly, obliquely truncate; surface as on disc, very slightly convex on lower half; punctures confused except near upper margin; margin on upper half abruptly rounded, subacute on lower half. Glabrous.

DISTRIBUTION.— Panama.

PANAMA: Bugaba, Chiriquí, G. C. Champion.

NOTES.— The above treatment was based on the holotype. No other American species known to me resembles this one. It is in a unique species group.

## GENUS *XYLEBORINUS* REITTER

*Xyleborinus* Reitter, 1913. Wiener Ent. Zeit. 32(Beiheft):83 (Type-species: *Bostrichus saxeseni* Ratzeburg, subsequent designation by Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):50)

DIAGNOSIS.— This genus has been recognized by most previous authors either as a subgenus or a synonym of *Xyleborus* Eichhoff. Nevertheless, following a review of more than 600 species of the world fauna of *Xyleborini*, it is obvious that clearly recognizable subgroups exist within the tribe that should have generic status. *Xyleborinus* is one such group. *Xyleborinus* is distinguished from

*Xyleborus* by the precipitous basal margins of the elytra in the median area, by the conical scutellum that does not fit into the sutural notch, by the conspicuous pubescence in the sutural notch adjacent to the scutellum, and, in part, by the absence of a carina on the posterolateral margin of the declivity.

DESCRIPTION.— Length of females 1.4–3.5 mm, 2.6–3.0 times as long as wide; males dwarfed, deformed, stouter; color dark brown. Description as for *Xyleborus* except as noted in above diagnosis.

DISTRIBUTION.— Worldwide; more than 30 nominate species are known; 10 species occur in North and Central America.

BIOLOGY.— The limbs and boles of dying or recently cut material are selected for attack. Basic habits are essentially as described for *Xyleborus*. Parental tunnels are either of the cave type (*saxeseni*) or branched (most other species).

NOTES.— Until a world review of the Xyleborini was attempted, I opposed the recognition of *Xyleborinus* as anything more than a *subgenus*. It is now evident that it forms a clearly definable genus that is allied to several Indomalayan species groups (genera?) awaiting clarification. A reliable description of *Xyleborinus* cannot be made until a generic revision of the tribe is completed.

Key to the Species of *Xyleborinus*

1. Interstriae 1, 2, and 3 each equally, regularly armed by a row of moderately fine, pointed tubercles; posterolateral margin of declivity rounded and bearing several somewhat larger tubercles; Veracruz to Panama and Venezuela; 1.4–1.6 mm ..... 1. ***intersetosus*** **(Blandford)**

— Interstriae 1 and 2 unarmed except at base in some species (1 armed in *saxeseni*), 3 variously modified ..... 2

2(1). Lateral margins of elytral declivity armed by two or three pairs of large, slender spines, spine 1 (often absent) at upper margin, 2 just below middle, 3 just before apex; punctures on declivital face rather larger; 2.4–3.5 mm ..... 3

— Smaller, less than 2.3 mm; punctures on elytral declivity in rows, armature of lateral convexity different ..... 5

3(2). Larger; declivital punctures confused; declivity armed by three pairs of spines (upper pair sometimes absent); declivity distinctly concave; Costa Rica to Colombia; 3.3–3.5 mm ..... 5. ***dirus*** **(Wood)**

— Smaller; strial punctures on elytral declivity in rows; declivity armed by two pairs of spines; declivity almost flat ..... 4

4(3). Declivity more narrowly, subconcavely impressed, major spines smaller, apparently blunt, minor spines on basal half smaller; declivity steeper, shorter; El Salvador; *Quercus*; 2.5 mm (see also 2. ***tribuloides*** **Wood**) ..... 3. ***gracilicornis*** **(Schedl)**

— Declivity more broadly impressed, transversely almost flat, major spines conspicuously larger, minor spines on basal half much smaller; declivity more gradual, longer; Panama; 2.4–2.5 mm ..... 4. ***tribulosus*** **Wood**

5(2). Lateral margins of declivity strongly, obtusely elevated from sutural apex to well above middle of declivity, summit and lateral areas unarmed or with very minute granules; Costa Rica; 1.6–1.7 mm ..... 6. ***protinus*** **(Wood)**

— Lateral margins of declivity and lateral areas armed by several rather large, sharply pointed tubercles ..... 6

6(5). Interstriae 3 armed throughout length of declivity by a row of about eight large, closely set teeth, lateral areas bearing 20 or more similar but smaller teeth; Costa Rica and Panama to Venezuela and Surinam; 1.9–2.2 mm ..... 7. ***reconditus*** **(Schedl)**

— Interstriae 3 armed by fewer or much smaller denticles ..... 7

7(6). Declivity occupying posterior two-thirds of elytral length, broadly, moderately concave; interstriae 3 armed near middle of declivity by a rather large spine, base and sides of declivity bearing 20 or more smaller denticles of various sizes; Costa Rica to Colombia; 1.9–2.3 mm ..... 8. ***bicornatulus*** **(Wood)**

— Elytral declivity shorter, rather steep, occupying less than one-third of declivital length; declivity devoid of a large spine ..... 8

8(7). Declivital interstriae 1 and 3 equally, weakly elevated; interstriae 3, 4, basal half of 1, and lateral areas with a few small pointed granules, ventrolateral areas weakly elevated; S Canada and United States, etc.; 1.9–2.4 mm ..... 9. ***saxeseni*** **(Ratzeburg)**

— Declivital interstriae 1 not elevated or armed by granules, ventrolateral area rather strongly elevated and armed by 15–20 denticles, one or two of those near apex of interstriae 3 often moderately large; S Florida, Costa Rica to Colombia and Venezuela; 1.6–1.9 mm ..... 10. ***aspericauda*** **(Eggers)**

### 1. *Xyleborinus intersetosus* (Blandford)

*Xyleborus intersetosus* Blandford, 1898, Biol. Centr. Amer., Coleopt. 4(6):211 (Holotype, female; Tamahú, Vera Paz, Guatemala; British Mus. Nat. Hist.)

*Xyleborus analogus* Schedl, 1949, Rev. Brasil. Biol. 9:277 (Holotype, female; Mexico; Eggers Coll., evidently on loan to Schedl); Wood, 1966, Great Basin Nat. 26:31. *Synonymy*

DIAGNOSIS.— This species is distinguished from other Central American representatives of the genus by the broadly convex elytral declivity, by the equally, uniformly tuberculate declivital interstriae, and by the small size.

FEMALE.— Length 1.4–1.6 mm, 2.8 times as long as wide; color dark brown.

Frons broadly convex; surface reticulate, a few coarse, shallow punctures; vestiture of sparse, inconspicuous hair.

Pronotum 1.1 times as long as wide; widest slightly behind middle, sides very weakly arcuate on more than basal half, rather narrowly rounded in front, anterior margin armed by about six to eight broad, low, poorly formed serrations; summit at middle; anterior slope rather coarsely asperate; posterior areas reticulate, punctures fine, rather close. Vestiture hairlike, sparse on disc, mostly confined to marginal areas.

Elytra 1.6 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on slightly more than basal half, then very slightly tapered, rather broadly rounded behind; disc confined to slightly more than basal half; basal margins and scutellum as described for genus; striae not impressed, punctures minute; spaced within a row by two to four diameters of a puncture; interstriae smooth, shining, about five times as wide as striae, punctures very slightly smaller than those of striae. Declivity moderately steep, broadly convex; striae feebly impressed, punctures often slightly larger than on disc; interstriae each with a row of about six to eight small pointed tubercles of equal size; posterolateral margin rather narrowly rounded. Vestiture of rows of semirecumbent, moderately long strial hair, and rows of erect, coarser, longer interstrial bristles; each bristle slightly longer than distance between rows or between bristles within a row.

MALE.— Length 1.0 mm; essentially as in female except dwarfed, all characters poorly formed; anterior slope of pronotum less precipitous, most asperities obsolete; elytral declivity longer, more gradual, tubercles minute to obsolete.

DISTRIBUTION.— Veracruz to Colombia and Venezuela.

MEXICO: **Chiapas**: Palenque Ruins, 9-V-69, D. E. Bright. **Veracruz**: Dos Amates, 5-V-69, D. E. Bright; Valle Nacional. GUATEMALA: Tamahú, Alta Verapaz, G. C. Champion. COSTA RICA: Río Damitas, Dota Mts., San José, 12-VIII-63, 250 m, No. 124 from tree stump, No. 126 from a liana, No. 127 from *Vismia guianensis*, S. L. Wood; Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 69, tree seedling, S. L. Wood; Volcán, Puntarenas, 11-XII-63, 1000 m, No. 308, tree limb, S. L. Wood; Finca La Lola, Limón, 22-VI-63, *Theobroma cacao*, J. L. Saunders; Guápiles, Limón, 22-VIII-66, 100 m, No. 124, liana, S. L. Wood. PANAMA: Barro Colorado Island, Canal Zone, 23-VII-66, No. 31, log, S. L. Wood; 13 km S El Hato del Volcán,

7-I-64, 1000 m, tree sapling, S. L. Wood. OTHER COUNTRIES: Colombia, Venezuela.

HOSTS.— *Alexa imperatricia, Sloanea multiflora, Theobroma cacao, Vismia guianensis,* etc.

BIOLOGY.— Cut, weakened, and dying limbs, boles, logs, and stumps larger than 8 cm in diameter were selected for attack. The tunnels appeared to be of a simple branching type.

NOTES.— The above treatment was based on 94 specimens including several that were compared by me directly to the holotypes of *intersetosus* and *analogus.*

### 2. *Xyleborinus tribuloides* Wood

*Xyleborinus tribuloides* Wood, 1977, Great Basin Nat. 37:218 (Holotype, female; 15 miles or 24 km S Valle Nacional, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *bicornatulus* Wood by the uniformly reticulate pronotum and by the much shorter, less strongly impressed, very different declivity as described below.

FEMALE.— Length 2.1–2.3 mm, 2.9 times as long as wide; color dark brown.

Frons and pronotum about as in *bicornatulus* except pronotal disc uniformly, strongly reticulate.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; declivity confined to posterior third; striae not impressed, punctures fine, shallow; interstriae smooth, shining, three to four times as wide as striae, punctures finely granulate. Declivity gradual, shallowly subconcave; punctures on striae 1 and 2 slightly larger than on disc; interstriae 1 and 2 unarmed except for small granules at base, 3 armed one-third declivital length from base by a moderately coarse, pointed tubercle, as high as wide, a larger, blunt spine two-thirds of declivital length from base, longer than wide, its length about equal to width of an interstriae, a small tubercle at base above spine 1 and another at apex below spine 2; lateral summit at striae 4, lateral areas armed by about a dozen moderately coarse tubercles (smaller and less numerous than in *bicornatulus*). Vestiture of minute strial hair and distinctly longer interstrial hair, regularly, closely spaced to base, each interstrial seta about equal in length to width of an interstriae.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 24 km S Valle Nacional, 20-V-71, *Cecropia* leaf petiole, D. E. Bright.

NOTES.— The above treatment was based on the type series of two specimens.

### 3. *Xyleborinus gracilicornis* (Schedl)

*Xyleborus gracilicornis* Schedl, 1977, Zeitschr. Arb. Österr. Ent. 29:45 (Holotype, female; San Francisco Golera, El Salvador; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *tribulosus* Wood as indicated in the above key.

FEMALE.— Length 2.5 mm, 2.9 times as long as wide; color dark brown.

Refer to the above key and to the original description to distinguish this species.

DISTRIBUTION.— El Salvador.

EL SALVADOR: San Francisco Golera, 7-VI-74, *Quercus,* H. Schmutzenhofer.

NOTES.— Prior to its description the holotype was examined and used in the preparation of the key.

### 4. *Xyleborinus tribulosus* Wood

*Xyleborinus tribulosus* Wood, 1972, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):41 (Holotype, female; Madden Forest, Canal Zone Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *dirus* (Wood) by the larger size, by the more slender body form, by the smaller, uniseriate strial and interstrial punctures on disc and declivity, and by the different elytral declivity.

FEMALE.— Length 2.4–2.5 mm, 2.8 times as long as wide; color very dark brown.

Frons and pronotum essentially as in *dirus* except pronotum 1.1 times as long as wide; pronotal disc glabrous.

Elytra 1.6 times as long as wide (spines excluded), 1.4 times as long as pronotum; outline essentially as in *dirus*; striae not impressed, punctures small, uniseriate, close; interstriae smooth, shining, slightly more than twice as wide as striae, punctures half as large as those of striae, uniseriate. Declivity occupying two-thirds of elytral length; broadly flattened to feebly impressed, its margin armed by about 24 rather coarse, pointed denticles on interstriae 1–6 from base

to near sutural apex; interstriae 3 armed at middle and near apex by two pairs of very large spines, each spine one and one-half times as long as its basal width, about equal in length to discal distance from suture to striae 3; face of declivity with strial punctures in rows, slightly larger than on disc, interstrial punctures largely obsolete. Vestiture of rows of rather coarse interstrial setae, on disc each seta about as long as distance between rows, distinctly closer within a row, on declivity distinctly longer and less regularly placed.

DISTRIBUTION.— Panama.

PANAMA: Madden Forest, Canal Zone, 2-I-64, 70 m, No. 367, tree limb, S. L. Wood.

BIOLOGY.— Specimens were taken from a broken branch 8 cm in diameter.

NOTES.— The above treatment was based on the type series of two specimens.

### 5. *Xyleborinus dirus* (Wood)

*Xyleborus dirus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):41 (Holotype, female; Rincón de Osa, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the large size, by the very coarse declivital spines that superficially resemble *Xyleborus ferox* Blandford, and by the confused punctures on the declivital face.

FEMALE.— Length 3.4–3.6 mm, 2.7 times as long as wide; mature color black.

Frons convex, epistoma slightly elevated; surface reticulate, punctures rather large, impressed, indefinite; vestiture inconspicuous.

Pronotum 1.06 times as long as wide, widest a third of its length from base; sides rather weakly arcuate on basal two-thirds, converging very slightly, then rather strongly rounded in front, median area rather narrowly produced but unarmed (in many paratypes anterior margin rather broadly rounded); summit very slightly in front of middle; posterior area reticulate, except indistinctly so near base, punctures small, distinct, rather close; vestiture rather long and abundant on sides and in asperate area.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal half, then arcuately converging to apex of ventrolateral declivital spine, rather broadly U-shaped between spines; striae 1 weakly, others not impressed, punctures moderately large, deep, somewhat confused on 1; interstriae mostly twice as wide as striae, punctures similar to those of striae but deeper, uniseriate except partly confused on 1 and 2. Declivity moderately steep, broadly, shallowly excavated, lateral margins armed by three pairs of major spines; spine 1 at upper margin in line with striae 2, spine 2 on lateral margin two-thirds declivital length from upper margin, spine 3 at ventrolateral margin; spine 1 slightly more than half as long as 3, 2 slightly smaller than 3, 2 equal in length to width of antennal club; one minor tooth in front of spine 1, two others between 1 and 2; declivital face with confused punctures similar to those on disc. Vestiture consisting of rather long, slender hair arising from interstrial punctures on disc and sides, setae minute on excavated area.

MALE.— Length 2.5–2.7 mm; similar to female except smaller, eye reduced, pronotum not strongly arched with asperities somewhat reduced; elytral declivity much longer, more gradual, with spine 1 greatly reduced, minor teeth mostly absent.

DISTRIBUTION.— Costa Rica and Colombia.

COSTA RICA: Rincon de Osa, Puntarenas, 11-VIII-66, 30 m, No. 88, tree limb, S. L. Wood; Río Damitas, Dota Mts., San Joé, 22-VII-63, 250 m, No. 88, tree stump, No. 65, liana, S. L. Wood. COLOMBIA: Campamento Capote, 27 km NE Montoya, Santander, 2-VII-70, 150 m, No. 632, *Cespedesia macrophylla*, S. L. Wood.

BIOLOGY.— Specimens were taken from a standing bole 15 cm in diameter and from a stump 25 cm in diameter. The galleries were of a branching type except that some of the ends were enlarged into tabular cavities.

NOTES.— The above treatment was based on the type series of 56 specimens and on one other specimen.

### 6. *Xyleborinus protinus* (Wood)

*Xyleborus protinus* Wood, 1972, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):42 (Holotype, female; Finca La Lola, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species differs from other North and Central American representatives of the genus by the broadly, shallowly concave elytral declivity, with the lateral margins unarmed.

FEMALE.— Length 1.6–1.7 mm, 2.7 times as long as wide; color rather light brown, the prothorax distinctly lighter.

Frons very weakly convex from upper level of eyes to epistomal margin; surface reticulate, rather coarsely, obscurely punctured; vestiture inconspicuous.

Pronotum 1.25 times as long as wide; widest one-third pronotum length from base, sides weakly arcuate, basal and anterior angles more strongly rounded, rather narrowly rounded in front; asperities fine, largely isolated; summit indefinite, in front of middle; surface reticulate in front of summit, mostly smooth and brightly shining behind, punctures small, deep, not close; vestiture largely confined to sides and asperate area.

Elytra 1.6 times as long as wide, 1.3 times as long as pronotum; sides essentially straight and parallel on basal three-fourths, then rather abruptly rounded, shallowly emarginate on median third behind; scutellum conical; striae not impressed, punctures small, deep; interstriae twice as wide as striae, punctures small, indefinite; elytra arched from base to apex. Declivity beginning on basal third of elytra, gradual; lateral margins on lower half gradually elevated and continuing almost to apex, elevation rather high, not at all acute, evidently entirely unarmed; lower half transversely concave; striae 1 and 2 with punctures larger than on disc, strongly impressed; interstriae 2 wider than 1; interstrial punctures obscure. Vestiture consisting of stout, hairlike setae, more abundant on declivity, particularly on inner slope of lateral elevation.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Finca La Lola, Limón, 7-II-63, *Theobroma cacao*, J. L. Saunders.

NOTES.— The above treatment was based on the type series of five specimens.

### 7. *Xyleborinus reconditus* (Schedl)

*Xyleborus reconditus* Schedl, 1963, Studies on the Fauna of Surinam and other Guyanas 4:60 (Holotype, female; Tambahredjo, Surinam; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from other Central American representatives of the genus by the gradual, impressed declivity, and by the row of coarse, stout denticles of equal size on declivital interstriae 3 from near the base to the apex, interstriae 2 becoming obsolete before the apex.

FEMALE.— Length 1.9–2.2 mm, 2.6 times as long as wide; color dark brown to almost black.

Frons broadly, weakly convex, epistoma feebly elevated; surface reticulate, rather closely, coarsely, shallowly punctured; vestiture of fine, sparse, inconspicuous hair.

Pronotum 1.1 times as long as wide; widest just behind middle, sides weakly arcuate, almost parallel on basal two-thirds, rather broadly rounded in front; anterior margin irregularly, finely serrate; summit broad, slightly anterior to middle; entire surface reticulate except irregular, transverse shining area on posterior half, punctures rather fine, moderately abundant. Vestiture confined to marginal areas.

Elytra 1.45 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal three-fourths, then broadly rounded, shallowly subemarginate on median sixth behind; disc confined to slightly less than basal 40 percent; striae not impressed, punctures fine, shallow; interstriae smooth, shining, about five times as wide as striae, punctures slightly smaller than those of striae, uniseriate. Declivity gradual, shallowly, broadly sulcate; punctures on striae 1 and 2 about twice as wide as those on disc; strongly impressed, almost flat between striae 2, interstrial punctures on 1 and 2 almost obsolete; ascending rather strongly from striae 2 to broad rounded summit between striae 3 and 5; interstriae 3 armed from near base of declivity to near sutural apex by a row of rather coarse, stout denticles of about equal size, about 10–12 denticles on each side; lateral interstriae with rows of smaller tubercles; posterolateral margin rounded. Vestiture of rows of minute strial hair, and rows of longer interstrial setae; interstrial setae on disc hairlike, rather coarse on declivity, each slightly shorter than distance between rows.

DISTRIBUTION.— Costa Rica and Panama to Venezuela and Surinam.

COSTA RICA: San Isidro del General, San José, 5-XII-63, 1000 m, No. 287, *Eugenia jambos*, S. L. Wood; Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 65, liana, S. L. Wood. PANAMA: Ft. Clayton, Canal Zone, 22-XII-63, 30 m, S. L. Wood. VENEZUELA: Finca Monasterio, Cacagua, 1971, *Theobroma cacao*.

HOSTS.— *Eugenia jambos, Theobroma cacao*, etc.

BIOLOGY.— Specimens were taken from branches and limbs 4–10 cm in diameter.

NOTES.— The above treatment was based on 13 specimens, one of which was compared by me to the holotype of *reconditus*.

### 8. *Xyleborinus bicornatulus* (Wood)

*Xyleborus bicornatulus* Wood, 1967, Great Basin Nat. 27:137 (Holotype, female; Moravia, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *reconditus* (Schedl) by the much smaller denticles on declivital interstriae 3, except one just below middle of declivity that is almost twice as large as those of *reconditus*.

FEMALE.— Length 2.0–2.3 mm, 2.8 times as long as wide; color almost black.

Frons broadly, transversely convex, longitudinally straight to well above eyes, the epistoma slightly, gradually raised, surface reticulate, with rather coarse, deep, sparse punctures; vestiture inconspicuous except along epistoma. Eye finely faceted; half divided by a narrow emargination.

Pronotum 1.2 times as long as wide; widest just behind middle, sides weakly arcuate, feebly if at all converging before rather abrupt anterolateral angles, rather broadly rounded in front; anterior margin subserrate; summit at middle; posterior area smooth and shining on disc, reticulate laterally, with sparse, very fine punctures; vestiture sparse, inconspicuous.

Elytra 1.6 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal two-thirds, then broadly rounded, almost straight on median third of posterior margin, arcuate portion strongly serrate; striae not impressed, punctures very small, distinct; interstriae shining, not entirely smooth, about four or five times as wide as striae, punctures about as small as those of striae. Declivity beginning very slightly more than one-third elytral length from base, gradual, rather broadly excavated, sides moderately elevated, rounded; striae 1 and 2 wider than normal, distinctly punctured; interstriae 1 and 2 shining and uniseriately punctured, each with three or four tubercles at declivital base, 1 weakly elevated, 2 impressed; interstriae 3 somewhat elevated, upper third armed by a row of up to five tubercles, an additional much longer spine at middle of declivity; apex of interstriae 3 near declivital margin with one or two tubercles; interstriae 4 with a row of rather coarse, pointed tubercles on upper third, 5 with a similar series on middle half, 6 and 7 with similar series on most of lower half, a few tubercles extending almost to apex. Vestiture consistinng of rows of interstrial hair, rather fine on disc and sides, stout on declivity.

DISTRIBUTION.— Costa Rica to Colombia.

COSTA RICA: Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 79, palm log, S. L. Wood; Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 55, *Ochroma*, S. L. Wood; Río Damitas, Dota Mts. San José, 18-II-64, 250 m, No. 442, log, S. L. Wood; Moravia, Cartago, 11-III-64, 500 m, No. 472, log, S. L. Wood; Finca La Lola, Limón, 27-XII-62, *Theobroma cacao*, J. L. Saunders. PANAMA: 13 km S El Hato del Volcán, Chiriquí, 7-I-64, 1000 m, No. 371, tree sapling, S. L. Wood; Cerro Campana, Cocle, 26-VII-66, tree branch, S. L. Wood. OTHER COUNTRIES: Colombia.

HOSTS.— *Ochroma* sp., *Theobroma cacao*, etc.

BIOLOGY.— Specimens were taken from material 5–20 cm in diameter. The tunnels evidently were of a simple branching type.

### 9. *Xyleborinus saxeseni* (Ratzeburg)

Fig. 187

*Bostrichus saxeseni* Ratzeburg, 1837, Die Forst-insekten 1:167 (Syntypes, female; presumably lost with Hamburg Mus.)

*Xyleborinus saxeseni*: Reitter, 1913, Wiener Ent. Zeit. 32(Beiheft):83

*Tomicus dohrni* Wollaston, 1854, Insecta Maderensia, p. 290 (Syntypes, female; Madera; British Mus. Nat. Hist.); Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:362. *Synonymy*

*Tomicus decolor* Boieldieu, 1859, Ann. Soc. Ent. France (3)7:473 (Syntypes, female; Péronne, France; Paris Mus.?); Ferrari, 1867, Die Forst- und Baumzuchtschädlichen Borkenkäfer, p. 22. *Synonymy*

*Xyleborus angustatus* Eichhoff, 1866, Berliner Ent. Zeitschr. 10:278 (Syntypes, female; Volhynia, USSR; presumably lost with Hamburg Mus.); Schedl, 1964, Reichenbachia 3:313. *Synonymy*

*Xyleborus sobrinus* Eichhoff, 1875, Ann. Soc. Ent. Belgique 18:202 (Syntypes?; Japan; Brussels Mus.?); Schedl, 1964, Reichenbachia 3:313. *Synonymy*

*Xyleborus subdepressus* Rey, 1883, Rev. d'Ent. 2:142 (Syntypes, male; Lyon, France; Paris Mus.?); Bedel, 1888, Ann. Soc. Ent. France, hors serie, 6:419. *Synonymy*

*Xyleborus quercus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:63 (Holotype, female; Baxterville, Mississippi; U.S. Nat. Mus., 7643); Wood, 1962, Great Basin Nat. 22:79. *Synonymy*

*Xyleborus pecanus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:63 (Holotype, female; Waynesboro, Mississippi; U.S. Nat. Mus. 7645); Wood, 1962, Great Basin Nat. 22:79. *Synonymy*

*Xyleborus floridensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:63 (Holotype, female; Enterprise, Florida; U.S. Nat. Mus., 7646); Wood, 1962, Great Basin Nat. 22:79. *Synonymy*

*Xyleborus arbuti* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:64 (Holotype, female; Walker, California; U.S. Nat. Mus., 9583); Wood, 1957, Canadian Ent. 89:403. *Synonymy*

*Xyleborinus tsugae* Swaine, 1934, Canadian Ent. 66:204 (Holotype, female; Mission, British Columbia; Canadian Nat. Coll., 3815); Wood, 1957, Canadian Ent. 89:403. *Synonymy*

*Xyleborinus libocedri* Swaine, 1934, Canadian Ent. 66:205 (Holotype, female; Oak Ridge, Oregon; Canadian Nat. Coll., 3816); Wood, 1957, Canadian Ent. 89:403. *Synonymy*

*Xyleborus pseudoangustatus* Schedl, 1949, Proc. Roy. Soc. Queensland 60:28 (Syntypes, female; Australia; British Mus. Nat. Hist. and Schedl Coll.); Schedl, 1964, Reichenbachia 3:313. *Synonymy*

DIAGNOSIS.— This species is distinguished from other North and Central American representatives of the genus by the tuberculate declivital interstriae 1, with interstriae 2 unarmed.

FEMALE.— Length 1.9–2.4 mm, 3.0 times as long as wide; color dark brown.

Frons and pronotum essentially as in *intersetosus* (Blandford) except pronotal asperities slightly larger, punctures on pronotal disc slightly smaller.

Elytral outline and disc as in *aspericauda* (Eggers) except posterior outline straight on median third, not emarginate, and interstrial punctures on disc almost obsolete. Declivity essentially convex, very shallowly bisulcate; strial punctures about as on disc; interstriae 1 and 3 feebly elevated, each armed by a row of about five to seven pointed tubercles, those on lower fifth usually reduced or obsolete on 1; 2 slightly narrower than 1 or 3, weakly impressed, unarmed, impunctate, one or two minute granules near base, 4–7 each with a few smaller pointed tubercles; posterolateral margin rounded. Vestiture as in *aspericauda* except setae near declivity slightly longer, those on declivital interstriae 2 obsolete.

MALE.— Length 1.6–1.8 mm; similar to female except smaller, all characters poorly formed, pronotal asperities and declivital granules much smaller.

DISTRIBUTION.— British Columbia and Maine to Baja California, Hidalgo, and Florida; Europe, Asia, Australia, Hawaii, Argentina, Brazil, Chile.

CANADA: British Columbia, Ontario. USA: Alabama, Arizona, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Mississippi, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, ennessee, Texas, Utah, Virginia, Washington. MEXICO: Baja California, Hidalgo.

HOSTS.— Numerous trees and shrubs.

BIOLOGY.— This species attacks recently cut, injured, and dying material from 5–50 cm in diameter. The attacking female constructs a radial entrance tunnel through the bark and about 1–7 cm into the wood. In the innermost section, she enlarges the upper and lower walls parallel to the grain of the wood. She then deposits eggs in this section of the tunnel. The larvae apparently feed on a combination of ambrosial fungus and wood obtained from continuing the tabular excavation of their mother. The mature tunnel is of a tabular cave type, with the broad axis parallel to the grain of the wood. At times the entire cavity is a mass of larvae. One to two months are required to complete a generation under favorable conditions. Blackman (1922) recorded a sex ratio of 1 male to 7 females, but field observations suggest a more normal ratio is 1 to 15. This species is capable of causing rather severe economic damage.

### 10. *Xyleborinus aspericauda* (Eggers)

*Xyleborus aspericauda* Eggers, 1941, Arb. Morph. Taxon. Ent. Berlin-Dahlem 8:106 (Holotype, female; Guadeloupe Island; Fleutiaux Coll.)

DIAGNOSIS.— This species is distinguished from *saxeseni* (Ratzeburg) by the absence of an elevation and of denticles on declivital interstriae 1, and by the rather strongly elevated ventrolateral area of the declivity, which is armed by 15–20 denticles.

FEMALE.— Length 1.6–1.9 mm, 3.0 times as long as wide; color dark brown to black.

Frons as in *intersetosus*.

Pronotum 1.2 times as long as wide; sides straight and parallel on almost basal two-thirds, rather narrowly rounded in front;

anterior margin feebly serrate; summit slightly more than one-third pronotum length from anterior margin; anterior slope rather finely asperate; posterior areas reticulate, punctures fine, moderately abundant. Vestiture fine, short, sparse in discal area, longer and rather coarse on asperate area.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on basal two-thirds, then slightly tapered, shallowly, broadly emarginate on median third behind; scutellum as described for genus; disc confined to basal 60 percent; striae not impressed, punctures small, spaced within row by diameter of a puncture; interstriae almost smooth, shining, about two and one-half times as wide as striae, punctures fine, two-thirds as large as those of striae, those near declivity finely granulate. Declivity rather steep, somewhat flattened on basal half, rather broadly sulcate below; striae 1 weakly impressed, punctures slightly larger than on disc; interstriae 1 and 2 almost flat, unarmed, 2 narrowed, then obsolete on lower third; lateral area on less than lower third elevated, rounded, armed by about 15 pointed tubercles, one or two of those on summit of elevation on interstriae 3 distinctly larger. Vestiture of minute, almost obsolete strial hair, and rows of longer, erect, coarse, interstrial hair, each hair about as long as distance between rows, similarly spaced within a row.

DISTRIBUTION.— S Florida and Costa Rica to Colombia and Venezuela.

USA: Florida: Biscayne Bay. COSTA RICA: Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 87, tree branch, S. L. Wood; Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, Nos. 55, 65, liana, S. L. Wood; San Isidro del General, San José, 5-XII-63, 1000 m, No. 284, *Miconia pubescens*, S. L. Wood; Turrialba, Cartago, 1970, R. I. Gara; Guápiles, Limón, 22-VII-66, 100 m, No. 119, *Terminalia*, S. L. Wood; Finca La Lola, Limón, 4-III-63, *Theobroma cacao*, J. L. Saunders. PANAMA: 13 km S El Hato del Volcán, Chiriquí, 7-I-64, 1000 m, No. 371, tree sapling, S. L. Wood. OTHER COUNTRIES: Colombia, Venezuela, Guadeloupe.

HOSTS.— *Terminalia* sp., *Theobroma cacao*, etc.

BIOLOGY.— Specimens were taken from material 5–50 cm in diameter.

NOTES.— The above treatment was based on 39 specimens, 2 of which were compared to Schedl's series of this species. The type was not located.

## Tribe CRYPHALINI

Cryphaloideae Lindemann, 1876, Bull. Soc. Imp. Nat. Moscou 51:165 (Type-genus: *Cryphalus* Erichson, 1836)
Ernoporinae Nüsslin, 1911, Zeitschr. wissensch. Insektenbiol. 7:375 (Type-genus: *Ernoporus* Thomson, 1859)
Trypophloeinae Nüsslin, 1911, Zeitschr. wissensch. Insektenbiol. 7:375 (Type-genus: *Trypophloeus* Fairmaire, 1868)
Eidophelinae Murayama, 1954, Bull. Fac. Agric. Yamaguti Univ. 5:200 (Type-genus: *Eidophelus* Eichhoff, 1875)

Anatomical features.— The frons is usually convex and is rarely dimorphic, the eye is usually entire (shallowly emarginate in *Stegomerus*, *Cryphalus*, *Hypocryphalus*, *Hypothenemus*, *Cryptocarenus*), the antennal funicle is 3–5-segmented, the club is flattened, when present, the sutures on the posterior face are strongly displaced toward the apex, the anterior area of the pronotum is declivous and asperate, its lateral margins may be rounded or marked by an acutely raised line, the procoxae are contiguous, the tibiae are rather strongly flattened and usually armed by more than four socketed denticles, the costal margin of the elytra ascends from the base of the declivity to its apex, and the males are dwarfed and deformed in *Trischidias*, *Hypothenemus*, and *Cryptocarenus*.

Biological features.— All are monogamous and they are either phloeophagous or pith borers. Parental galleries are usually of a modified cave type. Eggs are deposited in the parental gallery. Larvae may make individual mines or extend the parental tunnel. Males of *Trischidias*, *Hypothenemus*, and *Cryptocarenus* are flightless and do not join the female in the construction of parental galleries; these genera practice consanguineous polygyny and arrhenotokic parthenogenesis; the males are presumed to be haploid.

Taxonomy.— The generic classification of this tribe is in chaos. *Stegomerus*, *Trischidias*, and *Cryptocarenus* are restricted to tropical America. *Trypophloeus*, *Ernoporicus*, *Procryphalus*, and North American *Cryphalus* are of Eurasian origin and reached North America rather recently. *Scolytogenes* and *Hypothenemus* are circumtropical, their origins not known. This is one of the largest and most difficult tribes to classify in the family.

### Genus *TRYPOPHLOEUS* Fairmaire

*Trypophloeus* Fairmaire, 1868, *in* Jacquelin du Val and Fairmaire, Genera des Coleopteres d'Europe 4:105 (Type-species: *Bostrichus binodulvs* Ratzeburg, monobasic).
*Glyptoderus* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége, ser. 2, 8:34, 44, 137 (Type-species: *Bostrichus binodulus* Ratzeburg, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:122); Bedel, 1888, Ann. Soc. Ent. France, hors ser., 6:397. *Synonymy*

Diagnosis.— This genus is distinguished from *Procryphalus* Hopkins by the 5-segmented antennal funicle, by the smaller, slender, apically pointed, aseptate antennal club, and by the absence of scalelike setae on the basal half of the pronotum.

Description.— Length 1.5–2.1 mm, 2.3–2.5 times as long as wide; color dark brown to black; sexes similar; frons convex, conservatively sculptured. Eye entire, finely granulate. Antennal funicle 5-segmented, club elongate, apically pointed. Pronotum with summit at middle; anterior area asperate, punctured posteriorly; anterior margin armed; lateral margins rounded, not marked by a raised line. Elytral striae indicated or not, interstriae and declivity conservatively sculptured; costal margin ascending very slightly toward apex. Vestiture of abundant, short ground cover of scales and/or hair and interstrial rows of erect setae. Prothoracic tibiae broadened distally, armed on distal third of lateral margin by about eight teeth, hind tibiae somewhat similar, armed by about six teeth.

Distribution.— Northern areas of North America, Europe, and Asia; four species occur in North America and about a dozen in Europe and Asia.

Biology.— The species of this genus are monogamous and phloeophagous. They con-

struct cave-type tunnels in the bark immediately below the outer surface in unthrifty, living trees. The cavity is stained black, suggesting the presence of fungal growth that may play a significant role in their nutrition. Larval mines are short and winding.

Key to the Species of *Trypophloeus*
(Modified from Wood 1954)

1. Strial punctures impressed, at least on basal third of disc, diameters of largest punctures about equal in width to adjacent interstriae; vestiture hairlike on basal half of disc, either hair- or scalelike on declivity; declivital interstrial bristles distinctly longer than half of distance between rows ..... 2
— Strial punctures obscure, their diameters much less than width of an adjacent interstriae; vestiture scalelike on at least posterior three-fourths of elytra; declivital interstrial bristles shorter, their length equal to less than half distance between rows ..... 3

2(1). Strial punctures on more than basal half of disc coarse, deep; punctures on posterolateral areas of pronotum rather large, deep, close; scalelike setae confined to elytral declivity; Alaska and Utah to Nova Scotia; *Alnus, Salix*; 1.6–2.0 mm ..... 1. ***striatulus*** **(Mannerheim)**
— Strial punctures greatly reduced except on basal fourth of disc; punctures on posterolateral areas of pronotum rather small, shallow, not as close; scalelike setae covering posterior half of elytra; Washington to California; *Alnus, Salix*; 1.5–1.7 mm ..... 2. ***salicis*** **Hopkins**

3(1). Apex of interstriae 4 smooth or with minute, rounded granules; elytral scales abundant, broad, their apices rounded; front convex; E Nevada and Arizona to Saskatchewan and New Brunswick; *Populus*; 1.7–2.1 mm ..... 3. ***populi*** **Hopkins**
— Apex of interstriae 4 armed by a row of 1–5 small, slender, pointed teeth, each at least twice as long as its basal width; elytral scales abundant, their apices acuminate; frons usually subconcavely impressed; British Colombia to California; *Populus*; 1.5–1.9 mm ..... 4. ***thatcheri*** **Wood**

### 1. *Trypophloeus striatulus* (Mannerheim)
Fig. 194

*Cryphalus striatulus* Mannerheim, 1853, Bull. Soc. Imp. Nat. Moscou 26:235 (Holotype, sex?; Kenai Peninsula, Alaska; not in Helsinki Mus., presumably lost)

*Trypophloeus striatulus*: Wood, 1969, Great Basin Nat. 29:115

*Trypophloeus nitidus* Swaine, 1912, Canadian Ent. 44:349 (Lectotype, sex?; Weymouth, Nova Scotia; Canadian Nat. Coll., 9276, designated by Bright, 1967, Canadian Ent. 99:679); Wood, 1969, Great Basin Nat. 29:115. *Synonymy*

*Trypophloeus punctipennis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:37 (Holotype, female; Alta, Utah; U.S. Nat. Mus., 7399); Wood, 1954, Univ. Kansas Sci. Bull. 36:990. *Synonymy*

DIAGNOSIS.— The coarse strial punctures extending at least two-thirds of the distance from the elytral base to the declivity, and the absence of scalelike pubescence, except to a limited extent on the declivity, distinguish this species from other North American representatives of this genus.

FEMALE.— Length 1.6–2.0 mm, 2.45 times as long as wide, body color black.

Frons convex, with a variable Y-shaped impression beginning above upper level of eyes, branching above epistoma and continuing to margins of antennal insertions; surface coarsely reticulate above upper level of eyes, coarsely, shallowly, closely punctured below; pubescence consisting of inconspicuous, fine, sparse hair of medium length. Eye elongate-ovate, wider above, about 2.2 times as long as wide, finely granulate; entire or with two or three facets missing, suggesting an emargination. Antennal club longer than scape, about 1.69 times as long as wide, with three straight sutures indicated by rows of setae.

Pronotum 0.94 times as long as wide; anterior margin slightly produced, with four to eight contiguous or subcontiguous teeth, lateral ones reduced in size; summit slightly behind middle; asperate in front of summit, asperities rather large, abundant; posterior and

lateral areas shining, punctures rather close, coarse, rather deep; pubescence consisting of rather short, fine, erect hair, slightly longer in asperate area.

Elytra shining; striae not impressed, punctures rather coarse and deeply impressed on anterior two-thirds of disc, usually becoming smaller and shallow near declivity; interstriae (anteriorly) about as wide as striae, becoming subcrenulate at base, punctures fine, shallow, confused, rather abundant, subgranulate anteriorly. Declivity rather steep, convex; striae weakly impressed, punctures reduced; interstriae each with a uniseriate row of small, rather widely spaced granules. Elytral vestiture on disc and sides consisting of rather abundant, short, hairlike strial and interstrial setae and uniseriate rows of longer hairlike bristles; on declivity both short and long setae become stout and more nearly scalelike.

MALE.— Similar to the female.

DISTRIBUTION.— Alaska and Utah to Newfoundland and Nova Scotia.

ALASKA: 33 km (21 miles) E Cantwell, 30-VIII-67, Hopk. US 48895, M. M. Furniss; Kongakut River, Brooke Range (69° 15′ N, 141° 45′ W), 26-VIII-74, M. M. Furniss. CANADA: **Newfoundland**: Fort Blandford, IV-25, *Alnus*. **Nova Scotia**: Weymouth, No. 172, *A. incana*. **Quebec**: Laniel, 27-VIII-35, *Salix*, H. S. Fleming. **Yukon Territory**: Mile 105 Dawson Road, 28-VI-60, *Salix*; North Fork Pass, Ogilvie Mts., 19-VI-62, 4300 ft., R. E. Leech. USA: **Colorado**: Gould, 12-VI-28, *Salix*, S. L. Wood. **Idaho**: Coeur d'Alene, 8-XII-15, *Alnus*, J. C. Evenden, and 5-IV-29, H. J. Rust; Poison Creek, 20 miles SW Grandview, 31-VII-67, M. M. Furniss. **Minnesota**: Ely, Lake Co., 10-IX-36, *A. crispa*, H. R. Dodge. **Utah**: Alta, 30-VI, E. A. Schwarz; Logan Canyon, 17-VII-46, 7000 ft, S. *scouleriana*, S. L. Wood.

HOSTS.— *Alnus crispa*, *A. rugosa*, *Salix scouleriana*, *S.* sp.

BIOLOGY.— As described for the genus. Unthrifty, mature limbs of living trees are selected for attack. The attack is progressive and may continue for several generations on the same limb, ultimately resulting in its death.

NOTES.— The above treatment was based on the lectotype of *nitidus*, the holotype of *punctipennis*, and on 115 other specimens.

There are no specimens in the Mannerheim Collection under this name, nor are there American specimens of this or a related genus among the undetermined material. In view of the fact that the only Cryphalini in the impoverished northern fauna with distributions reaching to or near Kenai are *nitidus* and *Cryphalus ruficollis* Hopkins, and, considering Mannerheim's knowledge of the European fauna and his comparison of *striatulus* to *Trypophloeus granulatus* (Ratzeburg) rather than to *Cryphalus asperatus* (Gyllenhal), it is reasonably certain that *striatulus* and *nitidus* are the same species. The type specimen of *striatulus* was taken at Lake Skeljamma, Kenai Peninsula, Alaska, in mid-June, in flight, by D. F. Frankenhauser. My series from Cantwell, Alaska, 200 miles north of the type locality, is entirely typical of the species.

### 2. *Trypophloeus salicis* Hopkins

Fig. 194

*Trypophloeus salicis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:36 (Holotype, female; Del Monte, California; U.S. Nat. Mus., 7395)

*Trypophloeus concentralis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:36 (Holotype, male; Easton, Washington; U.S. Nat. Mus., 7398); Wood, 1954, Univ. Kansas Sci. Bull. 36:991. *Synonymy*

DIAGNOSIS.— This species is distinguished from *striatulus* (Mannerheim) by the scalelike pubescence of the elytra covering the posterior one-half, including part of the disc, by having the strial punctures coarse and impressed on less than the anterior one-third of the elytra, and by having the punctures on the posterolateral areas of the pronotum smaller and shallow.

FEMALE.— Length 1.5–1.7 mm, 2.5 times as long as wide, body color dark brown.

Frons flattened on a rather broad area, subconcave in some Washington specimens; rather weakly impressed above epistoma, with a short median prominence reaching epistoma; surface coarsely, closely, shallowly punctured at sides and above, indistinctly punctured toward center; pubescence consisting of inconspicuous, fine, sparse hair of medium length. Eye elongate-ovate, wider above, about 2.2 times as long as wide; finely granulate; entire or with two or three facets missing, suggesting an emargination. Antennal club longer than scape, about 1.70 times as long as wide, with three straight sutures indicated by rows of setae.

Pronotum 0.92 times as long as wide; anterior margin very slightly produced, with six subcontiguous teeth (rarely an additional pair of granules), lateral pair reduced in size; summit slightly behind middle; asperate in front

of summit, asperities rather large, abundant; posterior and lateral areas usually reticulate, and with small, rather close, shallow punctures; pubescence consisting of rather short, fine, erect hair, slightly longer in asperate area.

Elytra shining; striae not impressed, punctures rather coarse and quite deep on basal fourth of disc, less than half as large on posterior three-fourths; interstriae on basal fourth only slightly wider than striae, much wider posteriorly, usually subcrenulate toward base, punctures about as large as those of striae on posterior three-fourths of disc, confused; a uniseriate row of widely spaced, fine granules on each interstriae, each granule bearing an interstrial bristle. Declivity moderately steep, with a broad, shallow impression between interstriae 1 and 4; striae obscure; interstriae each with a row of fine granules, posterior extremity of 4 slightly elevated and bearing one to four larger, sharply pointed, toothlike granules. Elytral vestiture consisting of numerous, short, semirecumbent strial and interstrial setae and uniseriate rows of longer, erect bristles; both types of setae hairlike on anterior half of elytra, scalelike on posterior half, particularly on declivity.

MALE.— Similar to female.

DISTRIBUTION.— Washington to California.

USA: **California**: Belmont; Del Monte, 4-IX-02, Hopk. US 1092, *Salix*, A. D. Hopkins; Cotati, 17-V-49, C. Calkins. **Oregon**: Portland, 12-VII-40, *Salix*, J. Schuh. **Washington**: Easton, A. Koebele; Ft. Flagler, 19-XII-41, *Alnus*, T. O. Thatcher.

HOSTS.— *Alnus* sp., *Salix* sp.

BIOLOGY.— As in *striatulus*.

NOTES.— The above treatment was based on the holotypes of *salicis* and *concentralis* and on seven other specimens.

### 3. *Trypophloeus populi* Hopkins
Figs. 191, 193, 194

*Trypophloeus populi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:37 (Holotype, female; Williams, Arizona; U.S. Nat. Mus., 7397)

DIAGNOSIS.— This species differs from the very closely allied *thatcheri* Wood by the absence of small slender teeth at the end of interstriae 4, by the wider, apically rounded elytral scales, and by the more evenly convex frons.

FEMALE.— Length 1.7–2.1 mm, 2.3 times as long as wide, body color black.

Frons variable, flattened or weakly convex, rather weakly impressed above epistoma, occasionally with a more or less distinct median impression or elevation; surface coarsely reticulate above eyes, closely, coarsely, rather deeply punctured below; pubescence consisting of inconspicuous, fine, sparse hair of medium length. Eye elongate-ovate, wider above, twice as long as wide; finely granulate; entire or with two or three facets missing, suggesting an emargination. Antennal club longer than scape, about 1.87 times as long as wide, with three straight sutures indicated by rows of setae.

Pronotum 0.88 times as long as wide; anterior margin slightly produced, with four rather large, subcontiguous teeth, median pair larger, often with two additional smaller lateral granules; summit slightly behind middle; asperate in front of summit, asperities rather large, abundant; posterior and lateral areas shining, punctures rather close, coarse, quite deep; pubescence consisting of rather short, fine, semierect hair, some of these setae stout and almost scalelike on basal portion.

Elytra shining; striae not impressed, punctures reduced in size, shallow, usually obscure; interstriae with numerous, fine, confused, shallow punctures about equal in size to those of striae; usually bearing a uniseriate row of widely spaced, fine granules, each granule bearing an interstrial bristle. Declivity rather steep, convex except for a slight impression between interstriae 1 and 4; striae usually obscure; interstriae each with a row of fine granules, posterior extremity of 4 very slightly elevated, granules scarcely larger than on other interstriae. Elytral vestiture consisting of numerous short, semirecumbent, interstrial scalelike setae; and uniseriate rows of rather widely spaced, scalelike bristles, each bristle about two times as long as shorter scales, both types of setae covering elytra from base to posterior margin.

MALE.— Similar to female.

DISTRIBUTION.— E Nevada and N Arizona to Saskatchewan and New Brunswick.

CANADA: **Manitoba**: Aweme. **New Brunswick**: Fredericton, IX-52, aspen, G. W. Barter. **Saskatchewan**: Indian Head, 9-VII-43, 29-VI-42, aspen. USA: **Arizona**: Williams, *Populus tremuloides*, H. S. Barber, E. A. Schwarz. **Colorado**: Bellvue, 10-X-51, *P. acuminata*, T.

O. Thatcher. Idaho: South Mountain, 3-IX-58, *P. tremuloides*, M. M. Furniss. Nevada: Baker, 5-VI-39, *P. trichocarpa*, T. O. Thatcher. Utah: Logan, 5-VIII-52, *P. angustifolia*, S. L. Wood; Logan Dry Canyon, 29-VII-46, *P. tremuloides*, S. L. Wood; Provo Canyon, 20-IX-73, *P. tremuloides*, S. L. Wood.

HOSTS.— *Populus acuminata, P. angustifolia, P. tremuloides, P. trichocarpa.*

BIOLOGY.— The smooth green bark of limbs or bole of standing, dying trees is selected for attack; less commonly broken limbs are utilized. The parental galleries are immediately below the outer surface of the bark; larval mines penetrate more deeply into the thick bark. The attack of this species precedes that of *Procryphalus mucronatus* (LeConte) and usually subsides before the tree appears to be unthrifty (Petty 1977). The attack appears to be primary, and there are unproven indications of disease transmission by this species.

NOTES.— The above treatment was based on the holotype and on 189 other specimens.

### 4. *Trypophloeus thatcheri* (Wood), n. comb.

*Cryphalus thatcheri* Wood, 1954, Univ. Kansas Sci. Bull. 36(2):994 (Holotype, female; 2 miles NW Blue Lake, Lassen Co., California; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *populi* Hopkins by the presence of a row of one to five small slender teeth at the posterior end of interstriae 4, each tooth at least twice as long as its basal width; by the short, abundant acuminate elytral scales, and by the usually subconcavely impressed frons.

FEMALE.— Length 1.5–1.9 mm, 2.26 times as long as wide, body color black.

Head and pronotum as in *populi.*

Elytra shining; striae not impressed, punctures reduced in size, shallow, usually obscure; interstriae with numerous, fine, confused, shallow punctures about equal in size to those of striae, each usually bearing a single uniseriate row of widely spaced, fine granules, each granule bearing an interstrial bristle. Declivity rather steep; convex except for a broad, indistinct impression between interstriae 1 and 4; striae usually obscure; interstriae each with a row of small granules; posterior extremity of interstriae 4 slightly elevated and bearing a row of one to five small, slender, sharply pointed, toothlike granules, each tooth at least twice as long as its basal width. Elytral vestiture consisting of numerous short, semirecumbent, scalelike, interstrial setae, each scale more or less acuminate, and uniseriate rows of rather widely spaced, scalelike bristles, each with an interstrial granule at its base, each bristle about two to three times as long as shorter scales, both types becoming more nearly hairlike near elytral base.

MALE.— Similar to female; average size of male may be slightly smaller. Because of difficulty of determining sex and small number of specimens at hand, this observation not fully verified.

DISTRIBUTION.— British Columbia to California.

CANADA: **British Columbia**: Douglas Lake, 28-VIII-61, *Populus trichocarpa*, J. Grant; Squilax, 8-1-62, *P. trichocarpa*, J. Grant. USA: **California**: 2 miles NW Blue Lake, Lassen Co., 19-VII-47, *Populus tremuloides*, T. O. Thatcher; Warner Mts., Modoc Co., 10-VII-10; Sonora Pass, 4-VIII, J. N. Knull; Pasadena.

HOST.— *Populus tremuloides, P. trichocarpa.*

BIOLOGY.— As in *populi.*

NOTES.— The above treatment was based on the type series of 61 specimens and on 14 other specimens.

## GENUS *STEGOMERUS* WOOD

*Stegomerus* Wood, 1967, Great Basin Nat. 27:129 (Type-species: *Stegomerus vulgaris* Wood, original designation)

DIAGNOSIS.— This genus is distinguished from the allied *Ernoporus* Thomson by the 5-segmented antennal funicle, and by the emarginate eye.

DESCRIPTION.— Length 0.9–2.1 mm, 2.5–2.6 times as long as wide; sexes similar, frons slightly impressed in males of some species; frons simple. Eye elongate, finely granulate, broadly emarginate. Antennal scape short; funicle 5-segmented; club large, strongly flattened, with three aseptate, procurved sutures. Pronotum with summit conspicuous, anterior slope asperate, anterior margin armed, basal and lateral margins rounded not marked by a raised line. Elytra elongate, costal margins feebly elevated toward apex. Tibiae gradually widened from base, obliquely narrowed toward apex; lateral margins armed by several small teeth; tarsal segments narrow, laterally compressed.

DISTRIBUTION.— Mexico to Venezuela; six species, one of which occurs in South America.

BIOLOGY.— These monogamous beetles breed in recently cut and dying vines and lianas larger than 1 cm in diameter. The parental tunnels are constructed in the cambium region in an H-shaped pattern, with longitudinal egg galleries; the entrance tunnel is on the transverse connecting portion of the system. Larval mines are longitudinal.

Key to the Species of *Stegomerus*
(Modified from Wood 1967)

1. Interstrial scales and hair in uniseriate rows on disc and declivity; striae clearly evident; Nayarit to Costa Rica; *Canavalia*, etc.; 0.9–1.2 mm ..... 1. ***pygmaeus*** **Wood**
— Elytral vestiture and punctures abundant, confused on declivity; usually larger than 1.4 mm ..... 2

2(1). Setae on basal half of elytral interstriae 9 and 10 consisting of fine, long hair; suture 2 on antennal club much more strongly procurved than suture 1; scales on elytral disc almost in uniseriate rows ..... 3
— Setae on basal half of elytral interstriae 9 and 10 primarily scalelike, short; sutures 1 and 2 on antennal club equally, weakly procurved; scales on elytral disc abundant, confused ..... 4

3(2). Smaller, 1.3–1.6 mm; scales on declivital interstriae 2 and 3 mostly uniseriate; punctures of striae and interstriae somewhat smaller, essentially in rows; Panama; *Canavalia*; 1.3–1.6 mm ..... 2. ***chriquensis*** **Wood**
— Larger, 1.8–2.1 mm; scales on all declivital interstriae strongly confused; punctures of striae and interstriae coarser, completely confused; Costa Rica; *Muelenbeckia*; 1.8–2.1 mm ..... 3. ***montanus*** **Wood**

4(2). Scales on at least some of discal interstriae between 3 and 9 in uniseriate rows; declivital scales broad, usually less than twice as long as wide, apex of each scale truncate; Michoacán to Puebla; *Serjania*; 1.4–1.7 mm ..... 4. ***mexicanus*** **Wood**
— Scales on discal interstriae multiple, confused; declivital scales more than twice as long as wide, apex of each scale rounded; Guatemala to Costa Rica; *Serjania*; 1.7–2.0 mm ..... 5. ***vulgaris*** **Wood**

### 1. *Stegomerus pygmaeus* Wood

*Stegomerus pygmaeus* Wood, 1967, Great Basin Nat. 27:130 (Holotype, male; Los Corchos, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— As indicated in the key, this species is distinguished from others in the genus by its small size and by the uniseriate strial and interstrial punctures, with the elytral scales and hair in rows.

MALE.— Length 0.9–1.2 mm, 2.5 times as long as wide; color dark brown, summit of pronotum and elytra somewhat lighter.

Frons narrow, convex above, flat below, epistomal margin and its obtuse, median lobe slightly elevated; surface reticulate above, subreticulate below, and finely, sparsely punctured; vestiture on flattened area moderately abundant, consisting of fine, rather long hair. Eye elongate, about three times as long as wide; shallowly, broadly emarginate, rather finely faceted. Antennal scape shorter than the 5-segmented funicle; club marked by three equally, slightly procurved sutures.

Pronotum 1.0 times as long as wide; widest one-third of length from base, sides weakly arcuate, broadly rounded in front; armature on anterior margin poorly developed; summit at middle, prominent; anterior area rather

coarsely asperate; posterior and lateral areas almost smooth and shining, with small, rounded, isolated granules; vestiture consisting of hairlike setae over entire surface, with erect scales intermixed on posterior half.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on more than posterior two-thirds, rather broadly rounded behind; striae 1 feebly, others not impressed, punctures small, shallow; interstriae slightly wider than striae, punctures fine, uniseriate. Declivity moderately steep, convex; similar to disc except strial and interstrial punctures smaller and somewhat obscure. Vestiture consisting of uniseriate rows of short, semirecumbent strial hair and erect interstrial scales, each scale about three times as long as wide.

FEMALE.— Similar to male except lower half of frons more nearly convex.

DISTRIBUTION.— Nayarit to Costa Rica.

MEXICO: Jalisco: La Huerta, 1-VII-65, 500 m, No. 172, *Canavalia*. Nayarit: Los Corchos, 10-VII-65, 20 m, No. 210, *Canavalia villosa*. HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 560 from *Dioclea megacarpa*, No. 537 from *Canavalia villosa*; La Lima, 5-V-65, No. 581, *Cestrum scandens*. COSTA RICA: San José, San José, 22-X-63, 1600 m, No. 257, *Canavalia villosa*. All were taken by me.

HOSTS.— *Canavalia villosa*, *Cestrum scandens*, and *Dioclea megacarpa*.

BIOLOGY.— Presumably as described for the genus; the stem structure of the host and the small size of the beetle made observation difficult.

NOTES.— The above treatment was based on the type series of 49 specimens and on 61 other specimens.

### 2. *Stegomerus chiriquensis* Wood

*Stegomerus chiriquensis* Wood, 1967, Great Basin Nat. 27:131 (Holotype, male; Cerro Punta, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— As indicated in the key, this species is allied to *montanus*, but it is distinguished by the smaller size and by the different arrangement of elytral punctures and scales.

MALE.— Length 1.3–1.6 mm, 2.6 times as long as wide; color light brown, a few specimens much darker.

Frons convex above, rather strongly, transversely impressed near middle, flattened below; a median epistomal lobe present; surface reticulate, with moderately abundant, fine, obscure punctures; vestiture fine, rather sparse. Eye elongate, about three times as long as wide; broadly, rather deeply emarginate; rather coarsely faceted. Antennal scape shorter than 5-segmented funicle; club large, longer than combined length of scape and funicle, three procurved sutures subangulate at middle, suture 1 partly septate.

Pronotum as in *pygmaeus*, except anterior margin armed by a series of about six small teeth.

Elytra 1.6 times as long as wide, 1.7 times as long as pronotum; punctures of striae and interstriae very close, moderately large and deep, in obscure rows. Declivity rather steep, convex; strial punctures slightly smaller and interstrial punctures much smaller on disc, shallow, in rows. Vestiture consisting of uniseriate rows of short, fine, recumbent strial hair and longer, erect interstrial scales, each scale four or five times as long as wide; sutural margin on declivity with an additional row of shorter scales; an occasional scale on declivity not in rows.

FEMALE.— Similar to male except transverse frontal impression obscure or absent.

DISTRIBUTION.— Panama.

PANAMA: Cerro Punta, Chiriquí, 11-I-64, No. 495, *Canavalia villosa*, S. L. Wood.

BIOLOGY.— Essentially as described for the genus.

NOTES.— The above treatment was based on the type series of 51 specimens.

### 3. *Stegomerus montanus* Wood

*Stegomerus montanus* Wood, 1967, Great Basin Nat. 27:132 (Holotype, male; Volcán Irazu, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— As indicated in the above key, this species is distinguished from the closely allied *chiriquensis* Wood by the larger size and by the different arrangement of elytral setae.

MALE.— Length 1.8–2.1 mm, 2.6 times as long as wide; color dull black or grayish black, with elytra and summit of pronotum having a reddish cast.

Frons, eyes, and antenna as in *chiriquensis*.

Pronotum 1.0 times as long as wide; widest on basal fourth, sides very feebly arcuate and converging slightly toward rather narrowly rounded anterior margin; summit at middle,

impressed behind; surface and vestiture about as in *chiriquensis*.

Elytra 1.5 times as long as wide, 1.7 times as long as pronotum; disc densely, deeply, rather finely punctured, punctures separated by distances less than half width of a puncture, confused. Declivity rather steep, convex; striae and interstriae not distinguishable, punctures obscure. Vestiture consisting of rows of minute strial hair between confused rows of slender scales; setae on interstriae 9 and 10 from base to declivity consisting of fine hair only.

FEMALE.— Similar to male except frons flattened, not transversely impressed.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Irazu, Cartago, 28-VI-63, 2800 m, No. 5, *Muelenbeckia tamnifolia*, S. L. Wood; Villa Mills on Cerro de la Muerte, Cartago, 1-VIII-66, 3000 m, *M. tamnifolia*, S. L. Wood.

HOST.— *Muelenbeckia tamnifolia*.

BIOLOGY.— The above description of habits for the genus was based largely on this species. Larvae usually mine the phloem tissues; young adults commonly tunnel into deeper tissues.

NOTES.— The above treatment was based on the type series of 31 specimens.

### 4. *Stegomerus mexicanus* Wood

*Stegomerus mexicanus* Wood, 1967, Great Basin Nat. 27:133 (Holotype, male; 21 km W Morelia, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *vulgaris* Wood by the shape and arrangement of the elytral scales, as indicated in the above key.

MALE.— Length 1.4–1.7 mm, 2.5 times as long as wide; color rather light brown, some specimens dull black, with light vestiture.

Frons, eye, antennal scape, and funicle as in *chiriquensis*; antennal club larger, 1.3 times as long as wide, with three equally, weakly procurved sutures indicated.

Pronotum as in *chiriquensis*, but narrowly rounded in front; anterior margin armed by four large teeth.

Elytra 1.5 times as long as wide, 1.7 times as long as pronotum; sides straight and parallel on basal three-fourths, broadly rounded behind; disc with shallow, confused, close, indefinite punctures. Declivity rather steep, convex; surface as on disc except punctures evidently very feebly granulate. Vestiture consisting of uniseriate rows of fine strial hair and confused rows of erect interstrial scales, at least some of rows between interstriae 4 and 9 uniseriate; each scale about three to four times as long as wide.

FEMALE.— Similar to male except frons not as strongly flattened.

DISTRIBUTION.— Michoacán to Puebla.

MEXICO: **Michoacán**: 21 km W Morelia, 15-VI-65, 2300 m, No. 59, *Serjania*, S. L. Wood. **Puebla**: 11 km S Atlixco, 13-VII-53, No. 102, S. L. Wood.

HOST.— *Serjania* sp.

BIOLOGY.— Essentially as described for the genus. It breeds in stems less than 1 cm in diameter.

NOTES.— The above treatment was based on the type series of 53 specimens and on one other specimen.

### 5. *Stegomerus vulgaris* Wood

*Stegomerus vulgaris* Wood, 1967, Great Basin Nat. 27:134 (Holotype, male; Volcán Zunil, Quezaltenango, Guatemala; Wood Coll.)

DIAGNOSIS.— In the above key this species is placed near *mexicanus* Wood; it is distinguished by the shape and arrangement of the elytral scales.

MALE.— Length 1.7–2.0 mm, 2.6 times as long as wide; color light brown, some specimens with areas almost dull black.

Frons weakly convex, slightly impressed just above epistoma; premandibular epistomal process evident, projecting very slightly as a median epistomal lobe; surface coarsely reticulate, with moderately large, indefinite, isolated granules in central area, reduced in marginal areas. Eye three times as long as wide; coarsely faceted; about one-fourth divided by a broad emargination. Antennal scape and 5-segmented funicle short, subequal in length, their combined length distinctly less than length of club; club subcircular, 1.1 times as long as wide, divided into four subequal segments by three broadly procurved sutures, suture 1 partly septate at both ends.

Pronotum 1.0 times as long as wide; widest one-third of length from base; basal angles rounded, sides rather strongly, arcuately converging toward narrowly rounded anterior margin; anterior margin armed by about six teeth; oval area on anterior slope coarsely

asperate; summit elevated, near middle; posterior areas subreticulate-granulate, with moderately large, rather close, rounded granules; vestiture hairlike, except mixed with scales on basal fourth.

Elytra 1.7 times as long as wide, 1.8 times as long as pronotum; scutellum rather large, triangular, flat; sides straight and parallel on basal three-fourths, somewhat narrowly rounded behind; disc closely, obscurely punctured, punctures shallow, confused. Declivity rather steep, convex; striae 1 and 2 obscurely indicated (largely by color), otherwise similar to disc. Vestiture consisting of small, obscure, uniseriate rows of strial hair and abundant, confused, erect interstrial scales, each scale about four times as long as wide.

FEMALE.— Similar to male except frons very slightly, more strongly convex.

DISTRIBUTION.— Guatemala to Costa Rica.

GUATEMALA: Volcán Zunil, Quezaltenango, 27-V-64, 1000 m, No. 630, liana; Palín, Esquintla, 19-V-64, 350 m, No.682, *Serjania*. HONDURAS: San Lucas, Paraíso, 22-IV-64, 800 m, No. 523A, *S. mexicana*; Zamorano, Morazán, 18-IV-64, 700 m, No. 507, *S. triquetra*. COSTA RICA: San José, San José, 22-X-63, 1300 m, No. 168, evidently *Serjania*. All were taken by me.

HOSTS.— *Serjania mexicana*, *S. triquetra*, S. sp.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 132 specimens.

## GENUS *ERNOPORICUS* BERGER

*Ernoporicus* Berger, 1917, Rev. Russe Ent. 16:242 (Type-species: *Ernoporicus spessivtzevi* Berger, monobasic)

*Ernpocerus* Balachowsky, 1949, Faune de France 50:211 (Type-species: *Ernoporus caucasicus* Lindemann, designated by Wood, 1954, Univ. Kansas Sci. Bull. 36(2):986). *New synonymy*

DIAGNOSIS.— This genus is distinguished from *Procryphalus* Hopkins by the procurved, nonseptate sutures of the antennal club; there is an indistinct basal raised line on the pronotum. A conspicuous biological difference also exists.

DESCRIPTION.— Length 1.65 mm, about 2.6 times as long as wide; color dark brown (only American species considered); sexual differences obscure. Frons broadly convex, conservatively sculptured. Eye elongate-oval, entire but weakly sinuate; finely granulate. Antennal funicle 4-segmented; club large, broad, with three procurved sutures indicated by rows of setae, none of them septate. Pronotum with lateral margins rounded, basal raised line obscurely indicated; summit well developed, anterior slope asperate, anterior margin armed. Elytra elongate, weakly striate, conservatively sculptured. Vestiture largely scalelike. Third tarsal segments cylindrical.

DISTRIBUTION.— E United States (one species); Europe and Asia (about four species).

BIOLOGY.— The European species attack cut, broken, or unthrifty branches of *Tilia*, *Fagus* and, rarely, other tree genera, where they construct biramose, transverse parental galleries in the cambium region.

NOTES.— Schedl (1962:92–94) grouped several genera with *Ernoporus*. His action appears to have been premature but requires further study (Wood 1972:42).

### *Ernoporicus kanawhae* Hopkins

*Ernoporus kanawhae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:35 (Holotype, male; Kanawha Station, West Virginia; U.S. Nat. Mus., 7393); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):987 (description)

DIAGNOSIS.— This species is known only from the type specimen; it is closely allied to, but distinct from, *caucasicus* Lindemann of Europe.

MALE.— Length 1.65 mm, about 2.6 times as long as wide; color dark brown.

Frons convex, finely granulate; pubescence consisting of rather short, moderately abundant hair. Eye sinuate on anterior margin; finely granulate. Antennal club large, subcircular in outline, with three strongly procurved sutures indicated by rows of setae; not septate.

Pronotum rather narrowly rounded in front, armed by four small marginal teeth; summit near middle; anterior slope with numerous rather coarse asperities; posterior area with widely spaced granulate punctures, surface shining, although not entirely smooth; pubescence hairlike in asperate area, short scales behind.

Elytra shining; striae not impressed, punctures very small, distinct, not deep, spaced by about twice their own diameters, spacing irregular; interstriae four times as wide as the striae, punctures rather coarse, shallow,

confused, obscurely subgranulate. Declivity rather steep, convex; striae obsolete. Elytral vestiture consisting of short, rather narrow, abundant, scalelike setae and uniseriate rows of rather widely spaced, scalelike, interstrial bristles, each bristle about one and one-half times as long as wide and about one and one-half times as long as shorter, more abundant, interstrial scales.

DISTRIBUTION.— West Virginia.

USA: West Virginia: Kanawha Station, 15-IV-91, in flight, A. D. Hopkins.

NOTES.— The above treatment was based on the holotype; it is a male, not a female as stated in the original description.

## GENUS *PROCRYPHALUS* HOPKINS

*Procryphalus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:33 (Type-species: *Procryphalus populi* Hopkins = *Cryphalus mucronatus* LeConte, original designation)

DIAGNOSIS.— This genus is distinguished from other American Cryphalini by the absence of a distinct, raised line on the basal and lateral margins of the pronotum, by the septate suture 1 of the antenanl club, and by the weakly ascending costal margin of the elytra near the apex.

DESCRIPTION.— Length 1.5–2.2 mm, 2.5–2.8 times as long as wide; color almost black with pale vestiture; sexes similar. Frons broadly convex, conservatively sculptured. Eye elongate-oval, entire; finely granulate. Antennal funicle 4-segmented; the club elongate-oval, weakly constricted at sutures, sutures indicated by rows of setae, 1 septate. Pronotum about equal in length and width; basal and lateral margins rounded, without a raised line; summit in front of middle, anterior slope asperate; anterior margin produced medially and armed by several teeth. Elytra elongate, striate, sculpture conservative; costal margin feebly ascending posteriorly. Vestiture mostly scalelike. Third tarsal segments cylindrical.

DISTRIBUTION.— N North America and NE Asia; three species, one of which occurs in northeastern Asia.

BIOLOGY.— Essentially as described for *Trypophloeus*.

### Key to the Species of *Procryphalus*
(Adapted from Wood 1954:982)

1. Smaller; frons rather sparsely, shallowly punctured; interstriae more sparsely, finely punctured on posterior three-fourths of disc; Alaska and California to Quebec; *Salix*; 1.5–1.7 mm ..... 1. ***utahensis*** **Hopkins**

– Larger; frons coarsely, rather deeply punctured; interstriae densely, rather coarsely granulate-punctate over entire disc; Alaska to Colorado and New Mexico; *Populus tremuloides*; 1.8–2.2 mm ..... 2. ***mucronatus*** **(LeConte)**

### 1. *Procryphalus utahensis* Hopkins
Figs. 191, 193, 194

*Procryphalus utahensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:33 (Holotype, female; Alta, Utah; U.S. Nat. Mus., 7391)

*Procryphalus salicis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:33 (Holotype, female; Black Hills, South Dakota; U.S. Nat. Mus., 7390); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):983. *Synonymy*

*Procryphalus aceris* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:33 (Holotype, female; Albany, Oregon; U.S. Nat. Mus., 7389); Wood, 1975, Great Basin Nat. 35:22. *Synonymy*

DIAGNOSIS.— In addition to characters summarized in the above key, this species is distinguished from others in the genus by the presence of eight teeth (normally) on the anterior margin of the pronotum, and by the more coarsely granulate-punctate anterior one-sixth of the elytral interstriae in comparison to the posterior area.

FEMALE.— Length 1.5–1.7 mm, 2.7 times as long as wide, body color dark brown to black.

Frons weakly convex, moderately, shallowly punctured, weakly impressed above epistoma, an indistinct median ridge extending from upper level of eyes to epistomal margin; pubescence consisting of inconspicuous, sparse, fine, long hair. Eye elongate-oval, slightly wider above, about three times as long as wide, entire. Antennal club longer than scape, about 1.60 times as long as wide, with three straight sutures on anterior face, suture 1 septate.

Pronotum about as long as wide, rather strongly produced on anteromedian margin, and armed by eight teeth, two lateral pairs smaller and more widely spaced, often submarginal; summit anterior to middle; asperate in front of and lateral to summit, asperities rather small, abundant; posterior and lateral areas rugose, sparsely, coarsely granulate-punctate; pubescence consisting of moderately long, hairlike setae on asperate area, and rather short, narrow, scalelike setae on granulate-punctate area.

Elytra shining; striae not impressed, punctures of moderate size and depth, usually separated by distances greater than their own diameters (irregular); interstriae as wide or wider than striae, their surface finely, not closely granulate-punctate, rather coarsely granulate near elytral base. Declivity steep, convex; strial and interstrial punctures reduced in size, and not as deep as on disc. Elytral vestiture consisting of abundant, short, confused, semirecumbent, interstrial, scalelike setae and longer, rather sparse, uniseriate rows of scalelike bristles.

MALE.— Similar to female.

DISTRIBUTION.— Alaska and California to Quebec.

ALASKA: Bonanza Creek, 20 miles E Fairbanks, 6-IX-77, pheromone trap, T. Egan. CANADA: **British Columbia**: Copper Mountain. **Quebec**: Laniel. USA: **California**: Ft. Bidwell in Modoc Co., Soquel Basin in Madera Co. **Colorado**: Ft. Collins. **Idaho**: Minadoka N.F. **Oregon**: Albany, Dixie Pass. **South Dakota**: Black Hills. **Utah**: Alta, Logan Canyon.

HOSTS.— *Salix scouleriana*, S. sp.

BIOLOGY.— Very similar to *Trypophloeus striatulus*.

NOTES.— The above treatment was based on the holotypes of *utahensis*, *salicis*, and *aceris*, and on 38 other specimens.

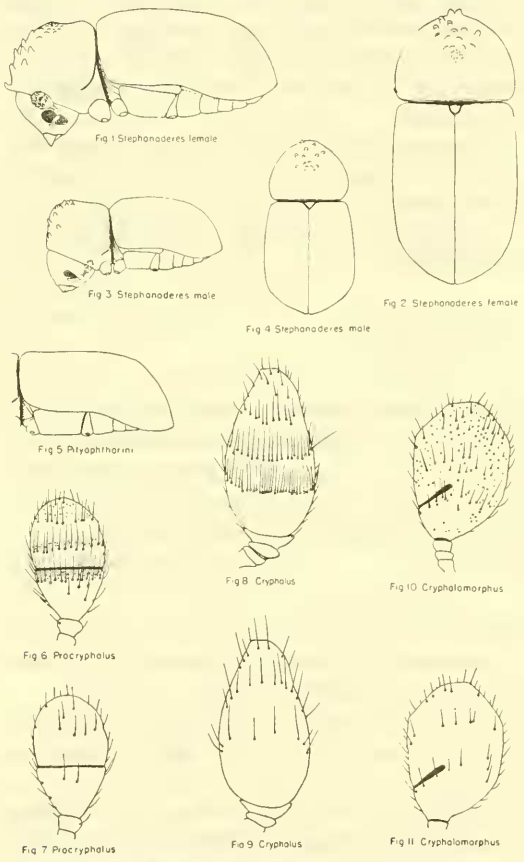



Fig. 191. Cryphalini tribal and generic characters: 1, 2, *Hypothenemus dissimilis*, female (note exposed metepisternum and ascending abdomen), 3, 4, same, male; 5, *Pseudopityophthorus pubipennis* (note concealed metepisternum and horizontal abdomen); 6, *Procryphalus utahensis*, anterior face of antennal club, 7, same, posterior face; 8, *Trypophloeus* (= *Cryphalus* of authors) *populi*, anterior face of antennal club, 9, same, posterior face; 10, *Scolytogenes* (= *Cryphalomorphus*) *knabi*, anterior face of antennal club, 11, same, posterior face. (Wood 1954:1079.)

## 2. *Procryphalus mucronatus* (LeConte)

Fig. 194

*Cryphalus mucronatus* LeConte, 1879, U.S. Dept. Int. Geol. Geogr. Survey Bull. 5:518 (Holotype, female; La Veta Pass, Colorado; Mus. Comp. Zool.)

*Procryphalus mucronatus*: Hopkins, 1915, U.S. Dept. Agric. Rept. 99:33

*Procryphalus idahoensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:34 (Holotype, female; Beaver Canyon, Idaho; U.S. Nat. Mus., 7392); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):985. *Synonymy*

*Procryphalus pouli* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:34 (Holotype, female; Tercio, Colorado; U.S. Nat. Mus., 7393); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):985. *Synonymy*

DIAGNOSIS.— This species is distinguished from *utahensis* Hopkins by the larger size, by the more coarsely, closely punctured frons, by the more strongly produced anterior margin of the pronotum, which is armed by only six teeth, and by the more coarsely, closely granulate-punctate interstriae.

FEMALE.— Length 1.8–2.2 mm, 2.54 times as long as wide, body color black.

Frons slightly convex to indistinctly impressed, coarsely, closely, deeply punctured, weakly impressed above epistoma, an indistinct median ridge extending from upper

level of eyes to epistomal margin; pubescence consisting of inconspicuous, sparse, fine, long hair. Eye elongate-oval, slightly wider above, entire. Antennal club longer than scape, about 1.62 times as long as wide, with two straight sutures on the anterior face, suture 1 septate.

Pronotum about as long as wide; strongly produced on anteromedian margin and armed by six teeth, lateral pair much smaller and more widely spaced, located at base of produced area; summit anterior to middle, asperate in front of and to sides of summit, asperities rather small, abundant; posterolateral areas rather coarsely, strongly granulate-punctate. Pubescence consisting of moderately long hairlike setae on asperate area and rather short, narrow, scalelike setae on granulate-punctate area.

Elytra shining; striae not impressed, punctures of moderate size, not always distinct or regularly spaced; interstriae about equal in width to striae, surface coarsely, closely granulate-punctate. Declivity steep, convex; strial and interstrial punctures reduced in size and not as deep as on disc. Elytral vestiture consisting of abundant, short, confused, semirecumbent, interstrial, scalelike setae, and longer, rather sparse, uniseriate rows of scalelike, interstrial bristles.

MALE.— Similar to female.

DISTRIBUTION.— Alaska to E Nevada, Colorado, and New Mexico.

ALASKA: Hope, 1978, pheromone trap, R. A. Werner. CANADA: Bright (1976:112) adds **Alberta** and **British Columbia**. USA: **Colorado**: Camp Creek in Jackson Co., Manitou, Norwood, Ouray, Poudre Canyon in Larimer Co., Ridgeway, Tercio. **Idaho**: Beaver Canyon, Franklin Basin in Franklin Co. **Nevada**: Lehman Creek at Mt. Wheeler. **New Mexico**: Sandia Mts., Sierra Blanca Mt. **Utah**: Logan Canyon, Logan Dry Canyon, Payson Canyon, Provo Canyon.

HOST.— *Populus tremuloides*.

BIOLOGY.— The smooth bark of the bole of large, dying, standing trees is selected for attack. The habits are reviewed by Petty (1977).

NOTES.— The above treatment was based on the holotypes of *mucronatus*, *idahoensis*, and *populi* and on 249 other specimens.

## GENUS *SCOLYTOGENES* EICHHOFF

*Scolytogenes* Eichhoff, 1878, Mem. Soc. Roy. Sci. Liége (2)8:475, 497 (Type-species: *Scolytogenes darwinii* Eichhoff, monobasic)

*Lepicerus* Eichhoff, 1878 (nec Motschulsky, 1855), Mem. Soc. Roy. Sci. Liége, (2)8:476, 501 (Type-species: *Lepicerus aspericollis* Eichhoff, monobasic); Wood, 1980, Great Basin Nat. 40:95. *Synonymy*

*Cryphalomorphus* Schaufuss, 1890, Tijdschr. Ent. 34:12 (preprint 1890, Martinus Nijhoff, Haag) (Type-species: *Cryphalomorphus communis* Schaufuss, monobasic); Schedl, 1940, Mitt. Münchener Ent. Ges. 30(2):583–591. *Synonymy*

*Letznerella* Reitter, 1913, Wiener Ent. Zeit. 32:68 (Type-species: *Bostrichus jalapae* Letzner, monobasic); Schedl, 1940, Mitt. Münchener Ent. Ges. 30(2):583–591. *Synonymy*

*Hypothenoides* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:11 (Type-species: *Hypothenoides parvus* Hopkins, original designation); Schedl, 1954, Philippine J. Sci. 83:138. *Synonymy*

*Ernoporides* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:34 (Type-species: *Ernoporides floridensis* Hopkins = *Ernoporides knabi* Hopkins, original designation); Schedl, 1940, Mitt. Münchener Ent. Ges. 30(2):583–591. *Synonymy*

*Neocryphalus* Eggers, 1922, Ent. Blätt. 18:169 (Type-species: *Neocryphalus usagaricus* Eggers, monobasic); Schedl, 1940, Mitt. Münchner Ent. Ges. 30(2):583–591. *Synonymy*

*Negritus* Eggers, 1923, Ent. Meded. 7:141 (Type-species: *Negritus ater* Eggers, present designation); Schedl, 1957, Ann. Mag. Nat. Hist. (12)10:152. *Synonymy*

*Lepicerinus* Hinton, 1936, Ann. Mag. Nat. Hist. (10)17:472 (Replacement name for *Lepicerus* Eichhoff).

*Cylindrotomicus* Eggers, 1936, Ann. Mag. Nat. Hist. (10)17:633 (Type-species: *Cylindrotomicus squamulosus* Eggers, monobasic); Schedl, 1957, Ann. Mag. Nat. Hist. (12)10:152. *Synonymy*

DIAGNOSIS.— In the American fauna this genus is most closely allied to *Ernoporicus* Berger, but it is distinguished by the absence of sutures on the antennal club except for a septum in the lateral half of suture 1, by the rounded lateral margins of the pronotum on which there is an obscure, fine raised line on the basal third, and by biological characters.

DESCRIPTION.— Length 0.9–1.9 mm, 2.3–2.7 times as long as wide; color dark brown to black, with pale vestiture. Frons broadly convex, conservatively sculptured. Eye elongate, entire to shallowly, very broadly emarginate; finely granulate. Antennal funicle 4-segmented; club moderately large, devoid of sutures except for strongly angulate septum in lateral half of suture 1. Pronotum with a fine raised line on lateral and basal margins; summit at or slightly in front of middle, anterior slope asperate; anterior margin rather broadly rounded, armed.

Elytra elongate, striae distinct or not; sculpture conservative. Vestiture of hair and scales.

BIOLOGY.— These monogamous beetles infest various vines. The parental tunnels evidently consist of an irregular, often branched chamber extending through one or more levels or concentric layers of host tissue. The larval mines are irregular and evidently wander among the fibers of the stem. The heavy infestations of samples examined have made accurate observations impossible.

Key to the Species of *Scolytogenes*

1. Fine strial hair and all interstrial scales in uniseriate rows; pronotal disc with fine, isolated granules in lateral areas as well as behind summit, punctures absent; anterior area of pronotum devoid of marginal or submarginal teeth, asperities confined to upper half of anterior slope; Honduras to Costa Rica; small vines; 0.8–0.9 mm ..... 1. **parvatis Wood**

— Interstrial setae more abundant, many or most not in rows; pronotum with lateral areas of disc punctured, granules usually absent except behind summit; anterior margin or submargin armed by two or more denticles; larger ..... 2

2(1). Strial punctures rather large, deep, almost as wide as interstriae, spaced within a row by average distances equal to less than half diameter of a puncture; pronotal vestiture entirely of hairlike setae (occasional scales on extreme posterior margin in one species) ..... 3

— Strial punctures small, shallow, diameters equal to less than half width of an interstriae, spaced within a row by average distances greater than diameter of a puncture ..... 4

3(2). Anterior margin of pronotum armed by four to eight teeth; declivital striae feebly impressed, interstriae indistinctly convex, interstrial granules small; erect interstrial scales more slender, about eight times as long as wide; Guatemala; liana; 1.4–1.7 mm ..... 2. ***setifer* Wood**

— Anterior margin of pronotum armed by two large marginal teeth; striae on posterior part of disc and on declivity rather strongly impressed, interstriae conspicuously convex, interstrial granules moderately large; erect interstrial scales wider, averaging about four to six times as long as wide; Puebla to Oaxaca; small tree, 1.7–1.9 mm ..... 3. **hirtus Wood**

4(2). Interstrial ground vestiture of disc scalelike, almost as wide as erect bristles in median rows, on declivity almost as wide as long, not tapered; punctures on disc bearing erect interstrial bristles not at all granulate; anterior margin of pronotum regularly armed by two coarse teeth; Jalisco and Guanajuato to Chiapas; small tree; 1.2–1.5 mm ..... 4. ***rusticus* Wood**

— Interstrial ground vestiture on disc slender, almost hairlike, on declivity scalelike, each scale more than twice as long as wide and narrowed toward its apex; punctures on disc bearing erect bristles, very finely granulate; anterior margin of pronotum sometimes irregularly armed by up to eight small teeth ..... 5

5(4). Strial punctures very small and in rows to completely confused with those of interstriae; disc of pronotum shining; erect declivital interstrial scales uniformly shorter, each about three to four times as long as wide; Nayarit and S Florida to Venezuela; vines; 1.1–1.5 mm ..... 5. ***knabi* (Hopkins)**

— Strial punctures distinctly larger than those of interstriae, in definite rows; disc of pronotum at least partly reticulate; erect, declivital interstrial scales less uniform in length, each four to six times as long as wide ..... 6

6(5). Punctures on pronotal disc and discal striae very slightly smaller; strial punctures on declivity only slightly wider than adjacent interstrial granules; interstrial bristles on lateral areas of basal half of disc similar to one another; Puebla to Oaxaca; small tree; 1.3–1.5 mm ..... 6. ***trucis*** **Wood**

— Punctures on pronotal disc and discal striae slightly larger; strial punctures on declivity at least twice as wide as adjacent interstrial granules; interstrial bristles on basal half of interstriae 9 and 10 longer and distinctly more slender than others; Mexico; *Exogonium jalapa*; 1.7–1.8 mm ..... 7. ***jalapae*** **(Letzner)**

### 1. *Scolytogenes parvatis* (Wood)

*Cryphalomorphus parvatis* Wood, 1974, Brigham Young Univ. Sci. Bull. 19(1):17 (Holotype, female; La Lima, Honduras; Wood Coll.)

DIAGNOSIS.— This unique species is characterized by the small size, by the unarmed anterior margin of the pronotum, and by the uniseriate rows of strial hair and interstrial scales. It is much more likely to be confused with species of *Hypothenemus* than with other *Scolytogenes* species.

FEMALE.— Length 0.8 mm, 2.6 times as long as wide; color very dark brown with pale scales.

Frons moderately convex, almost smooth, with rather abundant, very small punctures; vestiture inconspicuous. Eye elongate, very shallowly, broadly emarginate. Antennal scape short; club subcircular, septum poorly developed, almost transverse.

Pronotum 1.0 times as long as wide; widest slightly behind middle, sides moderately arcuate but converging only slightly to anterolateral angles, then rather abruptly converging to form subangulate, broadly rounded anterior margin; anterior margin unarmed; summit distinct, in front of middle; anterior slope rather finely asperate; posterior areas obscurely subreticulate, with rather fine, isolated granules of moderate abundance in lateral and dorsal areas. Vestiture of equally abundant short hair and scales in posterior areas, only hair on anterior half.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two thirds, rather narrowly rounded behind; striae not impressed, punctures uniseriate, small, rather shallow; interstriae as wide as striae, rather smooth, punctures slightly smaller than those of striae, not clearly defined. Declivity narrowly convex, rather steep; punctures slightly smaller than on disc. Vestiture of uniseriate rows of fine, short, recumbent strial hair, and uniseriate rows of erect interstrial scales; each scale about four times as long as wide, widest at its apex, spaced within a row and between rows by distances slightly shorter than length of a scale.

DISTRIBUTION.— Honduras to Costa Rica.

HONDURAS: La Lima, 5-V-64, 100 m, No. 581, *Cestrum scandens*, S. L. Wood. COSTA RICA: Guápiles, Limón, 22-VIII-66, 100 m, No. 106, leguminous vine, S. L. Wood.

HOSTS.— *Cestrum scandens* and a leguminous vine.

BIOLOGY.— Unknown except that it breeds in small vines.

NOTES.— The above treatment was based on the type series of three specimens.

### 2. *Scolytogenes setifer* (Wood)

*Cryphalomorphus setifer* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):18 (Holotype, female; Volcán Pacaya, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *hirtus* Wood by the smaller size, by the presence of four to eight teeth on the anterior margin of the pronotum, by the less strongly impressed striae, and by the more slender interstrial scales.

FEMALE.— Length 1.4–1.7 mm, 2.5 times as long as wide; color very dark brown, with pale vestiture.

Frons broadly convex above, somewhat flattened below, a weak transverse impression just above epistoma; surface strongly reticulate, punctures fine, rather obscure, moderately close; vestiture inconspicuous. Eye entire, not at all sinuate. Antennal scape elongate; club rather large, ovate, suture 1 septate on lateral half, its procurved groove extending to median margin.

Pronotum 1.0 times as long as wide; widest just behind middle, sides weakly arcuate on

posterior two-thirds, broadly rounded in front; anterior margin armed by four to eight small teeth; summit very slightly in front of middle; posterior areas coarsely, very closely punctured. Vestiture of short, stout, abundant hair.

Elytra 1.6 times as long as wide, 1.7 times as long as pronotum; outline as in *parvatus*; striae very feebly impressed, punctures rather coarse, moderately deep; interstriae very slightly wider than striae, smooth, punctures fine, deep, close, strongly confused. Declivity rather narrowly convex, steep; strial punctures slightly smaller, deeper; interstriae each with a uniseriate row of very fine granules. Vestiture of abundant, short ground cover, setae hairlike at base, becoming scalelike on declivity, and rows of erect interstrial bristles; each erect bristle as long as distance between rows and between scales within a row, those on declivity stouter, almost scalelike, about eight times as long as wide.

MALE.— Similar to female except frontal impression slightly deeper.

DISTRIBUTION.— Guatemala.

GUATEMALA: Guatemala City, 30-V-64, 1300 m, No. 641, liana, S. L. Wood; Volcán Pacaya, 1-VI-64, 1300 m, No. 665, liana, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 63 specimens.

### 3. *Scolytogenes hirtus* (Wood)

*Cryphalomorphus hirtus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):18 (Holotype, female; 16 km S Oaxaca, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *setifer* Wood by the larger size, by the presence of only two teeth on the anterior margin of the pronotum, by the more strongly impressed interstriae, and by the stouter interstrial scales.

FEMALE.— Length 1.7–1.9 mm, 2.3 times as long as wide; color dark brown, almost black.

Frons as in *setifer* except transverse impression on lower half much stronger, and punctures much coarser but shallow. Antennal club as in *setifer* but slightly wider. Pronotum as in *setifer* but anterior margin armed by only two teeth and punctures in posterior area not as deep; a few scales sometimes present on posterior margin in front of scutellum.

Elytra 1.4 times as long as wide; sides almost straight and parallel on basal three-fourths, broadly rounded behind; striae moderately impressed on posterior half of disc, punctures rather coarse, deep; interstriae slightly wider than striae, moderately convex toward declivity, punctures on disc small, close, confused, armed near declivity by median rows of small granules. Declivity very broadly convex, steep; sculpture as on posterior part of disc except interstriae slightly narrower, granules much larger. Vestiture of abundant ground cover of short scales and median interstrial rows of erect scales; erect scales little longer than ground cover on basal half of disc, more than twice as long on declivity, each scale almost as long as distance between rows and similarly spaced within a row, each about four to five times as long as wide.

MALE.— Similar to female except transverse frontal impression slightly deeper.

DISTRIBUTION.— Puebla and Oaxaca.

MEXICO: Oaxaca: 16 km S Oaxaca, 6-VII-53, S. L. Wood. Puebla: 6 km S Atlixco, 14-VI-67, 2300 m, No. 31, S. L. Wood. All taken from a small tree with simple leaves and a loosely layered structure of woody tissues in the branches.

NOTES.— The above treatment was based on the type series of eight specimens.

### 4. *Scolytogenes rusticus* (Wood)

*Cryphalomorphus rusticus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):18 (Holotype, female; 33 km N Juchitlan, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— Distinguished from *knabi* (Hopkins) by the two teeth arming anterior margin of the pronotum, by the much wider, scalelike ground vestiture on the anterior half of the elytral disc, and by the absence of interstrial granules on the disc.

FEMALE.— Length 1.2–1.5 mm, 2.6 times as long as wide; color dark brown, almost black.

Frons as in *knabi* except transverse impression much less strongly developed, punctures coarser, deeper. Eye, antenna, and pronotum as in *knabi* except anterior margin of pronotum armed by two coarse teeth and punctures on pronotal disc distinctly larger.

Elytra as in *knabi* except discal interstriae larger, deeper; declivital striae greatly reduced; interstrial ground vestiture at base of elytra of slender scales, each scale as wide as

those in erect rows, on declivity each scale as wide as long; erect scales on declivity slightly longer than in *knabi*.

MALE.— Similar to female in all respects.

DISTRIBUTION.— Jalisco and Guanajuato to Chiapas.

MEXICO: **Chiapas**: 11 km S Teopisca, 23-V-69, D. E. Bright. **Guanajuato**: Lagos, 11-VI-65, 2100 m, No. 44, S. L. Wood. **Jalisco**: 13 km N Juchitlán, 3-VII-65, 1300 m, No. 185, S. L. Wood. **Michoacán**: 11 km SE Tuxpan, 16-VII-53, S. L. Wood. All were taken from the same host as *hirtus*.

BIOLOGY.— Specimens were taken at all layers of the host from recently broken branches.

NOTES.— The above treatment was based on the type series of 27 specimens and on 8 other specimens.

Part of the series from Michoacán is intermediate between this species and *trucis*. The two forms breed in the same host in rather widely separated geographical areas. Perhaps future collecting will make it necessary to recognize them as no more than subspecies.

### 5. *Scolytogenes knabi* (Hopkins)

Figs. 191, 193, 194

*Ernoporides knabi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:34 (Holotype, female; Cordoba, Mexico; U.S. Nat. Mus., 7595)

*Cryphalomorphus knabi*: Schedl, 1940, Mitt. Münchner Ent. Ges. 30:588

*Ernoporides floridensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:34 (Holotype, female; Biscayne, Florida; U.S. Nat. Mus., 7394); Wood, 1966, Great Basin Nat. 26:23. *Synonymy*

*Hypothenemus ritchiei* Sampson, 1918, Bull. Ent. Res. 8:295 (Female syntypes; Jamaica; British Mus. Nat. Hist.); Wood, 1966, Great Basin Nat. 26:23. *Synonymy*

*Cryphalomorphus caraibicus* Schedl, 1951, Dusenia 2:96 (Syntypes, Guadeloupe; Schedl Coll.); Wood, 1966, Great Basin Nat. 26:23. *Synonymy*

*Cryphalomorphus minutissimus* Schedl, 1951, Dusenia 2:97 (Holotype, male; Env. de Trois Rivières, Guadeloupe; Schedl Coll.); Wood, 1977, Great Basin Nat. 37:385. *Synonymy*

*Cryphalomorphus subtriatus* Schedl, 1952, Dusenia 3:360 (Holotype, sex?; Mexico; Schedl Coll.); Wood, 1966, Great Basin Nat. 26:23. *Synonymy*

DIAGNOSIS.— This abundant species is distinguished from *rusticus* Wood and *trucis* Wood by the very small or obsolete discal strial punctures, by the smaller pronotal punctures, and by the somewhat less abundant, much more slender interstrial ground vestiture, particularly on the basal half of the disc.

FEMALE.— Length 1.1–1.5 mm, 2.6 times as long as wide; color dark brown to black, vestiture pale.

Frons convex above, moderately, transversely impressed on lower half; surface rather coarsely reticulate above, becoming almost smooth in median area below; punctures moderately coarse, rather shallow, much smaller in median area below; vestiture inconspicuous. Eye and antenna as in *setifer*.

Pronotum as long as wide; widest behind middle, sides weakly arcuate and converging very slightly on basal two-thirds, broadly rounded in front; anterior margin varying within a series from unarmed to armed by one to eight teeth (usually irregular in size and position; summit well developed, at or just in front of middle; posterior area smooth except for occasional minutely rugulose areas, a few isolated granules behind summit, remaining area with fine, poorly defined punctures. Vestiture of fine hair, with erect scales intermixed on basal third.

Elytra 1.6 times as long as wide, 1.7 times as long as pronotum; outline as in *privatus*; strial punctures fine, shallow, often indistinguishable from those of striae; interstriae at least twice as wide as striae, almost smooth, punctures fine, confused, moderately close, those on posterior half of disc bearing erect scales, very minutely granulate. Declivity rather narrowly convex; steep; strial punctures larger and deeper than on disc; interstrial granules larger. Vestiture of fine, short strial hair and a few similar interstrial setae in ground vestiture, and rows of longer, erect, interstrial scales; each scale on disc slightly shorter than distance between rows or between scales within a row, each about three times as long as wide, slightly longer on declivity and about four times as long as wide.

MALE.— Similar to female except transverse frontal impression usually much weaker.

DISTRIBUTION.— Nayarit and S Florida to Venezuela.

USA: **Florida**: Biscayne, Miami, Plantation Key, Sugar Loaf Key. MEXICO: **Chiapas**: Chiapa de Corzo. **Nayarit**: Los Corchos. **Oaxaca**: 11 km N Matías Romero. **Veracruz**: Cordoba, 5 km W Jáltipan. GUATEMALA: Esquintla, Guatemala City, Lago Amatitlan, Rodeo, Volcán de Agua. HONDURAS: La Ceiba, La Lima. OTHER COUNTRIES: Tortola in British West Indies,

Cuba, Dominican Republic, Guadeloupe, Jamaica, Venezuela.

HOSTS.— *Caloncition tamnifolium, Candiosperma holacobium, Ipomeoa pes-carpae, Serjania* sp., and several other vines and small lianas.

BIOLOGY.— Recently cut and dying vines usually less than 3 cm in diameter are selected for attack. All tissues in the stem are perforated. The irregular gallery patterns could not clearly be determined.

NOTES.— The above treatment was based on the holotypes of *knabi, floridensis, minutissimus,* and *subtriatus,* on syntypes of *ritchiei* and *caraibicus,* and on 223 other specimens.

There are slight variations in the size and position of strial punctures on the disc, in the arrangement of serrations on the anterior margin of the pronotum, and in the relative abundance of setae in the ground vestiture in long series. It appears from the number of synonyms of this species that some of these variations have been incorrectly interpreted as characterizing species.

### 6. *Scolytogenes trucis* (Wood)

*Cryphalomorphus trucis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):19 (Holotype, female; 16 km or 10 mi S Oaxaca, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *rusticus* Wood by the coarser, strial punctures on the elytral declivity, by the more slender discal interstrial ground vestiture, and by the different armature on the anterior margin of the pronotum.

FEMALE.— Length 1.3–1.5 mm, 2.6 times as long as wide; color very dark brown, almost black, vestiture pale.

Frons, eye, and antenna as in *rusticus* except frontal punctures larger, deeper. Pronotum as in *rusticus* except posterior areas reticulate, and anterior margin armed by about four to eight irregularly placed teeth.

Elytra as in *rusticus* except strial punctures slightly larger, deeper; interstrial punctures minute but evident; discal ground vestiture near base of elytra proportionately much narrower than adjacent erect scales; strial punctures on declivity average much larger.

MALE.— Similar to female.

DISTRIBUTION.— Puebla and Oaxaca.

MEXICO: Oaxaca: 16 km S Oaxaca, 6-VII-53, 1700 m. Puebla: 11 km S Atlixco, 13-VII-53, 1000 m; 6 km S Atlixco, 14-VI-67, 2300 m, No. 31. All taken from the same host as *hirtus* by me.

BIOLOGY.— As in *hirtus.*

NOTES.— The above treatment was based on the type series of 37 specimens.

The minor variations in this species and in *rusticus,* their close relationship, their allopatric distributions, and the fact that they utilize the same host species suggests that this species and *rusticus* represent no more than subspecies of one another. Nevertheless, until more material is available for study from intermediate localities, they should be recognized as being distinct.

### 7. *Scolytogenes jalapae* (Letzner)

*Bostrichus jalapae* Letzner, 1848, Uebers. Schlesischen Ges. Vaterland Kuture, p. 99 (Syntypes, not located).

DIAGNOSIS.— This species is distinguished from *trucis* Wood by the larger size, by the much longer, more slender bristles on the basal half of interstriae 9 and 10, and by other characters cited below.

FEMALE.— Length 1.7–1.8 mm, 2.5 times as long as wide; color dark brown.

Frons, eye, antenna, and pronotum as in *trucis,* except punctures on posterior area of pronotum distinctly larger.

Elytra as in *trucis* except strial punctures distinctly larger and deeper on both disc and declivity; interstrial granules on disc slightly larger, extending almost to base, punctures averaging smaller and slightly less numerous; interstrial granules on declivity smaller but almost as high; erect interstrial scales slightly longer.

MALE.— Similar to female.

DISTRIBUTION.— "Mexico."

This species has been intercepted numerous times in Jalapa root (presumably *Exogonium jalapa*) imported from Mexico. Specimens are labeled with the port of interception, but the source of the plant material is not recorded.

HOST.— Presumably *Exogonium jalapa.*

BIOLOGY.— The roots of the host are presumably infested at the time of harvest.

NOTES.— The above treatment was based on several hundred specimens intercepted at New York. Type material has not been located.

## GENUS *CRYPHALUS* ERICHSON

*Cryphalus* Erichson, 1836, Archiv Naturgesch. 2(1):61 (Type-species: *Bostrichus asperatus* Gyllenhal, subsequent designation by Thomson, 1859, Skandinaviens Coleoptera Synoptiskt Bearbetade 1:147)

*Taenioglyptes* Bedel, 1888, Ann. Soc. Ent. France, Hors. ser. 6:398 (Type-species: *Bostrichus abietis* Ratzeburg =*Bostrichus asperatus* Gyllenhal, original designation); Wood, 1972, Great Basin Nat. 32:40. *Synonymy*

DIAGNOSIS.— This genus is distinguished from the closely allied *Hypocryphalus* Hopkins by the 4-segmented antennal funicle, by the large, aseptate club with three recurved sutures on the anterior face indicated by impressed lines and rows of setae, and by the broad, emarginate third tarsal segments.

DESCRIPTION.— Length 1.4–2.1 mm, 2.3–2.4 times as long as wide; color brown; sexes similar. Frons broadly convex, conservatively sculptured; eye emarginate, finely granulate. Antennal funicle 4-segmented; club large, oval, a slight constriction at each of three nonseptate recurved sutures. Pronotum with basal and posterior third of lateral margins marked by a fine, raised line; summit well developed, anterior slope coarsely asperate; anterior margin armed; vestiture hairlike. Elytra finely striate, conservatively sculptured; costal margins rather strongly ascending near apex; vestiture of hair and abundant scales. Third tarsal segments broad, emarginate.

DISTRIBUTION.—N North America, Europe, and Asia to Australia; four species occur in the United States and Canada; several hundred nominate species from the Asian-Australian area have been assigned to the genus at various times.

BIOLOGY.— These monogamous, phloeophagous species construct a simple, cave-type parental chamber in which eggs are deposited. The larval mines are separate and wander at random in the phloem tissues. The American species breed in shaded-out or broken branches on living trees or in the limbs or boles of small suppressed trees.

NOTES.— This group is in serious need of a comprehensive worldwide revisional study. The generic limits are not clearly defined, and synonyms abound in the species from the Asian-Australian area.

### Key to the Species of *Cryphalus*

1. Elytral declivity with widely spaced, uniseriate rows of hairlike interstrial bristles, each bristle at least one-half as long as distance between rows of bristles ..... 2

— Interstrial bristles on declivity inconspicuous or absent, much shorter than one-half distance between rows of bristles ..... 3

2(1). Declivital bristles distinctly longer than distance between rows of bristles; British Columbia to California; *Abies*, *Pseudotsuga*, etc.; 1.6–1.9 mm ..... 1. ***pubescens*** **Hopkins**

— Declivital bristles one-half as long as distance between rows of bristles; Pennsylvania to North Carolina; *Picea rubens*; 1.6–2.0 mm ..... 2. ***rubentis*** **Hopkins**

3(2). Strial punctures indistinctly impressed, obsolete on declivity; posterolateral areas of pronotum granulate; Minnesota and Maine to North Carolina; *Abies*; 1.5–2.1 mm ..... 3. ***ruficollis fraseri*** **Hopkins**

— Strial punctures more strongly impressed, usually extending to declivity; posterolateral areas of pronotum granulate-punctate; Alaska, California, and Nuevo León to Quebec and Maine; *Abies*, *Picea*; 1.4–2.0 mm ..... 4. ***ruficollis ruficollis*** **Hopkins**

### 1. *Cryphalus pubescens* Hopkins
Fig. 192, 193

*Cryphalus pubescens* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:40 (Holotype, female; Port Williams, Washington; U.S. Nat. Mus., 7405)

*Cryphalus subconcentralis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:40 (Holotype, female, Astoria, Oregon; U.S. Nat. Mus., 7596); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1003. *Synonymy*

DIAGNOSIS.— This species is more closely allied to *piceae* Ratzeburg, of Europe, than to Nearctic species. It is distinguished from other American species by the very long interstrial setae and by the smoother, more finely punctured posterolateral areas of the pronotal disc. It differs from *piceae* by the more coarsely punctured posterolateral areas of the pronotum, and by the presence of distinctly larger median teeth on the anterior margin of the pronotum.

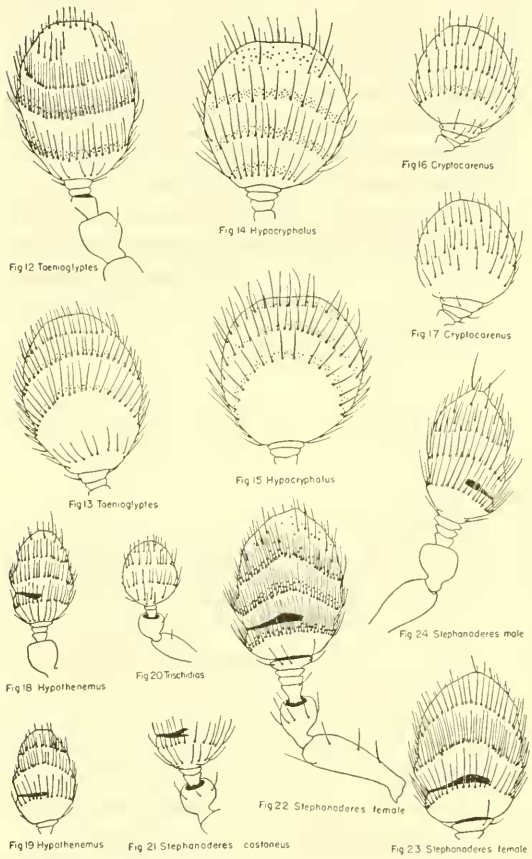



Fig. 192. Cryphalini spp., antennae: 12, 13, *Cryphalus* (=*Taenioglyptes*) *pubescens*, anterior and posterior faces, respectively; 14, 15, *Hypocryphalus mangiferae*, anterior and posterior faces, respectively; 16, 17, *Cryptocarenus heveae*, anterior and posterior faces, respectively; 18, 19, *Hypothenemus eruditus*, anterior and posterior faces, respectively; 20, *Trischidias minutissima*, anterior face; 21, *Hypothenemus birmanus*, aberrant funicle; 22–24, *Hypothenemus dissimilis*, anterior and posterior faces of female, anterior face of male (note funicle), respectively. (After Wood 1954:1081.)

FEMALE.— Length 1.6–1.9 mm, 2.4 times as long as wide, body color brown.

Frons weakly convex, with a short, often indistinct, median, longitudinal elevation above epistoma; surface coarsely, shallowly, rather closely punctured, rather coarsely reticulate over a larger area; pubescence consisting of inconspicuous, sparse, fine hair of medium length, and a more conspicuous ventrally directed epistomal brush.

Pronotum 0.83 times as long as wide; anterior margin rather narrowly rounded, bearing four to eight marginal teeth that decrease in size laterally; summit on basal third; anterior slope asperate, asperities rather abundant, large, usually broad, occasionally arranged in one or more subconcentric rows, particularly near summit; posterior and lateral areas coarsely, closely, deeply punctured, granulate behind summit and near lateral margins; pubescence consisting of rather short, fine, recumbent hair, coarse on asperate area.

Elytra shining; striae not impressed, punctures fine, shallow, distinct, separated by distances greater than their own diameters; interstriae two to three times as wide as striae, punctures fine, abundant, confused. Declivity rather steep, convex; striae more obscure than on disc. Elytral vestiture consisting of uniseriate rows of short, hairlike strial setae; abundant, confused, short, interstrial, scalelike setae; and uniseriate rows of widely spaced, very long, slender, interstrial, hairlike bristles, each bristle distinctly longer than distance between rows of bristles.

MALE.— Similar to female.

DISTRIBUTION.— The Pacific Coast Range from British Columbia to California.

CANADA: **British Columbia**: Pender Harbor, Saanichton, Sidney, Vancouver. USA: **California**: Eureka, Mt. Tamalpais in Marin Co., Muir Woods. **Oregon**: Astoria, Marshfield, Olympic N.F., Santiam N.F. **Washington**: Ft. Flagler, Port Townsend, Port Williams.

HOSTS.— *Abies grandis, Pinus lambertiana, Pseudotsuga menziesii, Sequoia sempervirens.*

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotypes of *pubescens* and *subconcentralis* and on 38 other specimens.

### 2. *Cryphalus rubentis* Hopkins

*Cryphalus rubentis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:40 (Holotype, female; Pocahontas Co., West Virginia; U.S. Nat. Mus., 7404)

DIAGNOSIS.— This species is somewhat intermediate between *pubescens* Hopkins and *ruficollis* Hopkins, but it is distinguished by the granulate posterolateral areas of the pronotum, by the obsolete strial punctures, and by the interstrial bristles, which are very long on the elytral disc and only one-half as long as the distance between rows of bristles on the declivity.

FEMALE.— Length 1.60–1.95 mm, 2.3 times as long as wide, color light brown.

Frons convex, with a weak transverse impression between eyes and usually with a short, indistinct, median, longitudinal elevation above epistoma; surface coarsely, shallowly, rather closely punctured at sides; rather coarsely reticulate over a larger area; pubescence consisting of inconspicuous, sparse, fine hair of medium length, and a more conspicuous ventrally directed epistomal brush.

Pronotum 0.86 times as long as wide; anterior margin rather narrowly rounded, bearing from four to eight teeth, four median ones usually subequal in size, lateral ones reduced; summit on basal third; asperate in front of summit, asperities rather abundant, large, usually narrow, confused; posterior and lateral areas coarsely, closely granulate, punctures not evident; pubescence consisting of rather short, fine, recumbent hair, coarse on asperate area.

Elytra shining; striae feebly or not at all impressed, punctures obscure; interstrial punctures abundant, confused, very fine, surface almost smooth except for punctures. Declivity rather steep, convex; striae obsolete. Elytral vestiture consisting of uniseriate rows of short, hairlike, strial setae; abundant, confused, short, interstrial, scalelike setae; and uniseriate rows of widely spaced, long, slender, interstrial, hairlike bristles, each bristle on disc about as long as distance between rows of bristles, those on declivity about half as long.

MALE.— Similar to female.

DISTRIBUTION.— Pennsylvania to North Carolina.

USA: **North Carolina**: Clingman's Dome in Great Smoky Mountains N.P., 19-VII-51, *Picea rubens*, S. L. Wood. **Pennsylvania**: Pocono Lake. **West Virginia**: Pocahontas Co., 6-V-93, Hopk. W. Va. 6258, *Picea rubens*, A. D. Hopkins; Randolph Co., *Picea*.

HOST.— *Picea rubens*.

BIOLOGY.— As described for the genus. Specimens were taken from the bole of a small tree.

NOTES.— The above treatment was based on the holotype of *rubentis* and on 30 other specimens.

### 3. *Cryphalus ruficollis fraseri* Hopkins

*Cryphalus fraseri* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:40 (Holotype, female; Pisgah Ridge, North Carolina; U.S. Nat. Mus., 7402)

*Cryphalus balsameus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:41 (Holotype, female; Camp Caribou, Maine; U.S. Nat. Mus., 7401); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1010. *Synonymy*

DIAGNOSIS.— This species is distinguished from *ruficollis* Hopkins by the obsolete strial punctures and by the more completely granulate posterolateral areas of the pronotum. It resembles *rubentis*, but the long interstrial bristles on the declivity are absent, the discal bristles are much shorter, and the surface of the elytra is rugose.

FEMALE.— Length 1.5–2.1 mm, 2.35 times as long as wide, body color brown.

Frons convex, with a weak transverse impression between eyes and usually with a short, indistinct, median, longitudinal elevation near the epistoma; surface coarsely, shallowly, rather closely punctured at sides, rather coarsely reticulate over a larger area; pubescence consisting of inconspicuous, sparse, fine hair of medium length, and a more conspicuous, ventrally directed epistomal brush.

Pronotum 0.82 times as long as wide; anterior margin rather narrowly rounded, armed by four to eight teeth, four median ones usually subequal in size, lateral ones reduced; summit on basal third; asperate in front of summit, asperities rather abundant, large, usually narrow, confused; posterior and lateral areas closely, rather coarsely granulate, punctures usually evident only near asperate area; pubescence consisting of rather short, fine, recumbent hair, coarse on asperate area.

Elytra shining; striae weakly or not at all impressed, punctures obsolete; interstriae

finely, closely granulate-punctate. Declivity rather steep, convex; striae obsolete; interstriae finely punctured. Elytral vestiture consisting of uniseriate rows of short, hairlike, strial setae, abundant, confused, short, interstrial scalelike setae, and uniseriate rows of widely spaced, rather long, slender, interstrial, hairlike bristles on disc, each bristle about half as long as distance between rows of bristles, obsolete on declivity.

MALE.— Similar to female.

DISTRIBUTION.— Minnesota and Maine to North Carolina.

CANADA: **Quebec**: Ile Perrot, Howick, Memphremagog, Monte Bello, St. Anne's. USA: **Maine**: Bar Harbor, Camp Caribou, Orono. **Michigan**: Charlevoix Co. **Minnesota**: Itasca Co. **New York**: Cranberry Lake, Green Co., Ithaca. **North Carolina**: Clingman's Dome in Great Smoky Mountains N.P., Pisgah Ridge. **Pennsylvania**: Pocono Lake.

HOSTS.— *Abies balsamea*, *A. fraseri*.

BIOLOGY.— As described for the genus. A series was taken from the bole of a small, suppressed tree.

NOTES.— The above treatment was based on the holotypes of both *fraseri* and *balsameus* and on 90 other specimens.

As more specimens of this subspecies are taken in the prairie provinces of Canada, it will be most surprising if it does not completely intergrade with *ruficollis*. The only significant difference appears to be in the depth, number, and spacing of strial punctures; a similar character gradient involving this same feature occurs in the European *asperatus* (Gyllenhal).

### 4. *Cryphalus ruficollis ruficollis* Hopkins

Fig. 176, 194

*Cryphalus ruficollis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:40 (Holotype, female, Alta, Utah; U.S. Nat. Mus., 7403)

*Cryphalus approximatus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:41 (Holotype, female; Sandpoint, Idaho; U.S. Nat. Mus., 7400); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1005. *Synonymy*

*Cryphalus grandis* Chamberlin, 1917, Canadian Ent. 49:323 (Lectotype, female; Corvallis, Oregon; Canadian Nat. Coll., designated by Bright, 1967, Canadian Ent. 99:681); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1005. *Synonymy*

*Cryphalus amabilis* Chamberlin, 1917, Canadian Ent. 49:321 (Lectotype, female; Elk Lake, Oregon; Canadian Nat. Coll., designated by Bright, 1967, Canadian Ent. 99:681); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1005 (subsp. of *ruficollis*)

*Cryphalus canadensis* Chamberlin, 1918, *in* Swaine, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):88 (Holotype, female; Roger's Pass British Columbia; Canadian Nat. Coll.); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1006. *Synonymy*

*Cryphalus mainensis* Blackman, 1922, New York St. Coll. For., Syracuse, Tech. Pub. 16:126 (Holotype, female; Orono, Maine, U.S. Nat. Mus.); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1006. *Synonymy*

*Taenioglyptes ruficollis coloradensis* Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1008 (Holotype, female; 7 miles N Grand Canyon N.P., Arizona; Snow Ent. Mus., Univ. Kansas). *New synonymy*

DIAGNOSIS.— This subspecies is distinguished from *ruficollis fraseri* Hopkins by the distinctly impressed strial punctures and by the less granulate posterolateral areas of the pronotum.

FEMALE.— Length 1.45–1.85 mm, 2.3 times as long as wide, body color dark brown.

Frons weakly convex, with a short, often indistinct, median, longitudinal elevation near epistoma; surface coarsely reticulate over a large area; pubescence consisting of inconspicuous, sparse, fine hair of medium length, and a more conspicuous, ventrally directed epistomal brush.

Pronotum 0.84 times as long as wide; anterior margin rather broadly rounded, bearing from four to eight marginal teeth that decrease in size laterally; summit on basal third; asperate in front of summit, asperities rather abundant, large, usually narrow, rarely arranged in one or more subconcentric rows near summit; posterior and lateral areas closely, rather finely, deeply granulate-punctate; more granulate basally, particularly in posterolateral angles; pubescence consisting of rather short, fine, recumbent hair, coarse on asperate area.

Elytra shining; striae usually not impressed, punctures distinctly impressed, rather fine, separated by a distance greater than their own diameters; interstriae two to three times as wide as striae, punctures fine, abundant, confused. Declivity rather steep, convex, strial and interstrial punctures obsolete. Elytral vestiture consisting of uniseriate rows of short, hairlike, strial setae; abundant, confused, short, interstrial, scalelike setae; and uniseriate rows of widely spaced, rather long, slender, interstrial bristles on disc, each bristle distinctly longer than distance between rows of bristles.

MALE.— Similar to female, elytral scales usually slightly larger.

DISTRIBUTION.— Alaska, California and Nuevo León to Newfoundland and New York.

ALASKA: Chatley River (E Central), Kenai Peninsula. CANADA: **Alberta**: Banff, Lake Louise. **British Columbia**: Bowser, Hope Mountain, London Hill Mine near Bear Lake, Mt. Apex Hedley, Nicomin Ridge, Pine Pass, Rogers Pass, Stanley. **Manitoba**: Churchill. **New Brunswick**: Fredricton. **Prince Edward Island**: Riley Brook. **Newfoundland**: Cornerbrook, Pasadena. **Nova Scotia**: Kejimkujik N.P. **Ontario**: Algonquin Park, Arnprior, Kaladar. **Quebec**: Gaspé. USA: **Arizona**: Jacob's Lake. **California**: Devil's Post Pile N.M. **Colorado**: Cameron Pass, Colorado N.F., Norwood, Ridgeway. **Idaho**: Sandpoint. **Maine**: Orono. **Montana**: Glacier N.P. **New Mexico**: Sandia Mts. **New York**: Cranberry Lake, Seneca Lake. **Oregon**: Corvallis, Elk Lake. **Utah**: Alta, Beaver, Kamas, Logan Canyon, Mirror Lake in Summit Co., Mt. Nebo, Wolf Creek Pass. **Washington**: Metaline Falls, Mt. Rainier, Naches R.S. MEXICO: **Nuevo León**: Cerro Potosí.

HOSTS.— *Abies concolor, A. grandis, A. magnifica, A. lasiocarpa, A.* sp., *Picea engelmannii, P. glauca*, and *P. rubens.*

BIOLOGY.— As described for the genus. This species has been taken in suppressed trees and in shaded out and broken branches. In emerging reared material copulation occurred on the outer surface of the bark of the brood tree before flight. This may or may not be normal behavior for the species.

NOTES.— The above treatment was based on the holotypes of *ruficollis, approximatus, grandis, amabilis, canadensis, mainensis*, and *coloradensis*, and on 305 other specimens.

This form probably intergrades completely with *fraseri.* Separate subspecies are maintained only because insufficient material is available for a proper evaluation. Specimens from Utah and North Carolina differ conspicuously, but these characters are not consistent throughout the range of this species.

## GENUS *HYPOCRYPHALUS* HOPKINS

*Hypocryphalus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:41 (Type-species: *Hypocryphalus rotundus* Hopkins, original designation)

*Dacryphalus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:42 (Type-species: *Dacryphalus obesus* Hopkins, original designation); Schedl, 1938, Trans. Roy. Soc. So. Australia 62:48. *Synonymy*

DIAGNOSIS.— This genus is distinguished from *Cryphalus* Erichson by the 5-segmented antennal funicle, by the procurved sutures on the antennal club, and by the cylindrical third tarsal segments.

DESCRIPTION.— Length 1.6–1.9 mm, 2.2 times as long as wide; color light brown; sexes similar. Frons broadly convex, conservatively sculptured. Eye emarginate, finely granulate. Antennal funicle 5-segmented; club large, subcircular, with three procurved sutures marked only by rows of setae. Pronotum and elytra as in *Cryphalus.* Third tarsal segments cylindrical.

DISTRIBUTION.— Florida and Mexico to Brazil, SE Asia to Australia and Africa; more than 30 species are known in the Old World, one of which was introduced into North and South America in mango trees.

BIOLOGY.— Species in this genus are monogamous and phloeophagous, with habits essentially as in *Cryphalus.*

### *Hypocryphalus mangiferae* (Stebbing)

Figs. 192–194

*Cryphalus inops* Eichhoff, 1872, Berliner Ent. Zeitschr. 15:131 (Holotype, female; Guadeloupe; Brussels Mus.). Appeal to suppress pending

*Hypothenemus griseus* Blackburn, 1885, Trans. Roy. Soc. Dublin (2)3:194 (Holotype, female; plains of Honolulu, Oahu, Hawaiian Islands; British Mus. Nat. Hist.). Appeal to suppress pending

*Hypothenemus* sp.(?) Stebbing, 1903, Indian Mus. Notes 6(1):68

*Cryphalus mangiferae* Stebbing, 1914, Indian Forest Insects, p. 542 (Lectotype, female; Eastern Dun, India, British Mus. Nat. Hist., present designation.)

*Hypocryphalus mangiferae*: Beeson, 1929, Insects of Samoa 4:226; Wood, 1954, Univ. Kansas Sci. Bull. 36(2):999.

*Hypocryphalus mangiferae* Eggers, 1928 (nec Stebbing, 1914), Inst. Biol. (Sao Paulo) Arquivos 1:85 (Lectotype, male; Brazil; U.S. Nat. Mus., 60177, designated by Anderson and Anderson, 1971, Smithsonian Contrib. Biol. 94:19); Eggers, 1931, Wiener Ent. Zeit. 47:185. *Synonymy*

DIAGNOSIS.— Because of the host, distribution, and generic characters, this species is not likely to be confused with any American species.

FEMALE.— Length 1.6–1.9 mm, about 2.2 times as long as wide, body color dark yellowish brown.

Frons broad, convex above, more or less flattened below; surface finely aciculate, reticulate above frons; evidently punctured only at sides and above; pubescence consisting of very fine, inconspicuous hair of medium length, a more conspicuous, short, ventrally

directed brush on epistomal margin. Eye narrowly, rather deeply emarginate; finely granulate. Antennal club large, subcircular, slightly longer than scape; not septate, with three procurved sutures indicated by rows of setae.

Pronotum about 0.93 times as long as wide; anterior margin armed by four (rarely three or five) teeth of moderate size, median pair slightly larger, closely placed, lateral ones separated by a distance at least equal to the basal width of one tooth; summit rather indefinite, near middle; asperate in front of summit, asperate area closely, finely punctured; posterior and lateral areas uniformly, closely, finely granulate; pubescence consisting of abundant, rather short, fine, recumbent hair, and a few longer erect bristles.

Elytra dull, not shining; striae impressed, punctures obscure, not impressed; interstriae two to three times as wide as striae, covered with closely placed, minute, confused granules, intermixed with a few minute, shallow punctures; each granule bearing a seta. Declivity convex, not steep. Elytral vestiture consisting of abundant, short, coarse, recumbent interstrial and strial hair; and uniseriate rows of long, slender, hairlike interstrial bristles.

MALE.— Similar to female except posterior margin of abdominal sternum 5 more broadly rounded.

DISTRIBUTION.— Circumtropical; it occurs wherever the host is cultivated.

USA: **Florida**: Homestead, 22-V-51, mango, S. L. Wood. MEXICO: **Veracruz**: Dos Amates, 5-V-69, D. E. Bright. HONDURAS: La Ceiba, 20-V-15, 17-VI, 26-VIII-49, at light, E. C. Becker. COSTA RICA: Limón, 26-VIII-63, mango, S. L. Wood. PANAMA: Summit Gardens, Canal Zone, 21-VII-66, mango, S. L. Wood. OTHER AMERICAN COUNTRIES: Barbados, Brazil, Hawaii, Venezuela.

HOST.— *Mangifera indica.*

BIOLOGY.— Apparently as in *Cryphalus*, except that the parental egg chamber is much more irregular. The monogamous phloeophagous beetles infest unthrifty branches on living trees as well as recently cut, larger material.

NOTES.— The above treatment was based on the holotypes of *inops* and *griseus*, on the lectotype of *mangiferae* Eggers, and on 166 other specimens.

## GENUS *TRISCHIDIAS* HOPKINS

*Trischidias* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:12 (Type-species: *Trischidias georgiae* Hopkins, original designation)

DIAGNOSIS.— This genus is distinguished from *Hypothenemus* by the entire eye, by the 3-segmented antennal funicle, by the aseptate sutures of the antennal club, by the very small size, and by the stout body form.

DESCRIPTION.— Length, female 0.65–1.10 mm, male 60 percent as large as female, 2.0–2.3 times as long as wide; males dwarfed in size, with abnormal sculpture; probably partly parthenogenetic. Frons broadly convex, conservatively sculptured. Eye finely granulate, entire; reduced in male to one-third size of female. Antennal funicle 3-segmented, sometimes with a partial fourth segment largely or totally fused to club. Pronotum with basal and posterior third of lateral margins with a fine, raised line; asperate in front of summit; anterior margin armed by two to four teeth. Elytra striate, punctures rather coarse; sculpture conservative; vestiture of hairlike and scalelike setae.

### Key to the Species of *Trischidias*

1. Body 2.3 times as long as wide; anterior margin of pronotum normally with four teeth; elytral striae less coarsely punctured; interstriae wider than striae; body and scale color lighter; Kansas and Maryland to Louisiana and Florida; female 0.65–0.80 mm ..... 1. ***atoma*** **(Hopkins)**

— Body stouter, 2.0 times as long as wide; anterior margin of pronotum normally with two teeth; elytral striae more coarsely punctured; interstriae narrower than striae, body and scale color darker ..... 2

2(1). Strial punctures not increasing in size posteriorly; declivital interstriae about as wide as on disc, strial punctures about as large as on disc; Florida: *Rhizophora*; female 0.65–0.80 mm ..... 2. ***minutisima*** **Wood**

— Strial punctures increasing conspicuously in size posteriorly; declivital interstriae less than one-half as wide as striae, strial punctures larger than on disc; Georgia; female 1.1 mm ..... 3. *georgiae* **Hopkins**

### 1. *Trischidias atoma* (Hopkins)
Fig. 194

*Hypothenemus atomus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:15 (Holotype, female, Morgantown, West Virginia; U.S. Nat. Mus., 7565)

*Trischidias atoma*: Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1068

*Hypothenemus impressifrons* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:15 (Holotype, female; Morgantown, West Virginia; U.S. Nat. Mus., 7355); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1068. *Synonymy*

*Hypothenemus marylandicae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:15 (Holotype, female; Pregnall, South Carolina; U.S. Nat. Mus., 7522); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1068. *Synonymy*

*Hypothenemus robiniae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:15 (Holotype, female; Chevy Chase, Maryland; U.S. Nat. Mus., 7523); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1068. *Synonymy*

*Hypothenemus toxicodendri* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:15 (Holotype, female; Morgantown, West Virginia; U.S. Nat. Mus., 7356); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1068. *Synonymy*

DIAGNOSIS.— This species is distinguished from *minutissima* Wood and *georgiae* Hopkins by the more slender body form, by the presence of four marginal teeth on the pronotum, by the less coarsely punctured striae, and by the lighter body and scale color.

FEMALE.— Length 0.75–1.00 mm, 2.32 times as long as wide, body color dark brown.

Frons convex, a weak transverse impression just above epistoma, a median impression of variable depth and length extending from upper level of eyes toward epistoma; surface coarsely reticulate and with a few minute, inconspicuous punctures; pubescence scarcely evident, consisting of a few fine hairs of medium length. Antennal club large, longer than scape, 1.28 times as long as wide, sutures straight.

Pronotum 0.91 times as long as wide; anterior margin slightly produced, with four subcontiguous teeth (rarely five or six), median pair distinctly larger; summit at middle; posterior and lateral areas coarsely reticulate, with a few scattered granules; hairlike pubescence shorter and intermixed on posterior half with longer, equally abundant, scalelike setae.

Elytra shining; striae slightly impressed, punctures fine, distinct, rather shallow, separated by distances equal to their own diameters; interstriae wider than striae, punctures small, rather coarsely granulate, evenly spaced in uniseriate rows, each bearing an erect scalelike bristle. Declivity moderately steep, convex. Elytral vestiture consisting of minute, recumbent, hairlike, strial setae; and uniseriate rows of broad, erect, scalelike, interstrial bristles, each bristle on declivity one to one and one-half times as long as wide.

MALE.— One male observed similar to female except length 0.53 mm, body stouter (damaged, could not measure); eye reduced in size, about one-half as large as in female; antennal funicle 3-segmented, club smaller and more slender; pubescence slightly longer.

DISTRIBUTION.— Kansas and Maryland to Louisiana and Florida.

USA: **District of Columbia**: Washington. **Florida**: Florida Keys, Sebring. **Kansas**: Lawrence. **Louisiana**: Covington. **Maryland**: Chevy Chase. **Mississippi**: Trimcane Swamp, Vicksburg. **New Jersey**: Westville. **North Carolina**: Cherokee, Tryon. **South Carolina**: Pregnall. **Tennessee**: Gatlinburg. **West Virginia**: Morgantown.

HOSTS.— *Acer rubrum*, *Asimina trilobata*, *Carya* spp., *Castanea dentata*, *Quercus marylandica*, *Rhizophora mangle*, *Rhododendron* sp., *Rhus toxicodendron*, *Robinia pseudoacacia*, *Salix nigra*, *S.* sp., *Ulmus americana*.

BIOLOGY.— This species attacks the phloem of recently broken or unthrifty twigs and small branches. Only the females attack the new host where each constructs a small irregular cavity at or near the cambium. The irregular larval mines are rather short if they depart from the parental gallery. Males are rare, dwarfed, and flightless, and mate in the brood chambers before becoming fully sclerotized.

NOTES.— The above treatment was based on the holotypes of *atomus*, *impressifrons*, *marylandicae*, *robiniae*, and *toxicodendri*, and on 45 other specimens.

### 2. *Trischidias minutissima* Wood
Fig. 192, 194

*Trischidias minutissima* Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1069 (Holotype, female; Sugar Loaf Key, Florida; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— The stouter body form, presence of two (rarely four) marginal teeth on the pronotum, the more coarsely punctured elytral striae, narrower interstriae, and darker body and scale color distinguish the female of this species from that of *atoma* (Hopkins). It is more closely allied to *georgiae* Hopkins but differs by the smaller body size, by the strial punctures that do not increase conspicuously in size posteriorly, and by the subcontiguous marginal teeth on the pronotum.

FEMALE.— Length 0.65–0.80 mm, 2.00 times as long as wide, body color black, scales dusky.

Frons convex, a weak transverse impression just above epistoma; a narrow median impression of variable depth and length extending from above upper level of eyes toward epistoma; surface coarsely reticulate with a few minute, inconspicuous punctures; pubescence scarcely evident, consisting of a few fine hairs of medium length. Antennal club large, longer than scape, 1.18 times as long as wide, sutures straight.

Pronotum 0.82 times as long as wide; anterior margin slightly produced, with two subcontiguous teeth, rarely with an additional pair of small granules lateral to teeth; summit at middle; posterior and lateral areas coarsely reticulate, with a few scattered granules; hairlike pubescence shorter and intermixed on posterior half with longer, equally abundant scalelike setae.

Elytra shining; striae slightly impressed, punctures rather large, deep, separated by distances equal to their own diameters; interstriae distinctly narrower than striae, punctures small, evenly spaced in uniseriate rows, each coarsely granulate and bearing an erect scalelike bristle. Declivity moderately steep, convex. Elytral vestiture consisting of minute, recumbent hairlike strial setae; and uniseriate rows of dark, broad, erect, scalelike, interstrial bristles, each bristle on declivity one to one and one-half times as long as wide.

DISTRIBUTION.— S Florida.

USA: Florida: Sugar Loaf Key, 3-VII-51, *Rhizophora mangle*, S. L. Wood.

BIOLOGY.— This minute species infested fungus pustules just under the outer bark of broken aerial roots of red mangrove.

NOTES.— The above treatment was based on 10 paratypes and on one other specimen.

### 3. *Trischidias georgiae* Hopkins

*Trischidias georgiae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:12 (Holotype, female; Brunswick, Georgia; U.S. Nat. Mus., 7370)

DIAGNOSIS.— This species differs from *minutissima* Wood by the larger size, by the strial punctures increasing in size toward declivity, and by the smaller, more widely spaced teeth on the anterior margin of the declivity.

FEMALE.— Length 1.1 mm, about 2.0 times as long as wide, body color black.

Frons convex, a weak transverse impression just above epistoma, a short, shallow, median impression between eyes; surface rather coarsely reticulate, with a few minute, inconspicuous punctures; pubescence scarcely evident, consisting of a few fine hairs of medium length. Antennal club large, longer than scape.

Pronotum with anterior margin slightly produced, with two median teeth separated by basal width of one tooth; summit at middle; posterior and lateral areas coarsely reticulate, with a few scattered granules; hairlike pubescence shorter and intermixed on posterior half with longer, equally abundant, scalelike setae.

Elytra shining; striae slightly impressed, punctures rather large, deep, separated by distances equal to half their own diameters, becoming larger and closer toward declivity; interstriae distinctly narrower than striae, punctures small, rather coarsely granulate and evenly spaced in uniseriate rows, each bearing an erect scalelike bristle. Declivity moderately steep, convex; strial punctures very coarse, deep, separated by less than half their own diameters; interstriae narrow, about half as wide as striae. Elytral vestiture consisting of minute, recumbent, hairlike, strial setae; and uniseriate rows of rather dark colored, broad, erect, scalelike, interstrial bristles, each bristle on declivity one to one and one-half times as long as wide.

DISTRIBUTION.— Georgia.

USA: Georgia: Brunswick, 3-III, H. G. Hubbard and E. A. Schwarz.

NOTES.— The above treatment was based on the holotype.

## GENUS *HYPOTHENEMUS* WESTWOOD

*Hypothenemus* Westwood, 1836, Trans. Ent. Soc. London 1:34 (Type-species: *Hypothenemus eruditus* Westwood, monobasic)

*Stephanoderes* Eichhoff, 1872, Berliner Ent. Zeitschr. 15:132 (Type-species: *Stephanoderes chapuisii* Eichhoff =*Crypturgus dissimilis* Zimmermann, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:130); Browne, 1963, Ent. Ber. 23:53. *Synonymy*

*Homeocryphalus* Lindemann, 1876, Bull. Soc. Imp. Nat. Moscou 51:168 (Type-species: *Stephanoderes ehlersii* Eichhoff, =*Hypothenemus eruditus* Westwood, monobasic); Fauvel, 1884, Rev. d'Ent. 3:315. *Synonymy*

*Adiaeretus* Hagedorn, 1909, Deutsche Ent. Zeitschr. 1909:744 (Type-species: *Adiaeretus spinosus* Hagedorn =*Stephanoderes elaphas* Eichhoff, monobasic); Schedl, 1939, Rev. Zool. Bot. Afr. 32:380. *Synonymy*

DIAGNOSIS.— This genus is distinguished from other American Cryphalini by the emarginate eye, by the 3- to 5-segmented antennal funicle, by the antennal club with suture 1 almost straight and partly septate, suture 2 slightly procurved and marked by setae, by the fine, raised line on the basal and posterolateral margins of the pronotum, by the rather abundant vestiture, and by the dwarfed, often deformed, flightless males.

DESCRIPTION.— Length, females 0.9–2.2 mm, males rare 0.6–1.8 mm, females 2.1–2.7 times as long as wide, males slightly stouter; color pale yellowish brown to black.

Frons variously sculptured. Eye elongate-oval, emarginate; finely granulate. Antennal scape elongate, simple; funicle usually 5-segmented in larger females, often 4-segmented in females of smaller species (3-segmented in most *birmanus*), males usually with one fewer segments than in female; club moderately large, elongate-oval, usually constricted at partly septate suture 1, less strongly constricted at suture 2, suture 2 usually marked by setae. Pronotum with basal third of lateral margins and basal margin marked by a fine, raised line; anterior margin armed by a series of teeth; anterior slope coarsely asperate; summit near middle, usually well developed. Scutellum well developed. Elytra weakly striate; declivity convex, conservatively sculptured. Costal margins slightly elevated toward apex. Fore tibiae armed by a series of four to six small teeth, four on outer distal margin; hind tibiae with about four teeth on distal margin; tarsi cylindrical.

DISTRIBUTION.— Worldwide in tropical and subtropical areas; 39 American species are recognized from Panama northward; several hundred species have been described from this and other parts of the world, but a majority of them have been placed in synonymy (Wood 1972, etc.).

BIOLOGY.— The species of this genus attack small, cut, broken, or unthrifty branches and twigs of trees, shrubs, lianas, vines, weeds, and other plant material. A few species may infest the fruiting bodies or seeds of a wide variety of plants. One species, *hampei* (Ferrari), is a major pest of coffee. Because most species are prolific and live in a wide variety of hosts in coastal regions, they are ideally suited for transportation through commerce. Evidently *erectus* (LeConte), *biramus* (Eichhoff), *hampei, areccae* (Hornung), *africanus* Hopkins, *setosus* (Eichhoff), *javanus* (Eggers), *brunneus* Hopkins, *columbi* Hopkins, and *californicus* Hopkins all reached America from origins in the eastern hemisphere, and apparently *obscurus* (Fabricius), *crudiae* Panzer, *pulverulentus* Eichhoff, *pubescens* Hopkins, and *eruditus* Westwood have been exported from America to other parts of the world.

Mating, if it occurs in these partly parthenogenetic beetles, is among siblings in the brood host, or between mother and son. The males are dwarfed and flightless. Adult females locate a new host and construct tunnels in either the phloem, pith, or woody tissues. The eggs usually are deposited in a branch of the gallery. The period of incubation and larval development is short, perhaps as little as two weeks for the combined total in some tropical species. The larvae may extend the parental tunnel or they may feed individually or in groups. Evidently, when circumstances are favorable, more than one generation can be completed in the same piece of host material. Few offspring are produced by each female, usually fewer than a dozen, rarely more than 30, but their short life cycle and adaptability often contribute to high populations.

The species of *Hypothenemus* are usually associated with ecological disturbances in or adjacent to agricultural areas. They are uncommon in a virgin forest.

Key to the Species of *Hypothenemus*

1. Frons convex, with or without a narrow median groove; usually devoid of a median frontal tubercle but, if present, elytral vestiture limited to rows of erect, uniseriate, interstrial scales and (usually) uniseriate rows of strial hair; interstrial ground vestiture absent (except in *sundaensis*) ..... 2

— Frons with a conspicuous tubercle or transverse carina at middle, lower half of frons weakly to strongly, concavely impressed; interstrial ground vestiture hairlike, rather abundant ..... 30

2(1). Anterior margin of pronotum armed by two to four teeth; anterior slope of pronotum armed by 8–25 coarse asperities; short ground vestiture on declivital interstriae scalelike (except hairlike in *sundaensis*), either hair- or scalelike on disc; mostly larger species, females 1.5–2.2 mm ..... 3

— Anterior margin of pronotum armed by four to eight teeth; anterior slope of pronotum armed by 25 or more asperities; short interstrial ground vestiture either absent or hairlike; mostly smaller species, females 1.0–1.6 mm, rarely 1.7 mm ..... 10

3(2). Erect interstrial setae slender, each pointed at its apex; pronotal disc devoid of scalelike setae; anterior margin of pronotum armed by two subcontiguous teeth; ground vestiture on declivity slender, often as very coarse hair ..... 4

— Erect interstrial setae scalelike, uniseriate, each broadly rounded or truncate at its apex; pronotal disc with hair- and scalelike setae intermixed; anterior margin of pronotum armed by either two or four teeth ..... 6

4(3). Elytral ground cover on disc confused, rather abundant; longest interstrial setae on disc as long as distance between rows; Belize (British Honduras) to Jamaica and Venezuela, Java; 1.5–1.6 mm ..... 1. ***sundaensis*** **(Eggers)**

— Short hair on disc in sparse strial rows; interstrial setae shorter than distance between rows; larger species ..... 5

5(4). Elytral declivity broadly convex, interstriae 3 weakly elevated; strial punctures on declivity as large as those on disc; declivital bristles much coarser and longer than on disc; pronotal disc longitudinally substrigose; Florida Keys; 1.7–1.9 mm ..... 2. ***hirsutus*** **(Wood)**

— Elytral declivity more narrowly convex, interstriae 3 not elevated; strial punctures on declivity slightly smaller than on disc; interstrial bristles on declivity as slender as on disc and little if any longer; pronotal disc punctured, not at all strigose; Minnesota and Connecticut to Texas and N Florida; 1.6–2.4 mm ..... 3. ***dissimilis*** **(Zimmermann)**

6(3). Anterior margin of pronotum armed by two (four in *apicalis*) teeth; anterior slope of pronotum armed by 8–12 asperities; discal striae usually more distinctly impressed, punctures larger ..... 7

— Anterior margin of pronotum armed by four teeth, lateral pair smaller; anterior slope of pronotum armed by at least 15 asperities; discal striae usually more feebly impressed, punctures averaging smaller ..... 9

7(6). Interstriae 9 on apical half of declivity rather strongly elevated, elevation almost as high as wide; setae on apical elevation much more numerous; erect interstrial scales almost as long as distance between rows, spaced by similar distances within a row; Colima to Oaxaca; 1.7–2.0 mm ..... 4. ***apicalis*** **Wood**

— Declivital interstriae 9 equal in convexity to other interstriae, apical setae not more abundant; erect interstrial scales on declivity shorter and/or more slender; smaller species ..... 8

8(7). Erect interstrial scales on declivity slender, each six to eight times as long as wide, spaced within a row by distances slightly greater than length of a scale; elytral surface very finely rugose; Nayarit to Oaxaca; females 1.4–1.7 mm ..... 5. ***indigens*** **Wood**

— Erect interstrial scales on declivity each about two to four times as long as wide, spaced within a row by distances slightly less than length of a scale; elytral surface almost smooth; Kansas and New York to Florida, Texas and Oaxaca; females 1.5–1.7 mm ..... 6. ***rotundicollis*** **(Eichhoff)**

9(6). Mature color black; erect interstrial scales on declivity more slender, each four to six times as long as wide; interstrial punctures on disc averaging larger, more strongly confused; antennal funicle always 5-segmented; Texas to Honduras and Venezuela, Africa; female 1.7–2.2 mm ..... 7. ***erectus*** **Leconte**

— Mature color reddish brown; erect interstrial scales on declivity stouter, about two to four times as long as wide; interstrial punctures on disc smaller, less strongly confused; antennal funicle commonly 3-segmented; Florida to Panama; Hawaii to S Asia; female 1.5–2.1 mm ..... 8. ***birmanus*** **(Eichhoff)**

10(2). Interstrial ground vestiture absent, elytral vestiture consisting only of uniseriate rows of erect interstrial scales and rows of fine strial hair, one hair arising from each puncture; antennal funicle usually 5-segmented; mostly larger species, females 1.2–1.9 mm ..... 11

— Interstrial ground vestiture consisting of fine, confused hair, at least in posterolateral areas, in addition to uniseriate rows of erect scales and strial hair; antennal funicle usually 4-segmented; smaller species, females 1.0–1.4 mm ..... 22

11(10). Interstrial bristles on declivity very slender, flattened little if any, each bristle more than eight times as long as wide; anterior margin of pronotum armed by four teeth, rarely six ..... 12

— Interstrial bristles rather strongly flattened, each scale not more than six times as long as wide; anterior margin of pronotum usually armed by six or more teeth (four in *squamosus* and *solocis*) ..... 14

12(11). Interstrial punctures on discal interstriae 2 and 3 rather strongly confused, each puncture bearing an erect, flattened bristle; Veracruz to Colombia and Venezuela; female 1.5–1.8 mm ..... 9. ***trivialis*** **Wood**

— Interstrial punctures on disc uniseriate; smaller species ..... 13

13(12). Discal interstrial bristles rather strongly flattened, much wider than those on declivity; elytral declivity steep, confined to posterior fourth; interstrial punctures finely granulate on basal half of disc; Connecticut and Kansas to Panama and Cuba; female 1.5–1.7 mm ..... 10. ***interstitialis*** **(Hopkins)**

— Discal and declivital interstrial bristles equal in width; elytral declivity gradual, extending almost to middle of elytra; interstrial punctures on basal half of disc not at all granulate; Guatemala, Honduras, Brazil, Africa, SE Asia, etc.; coffee beans; female 1.4–1.6 mm ..... 11. ***hampei*** **(Ferrari)**

14(11). Summit of pronotum indefinite, very broadly convex; pronotal asperities small, very numerous particularly around summit, exceeding 50 in number; tropical species ..... 15

— Summit of pronotum narrowly, strongly convex, usually with a definite transverse impression on its posterior limits; pronotal asperities rather coarse, rarely exceeding 30 in number ..... 16

15(14). Setae on pronotal disc all hairlike; asperities on pronotal summit higher, not associated with pitlike depressions; posterolateral areas of pronotum rather coarsely, deeply punctured, surface subreticulate, shining; Veracruz to Costa Rica; 1.6–1.7 mm ..... 12. ***dolosus*** **Wood**

— Vestiture on pronotal disc of scales and hair intermixed; asperities on pronotal summit smaller, each with a small circular pit on its posterior margin, white frass packed in these pits usually appearing as recumbent, subcircular scales; posterolateral areas of pronotum strongly reticulate, dull, punctures very small, shallow, obscure; Costa Rica to Colombia and Venezuela; 1.4–1.9 mm ..... 13. ***opacus*** **(Eichhoff)**

16(14). Declivital striae rather strongly impressed, interstriae narrower than striae, rather narrowly convex and uniseriately armed by small, pointed denticles ..... 17

— Declivital interstriae weakly if at all impressed, interstriae as wide or wider than striae; interstrial granules on declivity small, rounded if present ..... 18

17(16). Elytral declivity broadly convex; costal margin at apex of elytral declivity normal; declivital interstrial granules small, equally developed to apices of all interstriae; Florida and Cuba to Veracruz and Colima; female 1.3–1.5 mm ..... 14. ***squamosus*** **(Hopkins)**

— Elytral declivity more narrowly convex, with costal margin near apex rather strongly elevated; interstrial tubercles on declivity larger except suppressed near apices of even-numbered interstriae; Sinaloa to Colima; female 1.3–1.5 mm ..... 15. ***solocis*** **Wood**

18(16). Frons with a small, rounded median tubercle at upper level of eyes; lower half of frons shallowly impressed, longitudinally concave, with a variable, shallow, median groove ending dorsad in median tubercle; New Jersey and Texas to Argentina, etc.; female 1.4–1.6 mm ..... 16. ***crudiae*** **(Panzer)**

— Frons almost uniformly convex, devoid of a median tubercle ..... 19

19(18). Entire elytral surface minutely rugose, including inner surface of strial punctures; frons with a rather deep, narrow median groove extending from upper level of eyes to epistoma; Florida and Costa Rica to Brazil, etc.; in twigs, seeds, and nuts; female 1.2–1.4 mm ..... 17. ***obscurus*** **(Fabricius)**

— Elytral surface largely smooth, shining; frontal groove, when present, much shorter, rarely occupying more than half distance from upper level of eyes to epistoma ..... 20

20(19). Larger species; strial punctures very small, shallow, about half as wide as interstriae; Tamaulipas to Colombia; 1.6–1.8 mm ..... 18. ***multidentatus*** **(Hopkins)**

— Smaller species; strial punctures larger, deeper, about as wide as interstriae ..... 21

21(20). Punctures in lateral areas of pronotal disc not at all granulate; interstrial scales on declivity three to six times as long as wide; anterior margin of pronotum usually armed by six teeth; West Virginia and Texas to Brazil, etc.; 1.4–1.6 mm ..... 19. ***seriatus*** **(Eichhoff)**

— Punctures in lateral areas of pronotal disc finely granulate; interstrial scales on declivity about twice as long as wide; anterior margin of pronotum armed by four teeth; Texas to Tamaulipas; 1.1–1.3 mm ..... 20. ***sparsus*** **Hopkins**

22(10). Anterior margin of pronotum rather broadly rounded, usually bearing six teeth; mostly larger than 1.1 mm ..... 23

— Anterior margin of pronotum narrowly produced, armed by four or fewer teeth, with lateral pair reduced in size; smaller than 1.1 mm ..... 29

23(22). Posterolateral areas of pronotum rather deeply, coarsely, closely punctured to lateral margin ..... 24

— Posterolateral areas of pronotum indistinctly, shallowly, finely punctured, punctures usually obsolete near lateral margin ..... 26

24(23). Body slender, 2.5 times as long as wide; pronotum as long or longer than wide; pronotum rather broadly rounded in front; Maryland and S California to Florida and Michoacán; 1.0–1.4 mm ..... 21. ***californicus*** **Hopkins**

— Body stout, 2.2 times as long as wide; pronotum distinctly wider than long; pronotum narrowly rounded in front; tropical species ..... 25

25(24). Posterolateral areas of pronotum smooth, shining, punctures not granulate; striae not impressed, punctures small, shallow; interstriae flat, smooth, devoid of granules; Chiapas; female 1.0 mm ..... 22. ***vesculus*** **Wood**

— Posterolateral areas of pronotum finely, densely granulate; striae distinctly impressed, punctures rather coarse, deep; interstriae convex, uniseriately, rather coarsely granulate; Costa Rica to Panama; 1.2–1.3 mm ..... 23. ***ascitus*** **Wood**

26(23) Body small, stout, less than 2.4 times as long as wide; interstrial scales on declivity short, broad, each scale half as long as distance between rows, less than twice as long as wide; mature color yellowish brown ..... 27

— Body slender, more than 2.4 times as long as wide; interstrial scales on declivity equal in length to distance between rows, each more than three times as long as wide (occasional exceptions in *eruditus*); mature color dark brown to black ..... 28

27(26). Body stouter, 2.1 times as long as wide; antennal club larger, its width greater than width of eye; anterior margin of pronotum and posterior margin of elytra more narrowly rounded; strial punctures deeper, interstrial granules larger; Costa Rica; female 1.0 mm ..... 24. ***nanellus*** **Wood**

— Body moderately stout, 2.3 times as long as wide; antennal club smaller, its width less than width of eye; anterior margin of pronotum and posterior margin of elytra more broadly rounded; Florida, Texas, Durango, Yucatan, Hawaii; in fruiting stalks of grass; female 1.0–1.1 mm ..... 25. ***pubescens*** **Hopkins**

28(26). Anterior margin of pronotum rather narrowly rounded, median pair of teeth subcontiguous or very narrowly separated; declivital interstrial scales two to eight times as long as wide; S California, Texas, and New Jersey to Argentina, etc.; 1.0–1.3 mm ..... 26. ***eruditus*** **Westwood**

— Anterior margin of pronotum very broadly rounded, median pair of teeth very widely separated, other teeth widely spaced; declivital interstrial scales six to ten times as long as wide; Florida, Cuba, Hidalgo; female 1.2–1.4 mm ..... 27. ***gossypii*** **Hopkins**

29(22). Anterior margin of pronotum bearing four teeth, median pair larger; strial punctures larger, more deeply impressed; declivital interstrial scales about three times as long as wide; Missouri; female 0.9 mm ..... 28. ***distinctus*** **Wood**

— Anterior margin of pronotum narrowly produced into a slender, hornlike, median process; strial punctures small, obscure; declivital interstrial scales about twice as long as wide; Georgia to Florida; female 1.05–1.15 mm ..... 29. ***miles*** **(LeConte)**

30(1). Frontal tubercle or carina very short, impression below tubercle rather poorly developed, tubercle and impression occupying less than median third of frons ..... 31

— Frontal carina weakly to strongly elevated, impression stronger, much wider, occupying at least median two-thirds ..... 34

31(30). Rows of erect interstrial scales on basal half of elytra only, all vestiture near and on declivity of very short hair; Costa Rica to Venezuela; female 1.0–1.2 mm ..... 30. ***teretis*** **Wood**

— Rows of erect interstrial scales on both disc and declivity ..... 32

32(31). Frons bearing a small but conspicuous flattened tubercle at upper level of eyes, impression below tubercle feebly if at all indicated; erect interstrial scales on declivity two to three times as long as wide; Tamaulipas, Colima, Hawaii; female 1.0–1.1 mm ..... 31. ***parallelus*** **(Hopkins)**

— Frontal tubercle less well developed, with a distinct, rather shallow impression on median third between upper level of eyes and epistoma (rather variable in both species) ..... 33

33(32). Interstrial scales on declivity stouter, each three to four times as long as wide; Veracruz to Colombia and Venezuela; 1.1–1.3 mm ..... 32. ***cylindricus*** **(Hopkins)**

— Interstrial scales on declivity slender, each about eight times as long as wide; Nayarit to Panama and Venezuela; 1.1–1.3 mm ..... 33. ***suspectus*** **Wood**

34(30). Smaller, females 1.0–1.4 mm, more slender, 2.4–2.5 times as long as wide; interstriae usually only slightly wider than striae; interstrial hairlike ground vestiture more abundant, proportionately longer ..... 35

— Larger, females 1.3–1.8 mm; stouter, 2.3 times as long as wide; interstriae usually more than twice as wide as striae; interstrial hairlike ground vestiture less abundant, proportionately shorter ..... 36

35(34). Interstrial scales on declivity longer, more slender, each scale six or more times as long as wide; frontal carina poorly developed, lowr frons flattened, more strongly impressed; posterior half of pronotum more nearly shining, smoother; Florida, Brazil, S Asia, etc.; female 1.2–1.4 mm ..... 34. ***areccae*** **(Hornung)**

— Interstrial scales on declivity shorter, broad, two to four times as long as wide; frontal carina more strongly, acutely elevated medially, lower frons more nearly concave; posterior half of pronotum mostly reticulate, less brightly shining; Florida, Texas, and Nayarit to Colombia and Venezuela; female 1.0–1.2 mm ..... 35. ***columbi*** **Hopkins**

36(34). Interstrial scales on declivity almost as long as distance between rows, each scale broad, about two to three times as long as wide; pronotal surface in posterolateral areas smooth, shining, punctures rather abundant, moderately small, rather deep; Alabama, Louisiana, circumtropical; 1.7–1.9 mm ..... 36. ***africanus*** **(Hopkins)**

— Interstrial scales on declivity more slender, at least four times as long as wide; posterolateral areas of pronotum reticulate to rugose-reticulate, punctures fine, shallow, less numerous, usually much less clearly defined ..... 37

37(36). Body slender, 2.4 times as long as wide; anterior slope of pronotum with more than 25 small asperities; anterior margin of pronotum with six to eight serrations; Florida and Chiapas to Brazil, etc.; female 1.6–1.7 mm ..... 37. ***setosus*** **(Eichhoff)**

— Body stout, 2.2 times as long as wide; anterior slope of pronotum with 12–18 coarse asperities; anterior margin of pronotum armed by two to four serrations .... 38

38(37). Posterolateral areas of pronotum shallowly, finely punctured, punctures not at all granulate; interstrial scales on declivity slightly longer, each scale about equal in length to distance between rows, and more slender, about six to eight times as long as wide; transverse frontal carina less acutely elevated; Florida, Cuba, and Jalisco to Panama, Venezuela, etc.; female, 1.4–1.7 mm ..... 38. ***javanus*** **(Eggers)**

— Posterolateral areas of pronotum less closely punctured, most punctures finely granulate or feebly vulcanate; interstrial scales on declivity slightly shorter, each scale about two-thirds as long as distance between rows, stouter, about four times as long as wide; transverse frontal carina more acutely elevated; Florida, Texas, and Nayarit to Panama; 1.30–1.45 mm ..... 39. ***brunneus*** **(Hopkins)**

### 1. *Hypothenemus sundaensis* (Eggers)

*Stephanoderes sundaensis* Eggers, 1927, Treubia 9:396 (Holotype, female; Haboko, Sumatra; Eggers Coll., apparently on loan to Schedl)

*Hypothenemus aequaliclavatus* Schedl, 1939, Tijdschr. Ent. 82:33 (Syntypes; Buitenzorg, Java; Buitenzorg Museum and Schedl Coll.). *New synonymy*

DIAGNOSIS.— This introduced species is distinguished from other American representatives of the genus having two teeth on the anterior margin of the pronotum by the rather abundant, confused, hairlike elytral ground vestiture, with the long hairlike setae closely set in rows.

FEMALE.— Length 1.5–1.6 mm, 2.4 times as long as wide; color dark brown.

Frons convex, except shallowly impressed on median fourth just below upper level of eyes; surface below upper level of eyes coarsely, closely punctured; vestiture moderately abundant, of fine, long hair.

Pronotum essentially as in *biramanus* (Eichhoff) except anterior margin usually armed by only two contiguous teeth and posterior areas without reticulation.

Elytra 1.6 times as long as wide; sides straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures minute, shallow; interstriae six or more times as wide as striae, almost smooth, punctures minute, much smaller than those of striae, some of those near base minutely granulate. Declivity convex, steep; sculpture as on disc. Vestiture of short, confused, moderately abundant, hairlike, strial and interstrial setae, and interstrial rows of long hair, each three to four times as long as ground cover, their length about equal to distance between rows, spaced by less than half that distance within a row.

DISTRIBUTION.— British Honduras, Jamaica, Venezuela, Indonesia.

BRITISH HONDURAS: "M-tee" District, 15-VI-06, Peck. JAMAICA: Bog Walk, 5-VIII-67, L. and C. W. O'Brien. VENEZUELA: Ocumare in Aragua.

NOTES.— The above treatment was based on the holotype of *sundaensis*, on 2 topotypic specimens of *aequaliclavatus* that were compared by Kalshoven to his syntypes, and on 13 other specimens.

### 2. *Hypothenemus hirsutus* (Wood)

Fig. 194

*Stephanoderes hirsutus* Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1020 (Holotype, female; Plantation Key, Florida; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *dissimilis* (Zimmermann) by the more broadly convex elytral declivity, with interstriae 3 more strongly convex, by the much longer, coarser, more abundant bristles on the elytral declivity, by the larger strial punctures, and by the larger, less abundant interstrial punctures.

FEMALE.— Length 1.7–1.9 mm, 2.3 times as long as wide; color almost black.

Frons evenly convex, finely aciculate; punctures of moderate size, depth, and density; vestiture inconspicuous.

Pronotum 0.88 times as long as wide; widest behind middle, sides strongly arcuate, converging on anterior half to rather broadly rounded anterior margin; anterior margin armed by two large, subcontiguous teeth; summit slightly behind middle, well developed; about 8–14 coarse asperities on anterior slope; posterior areas shining, obscurely, longitudinally strigose behind summit, punctures rather coarse, close, deep. Vestiture hairlike, moderately long.

Elytra 1.4 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae very feebly impressed, punctures moderately coarse, close, rather deep; interstriae slightly wider than striae, smooth, shining, punctures uniseriate, rather small. Declivity broadly convex, steep; interstriae 2 weakly impressed, 3 weakly convex. Vestiture on disc of uniseriate rows of fine, short, strial hair and rows of longer, erect, interstrial bristles; on declivity considerably longer, more abundant, coarser, each acutely tapered from base; scalelike setae entirely absent.

MALE.— Similar to female except smaller, 1.3–1.5 mm, 2.0 times as long as wide; eyes reduced in size, half as large as in female; antennal club more slender; anterior margin of pronotum usually devoid of teeth; elytral sculpture less distinct and more variable.

DISTRIBUTION.— Florida Keys.

USA: **Florida**: Key Largo, 25-VI-51, *Ardesia paniculata* and *Lysiloma bahamensis*, S. L. Wood; Matecumbe Key, 28-VI-51, *Acras sapota*, *Eugenia buxifolia*, and *Pithecellobium unguis-cati*, S. L. Wood; Plantation Key, 26-VI-51, *Ipomoea cathartica*, S. L. Wood; Grassy Key, 27-VI-51, *Reynosia septentrionis*, S. L. Wood; Key Vaca, 29-VI-51, *Pithecellobium guadelupense*, S. L. Wood; Sugar Loaf Key, 3-VII-51, *Metopium toxiferum*, S. L. Wood; Big Pine Key, 7,8-III, E. A. Schwarz; Key West, 6-IV-03, E. A. Schwarz.

HOSTS.— *Acras sapota, Ardesia paniculata, Eugenia buxifolia, Ipomoea cathartica, Lysiloma bahamensis, Metopium toxiferum, Pithecellobium guadelupense, P. unguis-cati, Reynosia septentrionalis.*

BIOLOGY.— Essentially as in *dissimilis*.

NOTES.— The above treatment was based on 50 paratypes.

### 3. *Hypothenemus dissimilis* (Zimmermann)

Figs. 191–194

*Crypturgus dissimilis* Zimmermann, 1868, Trans. Amer. Ent. Soc. 2:144 (Holotype, female; North Carolina; Mus. Comp. Zool.)

*Hypothenemus dissimilis*: LeConte, 1876, Proc. Amer. Philos. Soc. 15:356

*Stephanoderes chapuisii* Eichhoff, 1872, Berliner Ent. Zeitschr. 15:132 (Lectotype, female; America bor.; Brussels Mus., present designation); Eichhoff, 1896, Proc. U.S. Nat. Mus. 18:608, 610. *Synonymy*

DIAGNOSIS.— This species is distinguished from *hirsutus* Wod as indicated in the above key and in the diagnosis of *hirsutus*.

FEMALE.— Length 1.6–2.4 mm, 2.3 times as long as wide; color dark brown to black.

Head essentially as in *hirsutus*. Pronotum as in *hirsutus* except anterior slope armed by

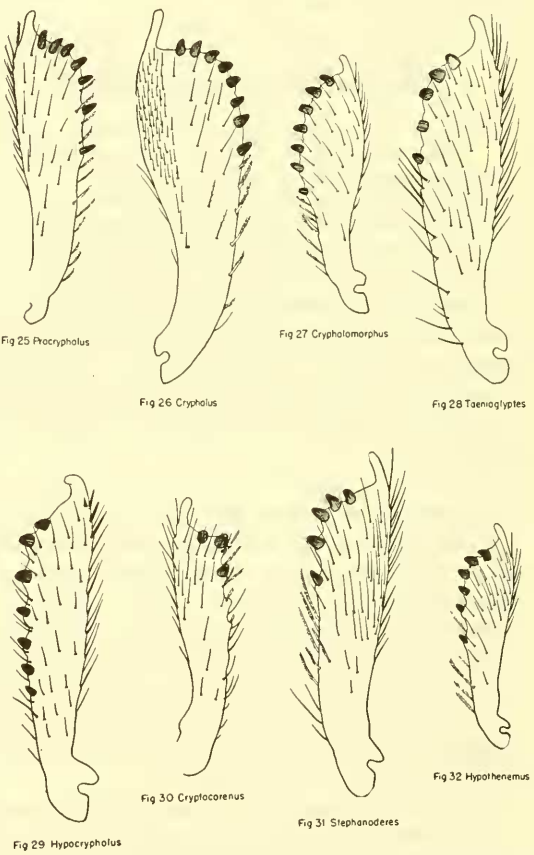



Fig. 193. Cryphalini spp., posterior face of protibia: 25, *Procryphalus utahensis*; 26, *Trypophloeus* (=*Cryphalus* of authors) *populi*; 27, *Scolytogenes* (=*Cryphalomorphus*) *knabi*; 28, *Cryphalus* (=*Taenioglyptes*) *pubescens*; 29, *Hypocryphalus mangiferae*; 30, *Cryptocarenus heveae*; 31, *Hypothenemus dissimilis*; 32, *Hypothenemus eruditus*. (After Wood 1954:1083.)

10–16 coarse asperities, posterior area less distinctly strigose.

Elytra as in *hirsutus* except strial punctures smaller, about half as wide as interstriae; interstrial punctures smaller, confused; declivity more narrowly convex, interstriae 2 not impressed, 3 not elevated; declivital vestiture of short, scalelike ground cover and longer, erect, coarse, pointed hair.

MALE.— As in female except differing as in male and female *hirsutus*.

DISTRIBUTION.— Minnesota and Connecticut to Texas and N Florida.

USA: **Alabama**: Mobile. **Connecticut**: Bradford, Hartford, New Haven. **District of Columbia**: Washington. **Florida**: Biscayne Bay, Dade City, Dunedin, Gainesville, Greenville, Jacksonville, La Belle, Monticello, Oleno St. Pk., Sanford, Sebring, Seminole, Snead, Suwanee Springs. **Georgia**: Brunswick, Waycross. **Illinois**: Lawrenceville. **Indiana**: Lawrence Co., Posey Co., Vermillion Co., Warren Co. **Louisiana**: Covington. **Kentucky**: Williamsburg. **Maryland**: College Park. **Minnesota**: Olmstead Co. **Mississippi**: Lucedale, Nicholson. **Missouri**: Warrensburg. **New Jersey**: "N.J." **New York**: Melville on Long Island, Pinelawn on Long Island, Yaphank. **North Carolina**: Aberdeen, Cherokee, Marston, Monroe, Southern Pines, Tryon. **Ohio**: Columbus, Franklin Co., Hocking Co. **Pennsylvania**: Allegheny, Chambersburg, Easton, Jeanette, Mt. Alto, Philadelphia, Pittsburgh, Wind Gap. **South Carolina**: Awendaw, Edisto Island, Myrtle Beach. **Tennessee**: Gatlinburg. **Texas**: Columbus, Hidalgo Co., Lexington, College Station. **West Virginia**: Doddridge Co., Kanawha Co., Morgantown.

HOSTS.— *Acer rubrum*, *Carya* spp., *Cercis canadensis*, *Fagus grandifolia*, *Kalmia latifolia*, *Quercus* spp., *Ocotea catesbyana*, *Rhamnus lanceolata*, *Vitis* spp.

BIOLOGY.— The females attack recently injured or broken twigs and small branches, where they construct cavities in the pith and/or wood. From the central chamber one or more short, longitudinal egg galleries may extend with the grain of the wood. Eggs are deposited in the tunnels or in the central chamber. The larvae and young adults extend the parental tunnels, often consuming the entire pith.

NOTES.— The above treatment was based on the holotype of *dissimilis*, on three syntypes of *chapuisii*, and on 98 other specimens. Three female syntypes of *chapuisii* in the Chapuis collection at the Institute Royal des Sciences Naturelles, Brussels, were examined; the first of these is here designated as the lectotype of *Stephanoderes chapuisii* Eichhoff.

### 4. *Hypothenemus apicalis* Wood

*Hypothenemus apicalis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):19 (Holotype, female; 3 km or 2 miles E Armeria, Colima, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *rotundicollis* (Eichhoff) and *erectus* LeConte by the much more slender erect, interstrial bristles and by the strongly elevated interstriae 9 at the elytral apex.

FEMALE.— Length 1.6–2.0 mm, 2.3 times as long as wide; color dark brown, vestiture pale.

Frons essentially as in *rotundicollis*. Pronotum as in *rotundicollis*, with 10 to 14 asperities on anterior slope, posterior area more strongly reticulate, anterior margin armed by four teeth, lateral pair usually smaller.

Elytra as in *rotundicollis* except declivity not as steep, its outline with a distinct lateral constriction near middle; declivital striae more strongly impressed, punctures shallow, larger, interstriae 1–3 distinctly convex, 9 distinctly convex to junction with 3 then strongly elevated from there to apex. Vestiture of short, confused ground setae, almost hairlike on disc, becoming scalelike on declivity, and rows of erect interstrial bristles; each bristle longer on declivity, on declivity each as long as distance between rows or between bristles within a row, each about eight times as long as wide.

DISTRIBUTION.— Colima to Oaxaca.

MEXICO: **Colima**: 3 km E Armeria, 28-VI-65, 70 m, No. 130, liana, S. L. Wood. **Oaxaca**: 10 km SE Totolapan, 21-VI-67, 1000 m, No. 73, shrub, S. L. Wood.

BIOLOGY.— As in *dissimilis*.

NOTES.— The above treatment was based on the type series of eight specimens.

### 5. *Hypothenemus indigens* Wood

*Hypothenemus indigens* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):20 (Holotype, female; 9 km or 6 miles S Huajuapan, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *rotundicollis* (Eichhoff) by the minutely granulose elytral surface and by the much more slender, more widely spaced, erect interstrial scales.

FEMALE.— Length 1.4–1.7 mm, 2.4 times as long as wide; color dark brown.

Head and pronotum as in *rotundicollis* except pronotal asperities slightly smaller,

narrower, posterior areas more strongly reticulate.

Elytra 1.6 times as long as wide; as in *rotundicollis* except surface minutely granulate, bristle-bearing interstrial punctures on disc granulate, declivital ground vestiture more nearly scalelike, and erect interstrial bristles much more slender and more widely spaced within a row; each bristle about eight times as long as wide, spaced within a row by distances slightly greater than length of a bristle.

MALE.— Similar to female except 1.2 mm long; eye reduced in size; antennal club more slender; most characters less sharply formed; vestiture longer.

DISTRIBUTION.— Nayarit to Oaxaca.

MEXICO: **Jalisco**: Volcán Colima, 23-VI-65, 2500 m, No. 103, shrub. **Nayarit**: Volcán Ceboruco, 5-V-65, 1100 m, No. 189, *Serjania*. **Oaxaca**: 13 km SE Cameron, 21-VI-67, No. 76, shrub; 9 km S Huajuapan, 16-VI-67, No. 45, *Serjania*; 17 km N Huajuapan, 15-VI-67, No. 43, *Psittacanthus*. **Puebla**: 5 km S Matamoros, 14-VI-67, 2000 m, No. 33, *Toxicodendron*. All were taken by me.

HOSTS.— *Psittacanthus* sp., *Serjania* sp., and *Toxicodendron* sp.

BIOLOGY.— Similar to *dissimilis*.

NOTES.— The above treatment was based on the type series of 19 specimens.

### 6. *Hypothenemus rotundicollis* (Eichhoff)

Fig. 194

*Stephanoderes rotundicollis* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:45, 145 (Syntypes?, female; America septentrionalis; presumably lost with Hamburg Mus.)

*Stephanoderes sculpturatus* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:45, 146 (Syntypes?, female; Tennessee; presumably lost with Hamburg Mus.); Eichhoff, 1896, Proc. U.S. Nat. Mus. 18:608, 610. *Synonymy*

*Stephanoderes quercus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:32 (Holotype, female; Berkeley, West Virginia; U.S. Nat. Mus., 7550); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1024. *Synonymy*

DIAGNOSIS.— This species is distinguished from related forms by the small number of pronotal asperities, by having only two teeth on the anterior margin of the pronotum, by the short, comparatively broad, erect, interstrial scalelike bristles, and by other characters summarized in the above key and in the diagnosis of related species.

FEMALE.— Length 1.5–1.7 mm, 2.2 times as long as wide; color dark brown.

Head and pronotum essentially as in *dissimilis* (Zimmermann) except anterior slope of pronotum armed by only 8–12 asperities, anterior margin armed by two teeth, posterior areas more finely, more shallowly punctured, with no indication of being strigose behind summit. Vestiture of fine hair, slender scales intermixed on posterior half.

Elytra 1.4 times as long as wide; essentially as in *dissimilis* except strial punctures on declivity slightly larger, interstrial punctures on disc finer. Vestiture with short ground cover hairlike on disc, stouter, almost scalelike on declivity, and with interstrial rows of erect scales, each erect scale on declivity two to four times as long as wide, scales two-thirds as long as distance between rows, spaced within a row by distances less than length of a scale.

MALE.— Similar to female except length 1.3–1.4 mm, 2.0 times as long as wide; differing from female as in *hirsutus*.

DISTRIBUTION.— Kansas and New York to N Florida, Texas, and Oaxaca.

USA: **Arkansas**: Hot Springs. **Florida**: Snead. **Georgia**: Barnsville, Clarke Co. **Kansas**: Kiowa. **Maryland**: "Md." **Missouri**: Iron Mt., Warrensburg. **New Jersey**: Mt. Misery. **New York**: Peekskill. **North Carolina**: Monroe, Southern Pines, Tryon. **Ohio**: Hocking Co. **Pennsylvania**: Angora, Franklin. **Tennessee**: Gatlinburg. **Texas**: Brownsville, Columbus, Dallas, Davis Mts., Devils River, Hidalgo Co., Lexington, Lopeno, Macdona, San Diego, Southmost, Victoria. **West Virginia**: Berkeley, Dellslow, Doddridge. MEXICO: **Michoacán**: Lombardia. **Nayarit**: 27 km E San Blas. **Tamaulipas**: Jiménez. **Oaxaca**: 83 km N Oaxaca. OTHER AREAS: Puerto Rico.

HOSTS.— *Carya alba, Cercis canadensis, Fagus grandifolia, Mimosa* sp., *Quercus* sp., *Prosopis* sp., *Rhamnus lanceolata*.

BIOLOGY.— As in *dissimilis*.

NOTES.— The above treatment was based on the Hopkins series of *rotundicollis*, on the holotype of *quercus*, and on 36 other specimens. The unique holotype of *rotundicollis* is lost and the exact type locality is unknown; however, Eichhoff established the synonymy with *sculpturatus*, which came from Tennessee (types also lost), and he described the type as having two marginal teeth on the pronotum and rows of erect scales on the elytra. Only one species matching this description occurs in Tennessee. Schwarz received at least 99 numbered species of Scolytidae from Eichhoff, mostly syntypes. Of these, No. 60 was "Stephanoderes setosus";

Nos. 52–59 have not been found, but one of them could have included a specimen of *sculpturatus*. Hopkins also sent some of his material to Eichhoff for identification; unfortunately, the Eichhoff labels were removed from most of them and at present there is no indication of the authority who made the identification of his specimens.

### 7. *Hypothenemus erectus* LeConte
Fig. 194

*Hypothenemus erectus* LeConte, 1876, Proc. Amer. Philos. Soc. 15:356 (Lectotype, female; Texas, by Belfrage, presumably lower Rio Grande Valley; Mus. Comp. Zool., designated by Wood, 1972, Great Basin Nat. 32:45)

*Hypothenemus validus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):228 (Holotype, female, Motzorongo, Veracruz, Mexico; British Mus. Nat. Hist.); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Stephanoderes puncticollis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:32 (Holotype, female; Tampico, Tamaulipas, Mexico; U.S. Nat. Mus., 7547); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Stephanoderes cubensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:32 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7553); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Stephanoderes brunneicollis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:33 (Holotype, female; Round Mountain, Texas; U.S. Nat. Mus., 7386); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1026. *Synonymy*

*Stephanoderes discedens* Schedl, 1950, Bull. Inst. Roy. Sci. Nat. Belgique 26(50):23 (Holotype, female; St. Thomas; Schedl Coll.); Wood, 1976, Great Basin Nat. 36:348. *Synonymy*

DIAGNOSIS.— This species is distinguished from *birmanus* (Eichhoff) by the larger average size, by the darker body color, by the more slender erect, interstrial scales, by the smaller interstrial punctures, and by the consistently 5-segmented antennal funicle.

FEMALE.— Length 1.7–2.2 mm, 2.4 times as long as wide; mature color black.

Head and pronotum as in *dissimilis* (Zimmermann) except anterior slope of pronotum armed by 15–20 coarse asperities, anterior margin armed by four teeth, lateral pair usually smaller, posterior areas irregularly reticulate, more finely punctured. Vestiture hairlike, with slender scales intermixed in posterior areas.

Elytra 1.4 times as long as wide; outline as in *hirsutus*; striae feebly if at all impressed, punctures small, close, moderately deep; interstriae about three times as wide as striae, feebly convex, almost smooth, punctures fine, rather close, confused. Declivity convex, steep; essentially as on disc. Vestiture of short ground cover, hairlike on disc, stouter, almost scalelike on declivity, and rows of erect interstrial scales; each scale on declivity four to six times as long as wide, slightly shorter than distance between rows, spaced within a row by distance less than length of a scale.

MALE.— Similar to female except 1.5–1.7 mm, 2.0 times as long as wide; differing from female as in *hirsutus*.

DISTRIBUTION.— S Texas and Cuba to Honduras, Venezuela, and Africa.

USA: **Texas**: Brownsville, Corpus Cristi, Davis Mts., Fuller, Hidalgo Co., Laguna, Montell, Round Mountain, San Diego, Southmost, Victoria. MEXICO: **Chiapas**: Ocosingo, Ocozocoautla. **Colima**: 3 km E Armeria, 24 km W Armeria, 6 km S Cihuatlán. **Hidalgo**: 25 km N Ixmiquilpan. **Jalisco**: 8 km S Atenquique, Volcán Colima. **Nayarit**: Los Corchos, 48 km N Tepic, 8 km S Rosamorada, 48 km N Rosamorada, San Blas. **Nuevo León**: Chapinque, Monterrey. **Puebla**: 5 km S Matamoros. **Queretaro**: Landa de Matamoros. **San Luis Potosí**: El Salto. **Sinaloa**: **Mazatlán, Villa Union. Tamaulipas**: Encinal, Tampico. **Veracruz**: Cerro Gordo, 12 km E Huatusco, 35 km SE Jalapa, Matías Romero, Motzorongo, Orizaba, Sontecampan. HONDURAS: Zamorano. VENEZUELA: Barrancas, Merida.

HOSTS.— *Condalia* sp., *Ficus* sp., *Inga* sp., *Miconia* sp., *Mimosa* spp., *Prosopis* sp., *Rubus* sp., *Serjania* sp., *Toxicondendron* sp., *Verbisina agricolorum*, *Vismia* sp.

BIOLOGY.— As in idissimilis.

NOTES.— The above treatment was based on the lectotype of *erectus*, on the holotypes of *validus*, *puncticollis*, *cubensis*, *discedens*, and *brunneicollis*, and on 223 other specimens. Because LeConte's species was based on two female syntypes bearing identical data, I here designate the one remaining syntype in the LeConte collection and bearing the type label as the lectotype of *Hypothenemus erectus* LeConte.

A cotype of *Stephanoderes sambesianus* Eggers, in the Eggers collection at the U.S. National Museum, appears to be conspecific with *erectus*; S. *mozambiquensis* Eggers (three cotypes) and S. *dispar* Eggers (one cotype) are doubtfully distinct. These specimens, the absence of closely related native species in America, and the distribution patterns in America, with little or no geographical variation, strongly suggest an African

origin of this species. Nevertheless, additional African material should be studied before Eggers's names are placed in synonymy.

### 8. *Hypothenemus birmanus* (Eichhoff)

Figs. 192, 194

*Triarmocerus birmanus* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:486 (Syntypes?, female; Birma; presumably lost with Hamburg Mus.); Schedl, 1942, Bishop Mus. Bull. 172:148 (Compared type to available specimen)

*Stephanoderes birmanus*: Wood, 1960, Insects of Micronesia 18(1):35

*Hypothenemus maculicollis* Sharp, 1879, Trans. Roy. Ent. Soc. London 77:101 (Syntypes; Oahu, Hawaiian Islands; British Mus. Nat. Hist.); Wood, 1972, Great Basin Nat. 32:43. *Synonymy*

*Stephanoderes perkinsi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:31 (Holotype, female; Honolulu, Hawaii; U.S. Nat. Mus., 7594); Wood, 1972, Great Basin Nat. 32:43. *Synonymy*

*Stephanoderes stereuliae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:32 (Holotype, female; Calapan, Philippine Islands; U.S. Nat. Mus., 7551); Wood, 1972, Great Basin Nat. 32:43. *Synonymy*

*Stephanoderes psidii* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:32 (Holotype, female; Calapan, Philippine Islands; U.S. Nat. Mus., 7552); Wood, 1972, Great Basin Nat. 32:43. *Synonymy*

*Stephanoderes alter* Eggers, 1923, Zool. Meded. Roy. Mus. Nat. Hist. Leyden 7:219 (Syntypes, females; New Guinea and Australia; Museo Civico Genova and U.S. Nat. Mus.); Wood, 1960, Insects of Micronesia 18(1):35. *Synonymy*

*Stephanoderes pacificus* Beeson, 1940, Bishop Mus. Occas. Papers 15(18):197 (Holotype, female; Henderson Island; Bishop Mus.); Wood, 1960, Insects of Micronesia 18(1):35. *Synonymy*

*Stephanoderes castaneus* Wood, 1954, Univ. Kansas Sci. Bull. 36:1027 (Holotype, female; Homestead, Florida; Snow Ent. Mus., Univ. Kansas); Wood, 1960, Insects of Micronesia 18(1):35. *Synonymy*

DIAGNOSIS.— This species is distinguished from *erectus* (LeConte) by the smaller average size, by the reddish brown body color, by the stouter, erect interstrial scales, by the coarser interstrial punctures, and by the variable segmentation of the antennal funicle.

FEMALE.— Length 1.5–2.1 mm (maximum American size 1.8 mm), 2.3 times as long as wide; mature color reddish brown.

Head and pronotum as in *erectus* except antennal funicle variable, 3- to 5-segmented; pronotal asperities number 16–22, averaging smaller.

Elytra as in *erectus* except strial punctures larger, interstrial punctures larger and less numerous, tending to be uniseriate, and interstrial scales stouter and usually slightly shorter and closer, each scale about two to four times as long as wide.

MALE.— Similar to female except length 1.3–1.5 mm, 2.1 times as long as wide, differing from female as indicated for *hirsutus*.

DISTRIBUTION.— Florida to Panama, Hawaii to S Asia.

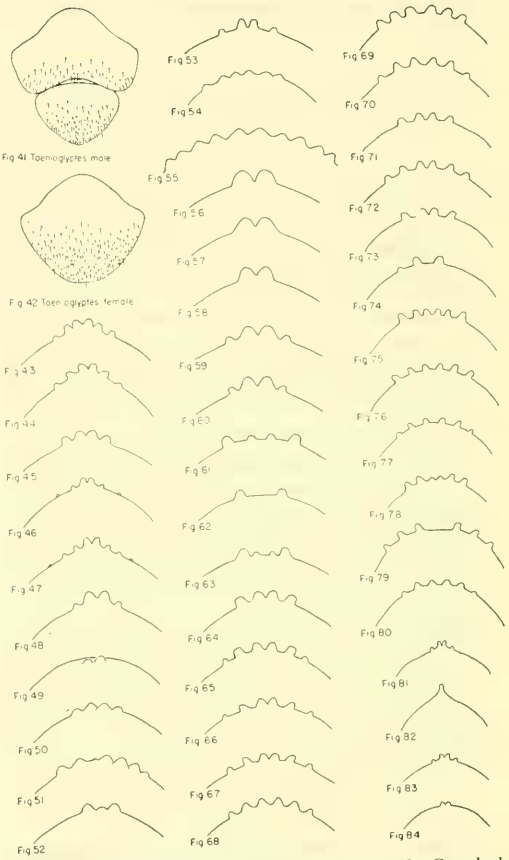



Fig. 194. Cryphalini spp., characters: 41, *Cryphalus pubescens*, male terga 7 and 8, 42, same, female tergum 7 (tergum 8 not visible); 43–84, anterior margin of pronotums; 43, *Trypophloeus striatulus*; 44, *Trypophloeus salicis*; 45, *Trypophloeus populi*; 46–47, *Procryphalus utahensis*; 48, *Procryphalus mucronatus*; 49, *Scolytogenes knabi*; 50–52, *Cryphalus ruficollis ruficollis*; 53, *Hypocryphalus mangiferae*; 54, *Cryptocarenus heveae*; 55, *Cryptocarenus seriatus*; 56, *Hypothenemus hirsutus*; 57, *Hypothenemus dissimilis*; 58, *Hypothenemus rotundicollis*; 59, *Hypothenemus erectus*; 60, *Hypothenemus birmanus*; 61, *Hypothenemus javanus*; 62–63, *Hypothenemus brunneus* variations; 64–65, *Hypothenemus interstitialis* variations; 67, *Hypothenemus squamosus*; 66, 68–72, *Hypothenemus seriatus*; 73–74, *Hypothenemus sparsus*; 75–76, *Hypothenemus californicus*; 77, *Hypothenemus eruditus*; 78, *Hypothenemus pubescens*; 79, *Hypothenemus gossypii*; 80, *Hypothenemus columbi*; 81, *Hypothenemus distinctus*; 82, *Hypothenemus miles*; 83, *Trischidias atoma*; 84, *Trischidias minutissima*. (After Wood 1954:1087.)

USA: **Florida**: Everglades N.P., Homestead, Key Largo, Miami, Perrine, Royal Palm Hammock St. Pk., Matheson Hammock in Dade Co. MEXICO: **Colima**: Isla Clarion. COSTA RICA: Playón. PANAMA: Canal Zone: Summit Gardens. OTHER AREAS: Burma, Celebes, Sri Lanka (Ceylon), Hawaii, India, Jamaica, Java, Malaya, Micronesia, New Guinea, Philippine Islands, Sarawak, Sumatra, Thailand.

HOSTS.— *Achras sapota, Adenanthera pavonia, Annona* sp., *Ardesia paniculata, Cassia florida, Dalbergia gastrophyllum, Eugenia buxifolia, Ficus aurea, Mangifera indica, Ocotea catesbyona, Persea borbonia, Phelocarpus septrionalis, Quercus* sp., *Rhizophora mangle, Trema floridana, Vitis* sp.

BIOLOGY.— As in *dissimilis.*

NOTES.— The above treatment was based on syntypes of *alter* and *maculicollis*, on the holotypes of *perkinsi, sterculiae, psidii, pacificus*, and *castaneus*, and on 191 other American specimens. The type of *birmanus* evidently is lost, but it was compared by Schedl (1942:148) to two specimens now in the Bishop Museum and found to differ only in size. Specimens from Java, Borneo, and Malaya vary considerably more in size than do those from America; specimens there commonly attain a length of 2.1 mm (the type was 2.0 mm). The largest American specimens are 1.8 mm.

In some areas the antennal funicle is almost invariably 3-segmented; in an adjacent area it may be consistently 5-segmented. Occasional populations contain a mixture of 3-, 4-, and 5-segmented structure, with some individuals exhibiting at least one incompletely divided segment.

### 9. *Hypothenemus trivialis* Wood

*Hypothenemus trivialis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):20 (Holotype, female; Santa Ana, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *bolivianus* Eggers by the smooth, shining elytral disc and smoother pronotal disc, by the more slender, slightly longer interstrial bristles, and by the much more strongly confused punctures and bristles on interstriae 2 and 3 on the basal half of the disc.

FEMALE.— Length 1.5–1.8 mm, 2.2 times as long as wide; color black.

Frons convex; a small, median impression at upper level of eyes; surface rather finely rugose-reticulate, except smooth and shining in median area from epistoma to impression.

Pronotum 0.90 times as long as wide; widest on basal third, sides rather strongly, arcuately converging to rather narrowly rounded anterior margin; anterior margin armed by four teeth, lateral pair smaller; anterior slope armed by more than 35 moderately large asperities; posterior areas subreticulate, shining, granulate behind summit, granules sparse and intermixed with fine, shallow punctures laterally. Vestiture of hair, intermixed in posterior areas with slender scales.

Elytra 1.4 times as long as wide; outline as in related species; striae not impressed, punctures moderately large, shallow, their inner surfaces reticulate-granulate; interstriae smooth, shining, twice as wide as striae, punctures fine, uniseriate on 1 and 4–10, confused on 2 and 3 except near declivity. Declivity commencing near middle of elytra, rather gradual, convex; striae weakly impressed, punctures smaller, deeper; interstriae weakly convex, punctures uniseriate, finely granulate. Vestiture of rows of minute, fine, strial hair, and rows of erect interstrial bristles; each bristle slightly longer than distance between rows or between bristles within a row; each bristle on disc slightly flattened, usually not flattened on declivity.

DISTRIBUTION.— Veracruz to Colombia and Venezuela.

MEXICO: Veracruz: Matías Romero. COSTA RICA: Beverley and Pandora in Limón, Cañas in Guanacaste, Finca Gromaco on Río Coto Brus and Rincon de Osa in Puntarenas, Río Damitas in the Dota Mts., and Santa Ana in San José. PANAMA: Canal Zone: Barro Colorado Island, Ft. Clayton, Paraíso, Summit. OTHER AREAS: Colombia, Venezuela.

HOSTS.— *Cuparia guatemalensis, Ochroma* sp., *Serjania* sp., and *Vismia guianensis.*

BIOLOGY.— As in *dissimilis.*

NOTES.— The above treatment was based on the type series of 53 specimens and on 17 other specimens. The elytral bristles in specimens from Mexico are distinctly shorter and broader than those from the southern areas.

### 10. *Hypothenemus interstitialis* (Hopkins)

Fig. 194

*Stephanoderes interstitialis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:28 (Holotype, female; Victoria, Texas; U.S. Nat. Mus., 7555)

*Stephanoderes interpunctus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:28 (Holotype, female; Brownsville, Texas; U.S. Nat. Mus., 7378); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1033. *Synonymy*

*Stephanoderes approximatus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:29 (Holotype, female; Columbus, Texas; U.S. Nat. Mus., 7381); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1033. *Synonymy*

*Stephanoderes flavescens* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:29 (Holotype, female; Tallahassee, Florida; U.S. Nat. Mus., 7536); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1033. *Synonymy*

*Stephanoderes obliquus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:30 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7538); Wood, 1972, Great Basin Nat. 32:48. *Synonymy*

*Stephanoderes opacipennis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:30 (Holotype, female; District of Columbia; U.S. Nat. Mus., 7540); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1033. *Synonymy*

*Stephanoderes quadridentatus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:30 (Holotype, female; District of Columbia; U.S. Nat. Mus., 7383); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1033. *Synonymy*

DIAGNOSIS.— This species is more likely to be confused with *seriatus* (Eichhoff) than with other American species, but it is distinguished by the stouter body, by the much more slender elytral scales and, usually, by the smaller number of teeth arming the anterior margin of the pronotum.

FEMALE.— Length 1.5–1.7 mm, 2.3 times as long as wide; body color dark brown to almost black, vestiture pale.

Head and pronotum essentially as in *trivialis* Wood except posterior area less granular, scales broader.

Elytra 1.4 times as long as wide; outline about as in *hirsutus*; striae not impressed, punctures moderately large, rather deep; interstriae almost smooth, as wide as striae, punctures uniseriate, fine, not granulate. Declivity limited to posterior third, steep, convex; striae feebly impressed; interstrial punctures indistinctly, finely granulate. Vestiture of rows of minute, obscure, fine strial hair, and rows of erect interstrial bristles; bristles slender, spaced within a row and between rows by distances slightly less than length of a declivital bristle, those on disc slightly shorter and more strongly flattened, less than six times as long as wide, those on declivity more than eight times as long as wide.

MALE.— Similar to female except 1.1–1.2 mm, 2.1 times as long as wide; differing from female as in *hirsutus*.

DISTRIBUTION.— Connecticut and Kansas to Florida and Costa Rica.

USA: **Alabama**: Mobile, Theodore. **Connecticut**: Brandford, Hamden. **District of Columbia**: "DC." **Florida**: Dade City, Dunedin, Gainesville, Jacksonville, La Belle, Monticello, Oleno St. Pk., Sanford, Sebring, Snead, Suwannee Springs. **Georgia**: Atlanta, Brunswick, Millner. **Illinois**: East St. Louis, Lawrenceville. **Kansas**: Laurence. **Kentucky**: Williamsburg. **Louisiana**: Baton Rouge, Boothville, Covington, Krotz Springs, New Orleans, St. Bernard. **Maryland**: Bladenburg, Plummer's Island. **Mississippi**: Corinth, Meridian, Nicholson, Trimcane Swamp, Vicksburg. **New Jersey**: Camden, Westville. **North Carolina**: Aberdeen, Black Mts., Cherokee, Monroe. **Pennsylvania**: Allegheny, Essington, Frankford, Philadelphia. **South Carolina**: Awendaw, Jacksonboro. **Tennessee**: Gatlinburg. **Texas**: Brownsville, Columbus, Dallas, Victoria. **Virginia**: Blacksburg, Cape Henry, Loudoun Co., Mt. Vernon. **West Virginia**: Morgantown. MEXICO: **Chiapas**: 21 km N Ocozoautla, 15 km SE Teopisca. **Nayarit**: Los Corchos, 48 km N Rosamorada. **Veracruz**: Cerro Gordo, 28 km E Coatzocoalcos, Cotaxtla, 14 km E Huatusco, 5 km W Jáltipan. GUATEMALA: Volcán de Agua. HONDURAS: Zamorano. COSTA RICA: San Isidro del General. PANAMA: Porto Bello. OTHER AREAS: Jamaica.

HOSTS.— *Acer rubrum*, *Aesculus* sp., *Carya* spp., *Cercis canadensis*, *Fagus grandifolia*, *Ficus* sp., *Liquidambar styracifla*, *Magnolia* sp., *Miconia* sp., *Mimosa* sp., *Morus rubra*, *Ocotea catesbyana*, *Persea borbonia*, *Picea* sp., *Prosopis* sp., *Quercus* spp., *Rhododendron* sp., *Rhus* spp., *Serjania* sp., *Vismia* sp., *Vitis* spp.

BIOLOGY.— Essentially as in *dissimilis*.

NOTES.— The above treatment was based on the holotypes of *interstitialis*, *interpunctus*, *approximatus*, *flavescens*, *obliquus*, *opacipennis*, and *quadridentatus*, and on 96 other specimens.

Variation throughout the range is slight except for the one specimen seen from Costa Rica. It is rather small and has the interstrial bristles slightly wider than those from elsewhere. An analysis of the significance of this variation must await the examination of additional specimens from the area south of Honduras.

### 11. *Hypothenemus hampei* (Ferrari)

*Cryphalus hampei* Ferrari, 1867, Die Forst.- und Baumzuchtschädlichen Borkenkäfer, p. 11, 12 (Syntypes, female; "Gallia," in coffee beans; apparently in Vienna Mus.)

*Stephanoderes coffeae* Hagedorn, 1910, Ent. Blätt. 6:1 (Syntypes, female; Entebbe, Uganda, Zentralafrika, Angola; British Mus.); Hagedorn, 1912, Ent. Blätt. 8:40. *Synonymy*

*Xyleborus coffeivorus* van der Weele, 1910, Teysmannia Batavia 21:308–316, also in Buitenzorg Bull. Dept. Agric. Indes Neerl. 35:1–6 (Syntypes?, Java); Strohmeyer, 1910, Ent. Blätt. 6:186. *Synonymy*

*Stephanoderes cooki* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:27 (Holotype, female; Mount Coffee, Liberia; U.S. Nat. Mus., 7592); Schedl, 1959, Trans. Ent. Soc. London 11:485. *Synonymy*

*Xyleborus cofeicola* Campos Novaes, 1922, Bol. Agric. Sao Paulo 23:67 (Not seen); Costa Lima, 1924, Chacaras e Quintaes 30:316. *Synonymy*

*Stephanoderes punctatus* Eggers, 1924, Ent. Blätt. 20:101 (Lectotype; Eala, Congo; U.S. Nat. Mus., 60, 160, by Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:27); Wood, 1972, Great Basin Nat. 32:48. *Synonymy*

DIAGNOSIS.— This species is distinguished from *obscurus* (Fabricius) by the brightly shining elytral surface, by the slightly longer, more widely spaced, much more slender elytral bristles, by the slightly larger average size, and by other characters indicated below.

FEMALE.— Length 1.4–1.7 mm, 2.3 times as long as wide; mature color black.

Frons and pronotum as in *obscurus* except pronotal disc not reticulate, more nearly shining. Elytra as in *obscurus* except interstriae smooth, brightly shining (centers of strial punctures usually reticulate as in *obscurus*); interstrial bristles slender, each at least eight times as long as wide, spaced between rows by length of a bristle, spaced within a row by a slightly smaller distance.

MALE.— Dwarfed as in male *obscurus* but otherwise similar to female.

DISTRIBUTION.— Guatemala, Jamaica, Colombia, Brazil, Micronesia, Philippines, Indonesia, Africa.

GUATEMALA: Parts of Escuintla, Retalhulen, Sololá, and Suchitepequez provinces. HONDURAS: Several localities.

HOSTS.— Coffee beans.

BIOLOGY.— Only the fruits (berries) of coffee are attacked. Previously mated females bore into green fruits near the stem. A small cavity is excavated where up to 120 eggs may be deposited in one fruit. The larvae extend the parental tunnel as they consume the bean. Pupation and emergence are followed by mating with the flightless sibling males inside the brood chamber. It is not entirely clear whether the mated females spend the remainder of the year in the brood chamber in fruit on the ground, emerge to infest unpicked fruit hanging on the plant, or estivate in litter in and near the plantation area. Apparently only one generation occurs each year. In severe infestations losses can be as high as 100 percent.

### 12. *Hypothenemus dolosus* Wood

*Hypothenemus dolosus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):21 (Holotype, female; Pandora, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *opacus* (Eichhoff) by the absence of pits behind the asperities on the pronotal summit, by the more coarsely, deeply punctured pronotal disc, by the smooth, shining elytral surface, and by the absence of scalelike setae on the pronotum.

FEMALE.— Length 1.6–1.7 mm, 2.3 times as long as wide; color dark brown to black.

Head and pronotum as in *opacus* except asperities at pronotal summit not associated with deep pits; some punctures between summit and base form deep pits but without associated asperities; posterolateral areas subshining, deeply, closely, coarsely punctured. Vestiture all hairlike.

Elytra as in *opacus* except surface of interstriae smooth, shining; punctures on discal interstriae 2 usually uniseriate; declivital surface minutely granulate.

DISTRIBUTION.— Veracruz to Costa Rica.

MEXICO: Chiapas: 21 km N Ocozocoautla, 2-VII-69, D. E. Bright. Veracruz: Dos Amates, 5-V-69, Lago Catemaco, 13-V-69, 16 km N Sontecompana, 20-VI-69, all by D. E. Bright. HONDURAS: La Lima, Cortéz, 5-V-64, 200 m, No. 575, *Swietenia*, S. L. Wood. COSTA RICA: Pandora, Limón, 23-VIII-63, 50 m, No. 140, *Mimosa*, S. L. Wood.

HOSTS.— *Mimosa* sp., and *Swietenia* sp.

BIOLOGY.— Essentially as in *dissimilis*.

NOTES.— The above treatment was based on the type series of 13 specimens and on 12 other specimens.

### 13. *Hypothenemus opacus* (Eichhoff)

*Stephanoderes opacus* Eichhoff, 1872, Berliner Ent. Zeitschr. 15:132 (Lectotype, female; Nov. Grenada; Institute Royal de Sciences Naturelles, Brussels, present designation)

DIAGNOSIS.— This species is distinguished from *bolivianus* Eggers by the much more broadly rounded pronotal summit, with smaller, more numerous asperities, by the small circular pit behind each asperity at the

summit (these normally fill with boring dust and resemble recumbent, white scales), and by the slightly stouter interstrial scales.

FEMALE.— Length 1.6–1.9 mm, 2.3 times as long as wide; color dark brown to almost black.

Head as in *bolivianus* and related species.

Pronotum 0.90 times as long as wide; widest one-third length from base, sides moderately arcuate, rather broadly rounded in front; anterior margin armed by six teeth, median pair largest, lateral pair minute; summit very broadly rounded, with numerous very fine asperities in summit area, a moderately large, subcircular pit behind each, pits normally filled with white boring dust; posterior areas minutely granulate, with several granules behind summit, fine, shallow punctures in remaining areas. Vestiture hairlike, with slender scales intermixed only in posterior areas.

Elytra 1.4 times as long as wide; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae distinctly impressed, punctures small, shallow, usually obscure; interstriae convex, minutely rugose, twice as wide as striae, punctures small, rather obscure, uniseriate except moderately confused on 2 and 3. Declivity convex, rather steep; essentially as on disc, all interstrial punctures uniseriate. Vestiture of rows of minute strial hair and rows of erect scales; each scale as long as distance between rows, more closely spaced within a row, each about four to six times as long as wide.

MALE.— Similar to female except 1.5 mm, 2.1 times as long as wide; eye reduced in size; pits on pronotal summit partly or entirely absent; interstrial scales slightly longer, more slender.

DISTRIBUTION.— Costa Rica to Colombia and Venezuela.

COSTA RICA: Beverley, Dominical, Finca Gromaco on Río Coto Brus, Guápiles, Playón, Rincón de Osa, Río Damitas in Dota Mts., San Isidro del General, Tapantí. PANAMA: Concepción, Paraíso, Porto Bello. OTHER AREAS: Colombia, Venezuela.

HOSTS.— *Calliandra confusa*, *Cassia* sp., *coffea aribica*, *Inga* sp., *Mimosa* spp., *Nectandra* sp., *Ochroma* sp., *Protium* sp., and *Tovomita guianensis*.

BIOLOGY.— Essentially as in *dissimilis*.

NOTES.— The above treatment was based on the two syntypes in the Chapuis collection at Brussels and on 109 other specimens. The first syntype in the Chapuis collection is here designated as the lectotype of *Stephanoderes opacus* Eichhoff.

Because at least one cotype of *Stephanoderes bolivianus* Eggers in the Schedl collection is a misidentified specimen of *opacus*, one might expect to find other material of this species incorrectly placed as a result of that error. The holotype of *bolivianus* is quite different.

### 14. *Hypothenemus squamosus* (Hopkins)

Fig. 194

*Stephanoderes squamosus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:26 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7566)

DIAGNOSIS.— This species is distinguished from *solocis* Wood by the more broadly convex elytral declivity, with the apical costal margin not strongly elevated, and by the smaller interstrial granules on the declivity that are equally developed on all interstriae.

FEMALE.— Length 1.3–1.5 mm, 2.3 times as long as wide; color dark brown to almost black.

Head and pronotum essentially as in *interstitialis*, except asperities slightly smaller; anterior margin armed by six teeth; posterior areas reticulate-granulate, punctures fine, obscure. Vestiture in posterior areas of fine, short hair intermixed with rather broad scales, each scale slightly more than twice as long as wide.

Elytra 1.5 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather broadly rounded behind; striae slightly impressed toward declivity, punctures small, moderately deep; interstriae almost twice as wide as striae, somewhat rugose, punctures moderately large, uniseriate, feebly vulcanate at base, more strongly vulcanate toward declivity. Declivity very broadly convex, rather steep; striae rather strongly, narrowly impressed, punctures obscure; interstriae distinctly convex, with close, subvulcanate, squamiferous granules; interstriae 9 rather weakly elevated from 3 to suture. Vestiture of rows of minute strial hair and rows of longer, erect, interstrial scales; scales on declivity twice as long as on disc, each declivital scale as long as distance between rows,

spaced within a row by half that distance, each two to four times as long as wide; scales in ventrolateral area of declivity much longer.

MALE.— Similar to female except 0.90–1.15 mm, 2.3 times as long as wide; eye reduced in size, one or more teeth missing from anterior margin of pronotum; elytral declivity not as steep; sculpture not as sharply defined.

DISTRIBUTION.— S Florida, Tamaulipas, Veracruz, Colima, and Cuba.

USA: **Florida**: Everglades N.P., Key Largo, Matecumbe Key. MEXICO: **Colima**: 3 km W Armeria. **Tamaulipas**: Encinal. **Veracruz**: Cerro Gordo, Huatusco, 3 km S Rinconada, 24 km W Veracruz. CUBA: Cayamas.

HOSTS.— *Ardisia paniculata, Dipholis salicifolia, Galactia spiciformis, Ichthyomethia communis, Lysiloma bahamensis, Parthenocissus quinquefolia, Phoradendron* sp., *Pithecellobium unguis-cati, Serjania* sp., *Torrubia longifolia, Vismia* sp.

BIOLOGY.— Essentially as in *dissimilis*.

NOTES.— The above treatment was based on the holotype of *squamosus* and on 51 other specimens. Specimens from Colima have the scales on the elytral declivity slightly shorter than those from Florida, but the transition is gradual and apparently indicates nothing more than a cline within a continuous distribution.

## 15. *Hypothenemus solocis* Wood

*Hypothenemus solocis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):21 (Holotype, female; 3 km or 2 miles W Armeria, Colima, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *squamosus* Hopkins by the more strongly impressed discal striae, by the slightly larger interstrial tubercles on both disc and declivity, by the more narrowly convex declivity with the costal margin near the apex much more strongly elevated, and by the reduction in size of tubercles toward the apices of interstriae 2, 4, 5, 6, and 8.

FEMALE.— Length 1.3–1.5 mm, 2.3 times as long as wide; color dark reddish brown.

Head and pronotum as in *squamosus* except surface of posterior areas more coarsely granulate.

Elytra 1.5 times as long as wide; sides almost straight and parallel on basal two-thirds, distinctly constricted near middle of declivity, rather narrowly rounded behind; striae distinctly impressed, punctures moderately large, shallow, indistinct; interstriae as wide as striae, distinctly convex, entire surface granulate, punctures uniseriate, granulate. Declivity rather narrowly convex, steep; interstriae more narrowly convex, particularly 1 and 3, granules larger except obsolete toward apices of 2, 4, 5, 6, and 8, posterior part of 9 with costal margin rather strongly elevated. Vestiture of rows of minute, fine, strial hair, and rows of erect, interstrial scales; each scale on declivity slightly shorter than distance between rows, slightly longer than distance between scales within a row, each about two to three times as long as wide.

DISTRIBUTION.— Sinaloa to Colima.

MEXICO: **Colima**: 3 km W Armeria, 28-VI-65, 70 m, No. 135, *Phoradendron*, S. L. Wood. **Nayarit**: 27 km E San Blas, 25-VII-53, S. L. Wood; Los Corchos, 10-VII-65, 7m, No. 206, tree branch, S. L. Wood; 48 km N Tepic, 11-VII-65, 500 m, No. 226 in *Inga*, No. 228 in iSerjania, S. L. Wood; 8 km S Río Santiago Ferry, 27-XI-48. **Sinaloa**: Concha, 20-VII-53, 15 m, S. L. Wood.

HOSTS.— *Inga* sp., *Phoradendron* sp., *Serjania* sp.

BIOLOGY.— Presumably as described for *dissimilis*.

NOTES.— The above treatment was based on the type series of 10 female specimens.

## 16. *Hypothenemus crudiae* (Panzer)

*Bostrichus crudiae* Panzer, 1791, Naturforscher 25:35–38 (Syntypes; India occidentali; presumably lost)

*Bostrichus plumeriae* Nördlinger, 1856, Nachtr. Ratzeburgi Forstinsekten, p. 74 (Syntypes; Venezuela) (Probable synonymy based on specimens determined by Eggers); Wood, 1972, Great Basin Nat. 32:44. *Synonymy*

*Cryphalus hispidulus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:156 (*Syntypes*; District of Columbia, Georgia, Louisiana; Mus. Comp. Zool.); Eichhoff, 1896, Proc. U.S. Nat. Mus. 18:608. *Synonymy*

*Hypothenemus nanus* Hagedorn, 1909, Deutsche Ent. Zeitschr. 1909:744 (Syntypes, female; Argentina; La Plata); Schedl, 1952, Ent. Blätt. 47–48:162. *Synonymy*

*Stephanoderes differens* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:25 (Holotype, female; San Bernardino, Paraguay; U.S. Nat. Mus., 7541); Wood, 1972, Great Basin Nat. 32:44. *Synonymy*

*Stephanoderes guatemalensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:26 (Holotype, female; Treces Aguas, Alta Verapaz, Guatemala; U.S. Nat. Mus., 7380); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1041. *Synonymy*

*Stephanoderes brasiliensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:26 (Holotype, female; Perambuco, Brazil; U.S. Nat. Mus., 7372); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1041. *Synonymy*

*Stephanoderes paraguayensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:26 (Holotype, female; San Bernardino, Paraguay; U.S. Nat. Mus., 7377); Wood, 1972, Great Basin Nat. 32:44. *Synonymy*

*Stephanoderes lecontei* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:27 (Holotype, female; Jefferson County, West Virginia; U.S. Dept. Agric., 7357); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1041. *Synonymy*

*Stephanoderes polyphagus* Costa Lima, 1924 (nec Eggers, 1924), Chac. Quint. 30:316 (not seen); Wood, 1972, Great Basin Nat. 32:44. *Synonymy*

*Stephanoderes fallax* Costa Lima, 1924, Chac. Quint. 30:414 (Replacement name for *polyphagus* Costa Lima)

*Stephanoderes largipennis* Piza Junior, 1924, Rev. Soc. Rur. Brasileira 5:354 (Syntypes?, Brazil); Costa Lima, 1925, Bol. Minist. Agric. Río de Janeiro 14:197. *Synonymy*

*Stephanoderes uniseriatus* Eggers, 1924, Ent. Blätt. 20:103 (Lectotype, female; Luebo, Congo, U.S. Nat. Mus., 60169, designated by Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:35); Wood, 1972, Great Basin Nat. 32:44. *Synonymy*

*Stephanoderes hivaoca* Beeson, 1935, Bull. Bishop Mus. 142:105 (Holotype, female; Tahauku, Hivaoa, Marquesas Islands; Bishop Mus.); Wood, 1972, Great Basin Nat. 32:44. *Synonymy*

*Stephanoderes lebronneci* Beeson, 1935, Bull. Bishop Mus. 142:104 (Syntypes; Tahuata and Uapou, Marquesas Islands; Bishop Mus.); Wood, 1972, Great Basin Nat. 32:44. *Synonymy*

*Stephanoderes hawaiiensis* Schedl, 1941, Proc. Hawaiian Ent. Soc. 11:112 (Syntypes?, female; Oahu, Honolulu; Bishop Mus.?); Wood, 1960, Insects of Micronesia 18(1):38. *Synonymy*

DIAGNOSIS.— This abundant, widespread, economically important species is distinguished from *seriatus* (Eichhoff) by the shallowly concave lower frons (concave on longitudinal axis only), by the presence of a small, often poorly developed median tubercle at upper level of eyes, this tubercle partly incised on lower side by a median groove of variable length, and by the somewhat more slender interstrial scales.

FEMALE.— Length 1.4–1.6 mm, 2.3 times as long as wide; color dark brown to almost black, vestiture pale.

Frons convex except shallowly impressed in median area, weakly concave on longitudinal axis from upper level of eyes to epistoma, a weak to moderately strong median tubercle at upper level of eyes, a median groove commencing at summit of tubercle and extending about half distance to epistomal margin (variable); surface strongly rugose-reticulate above, becoming more nearly punctate toward epistoma; vestiture inconspicuous.

Pronotum 0.93 times as long as wide; widest one-third of length from base, sides moderately arcuate, gradually converging to rather broadly rounded anterior margin; anterior margin armed by four to eight coarse teeth of about equal size; summit at middle, rather high; asperities on anterior slope abundant, rather small for this genus; posterior area subreticulate, small, isolated, rather numerous granules behind summit, granules smaller and intermixed with a few shallow punctures in lateral areas. Vestiture hairlike, in posterior areas with a few scales intermixed.

Elytra 1.5 times as long as wide; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae feebly if at all impressed, punctures rather coarse, moderately deep; interstriae as wide as striae, almost smooth, punctures fine, uniseriate, usually feebly granulate, particularly toward declivity. Declivity convex, steep; essentially as on disc. Vestiture of rows of minute recumbent strial hair and rows of erect interstrial scales; each scale almost as long as distance between rows, slightly closer within a row, each two to three times as long as wide, not noticeably longer laterally.

MALE.— Similar to female except 1.0–1.1 mm, 2.2 times as long as wide; eye reduced in size; pronotal teeth often reduced in number; elytral declivity not as steep; striae and other features less precisely formed; pubescence longer, more slender.

DISTRIBUTION.— SE United States to Argentina, Hawaiian Islands, Micronesia, and Africa.

USA: Alabama, Arkansas, District of Columbia, Florida, Georgia, Indiana, Kansas, Kentucky, Louisiana, Maryland, Mississippi, New Jersey, New York, North Carolina, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia. MEXICO: Chiapas, Colima, Jalisco, Michoacán, Oaxaca, San Luis Potosí, Tamaulipas, Veracruz. CENTRAL AMERICA: Guatemala, Honduras, Nicaragua, Costa Rica, Panama. OTHER AREAS: Argentina, Brazil, British Guiana, Colombia, Congo, Cuba, Ecuador, Ghana, Hawaiian Islands, Marquesas Islands, Micronesia, Paraguay, Puerto Rico, Trinidad, Venezuela, West Indies (Grenada).

HOSTS.— *Abutilon mollissimum*, *Acacia farnesiana*, *A.* sp., *Achras sapota*, *Adenanthera pavonina*, *Aloe vera*, *Astragalus* sp.,

*Bauhinia grandiceps, B. krugi, Betula* sp., *Bidens pilosa, Bignonia* sp., *Boehmeria scabra, Bucida buceras, Bursera* sp., *Carya* spp., *Cassia nodosa, Cinnamomum camphora, Citrus* sp., *Clerodendron squamatum, Crataegus* sp., *Dalbergia ecastophyllum, Derris* sp., *Dioclea megacarpa, Diphysia robinioides, Ficus* spp., *Glycine max, Grewia asiatica, Inga* spp., *Juglans nigra, Magnolia* sp., *Malus* spp., *Mangifera indica, Morus rubra, Passiflora latifolia, Phalocarpus septentrionis, Pinus taeda, Prunus persica, Quercus* spp., *Quisqualis indica, Rhizophora mangle, Richinus communus, Schleichere trijuga, Serjania racemosa, Sida rhombifolia, Smilax* sp., *Theobroma cacao, Wisteria* sp., *Yucca* sp.

BIOLOGY.— Specimens of this abundant and important species may attack small branches, twigs, vines, weeds, or other plants, where gallery systems similar to those of *dissimilis* are formed, or they may attack a wide variety of seeds, pods, or other fruiting bodies, where slightly modified galleries are formed. The broad host range, high fecundity, and ability to spread through commerce have made this species economically important in tropical and subtropical agriculture. Its importance in forestry apparently is limited to its effect on seed production.

NOTES.— The above treatment was based on the holotypes of *differens, guatemalensis, brasiliensis, paraguayensis, lecontei,* and *hivaoea,* on syntypes of *hispidulus, hawaiiensis, polyphagus,* and *libroneci,* on the lectotype *uniseriatus,* and on Eggers's specimens of *crudiae* and *plumeriae* (Eggers had the opportunity to see these type series, but whether he did or did not is not known). In all, 478 pinned specimens were examined, as well as several hundred in alcohol.

In general, specimens from southern South America have the frontal tubercle very poorly developed or almost absent and the transverse impression on the lower half of the frons may be poorly developed. Material from the Pacific islands usually has the frontal groove rather short and broad. These characters in series from both areas tend to be more variable than in material from other regions.

### 17. *Hypothenemus obscurus* (Fabricius)

*Hylesinus obscurus* Fabricius, 1801, Systema Eleuth. 2:395 (Lectotype, female; Essequibo, British Guiana, published as Americae meridionalis; Copenhagen Mus., designated by Wood, 1972, Great Basin Nat. 32:49)

*Stephanoderes asperulus* Eichhoff, 1872, (nec LeConte, 1868), Berliner Ent. Zeitschr. 15:133 (Lectotype, female; in *Cassia,* from northern South American; Institut Royal des Sciences Naturelles, Brussels, present designation); Wood, 1977, Great Basin Nat. 37:513. *Synonymy*

*Stephanoderes cassiae* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:152 (Replacement name for *asperulus* Eichhoff); Wood, 1977, Great Basin Nat. 37:513. *Synonymy*

*Hypothenemus künnemanni* Reitter, 1902, Wiener Ent. Zeit. 21:140 (Lectotype, female; Bremen, Germany, in Brazil nuts; Budapest Mus., designated by Wood, 1972, Great Basin Nat. 32:49); Wood, 1972, Great Basin Nat. 32:49. *Synonymy*

*Stephanoderes moschatae* Schaufuss, 1905, Ins. Börse, 1905:8 (reprint p. 2) (Holotype, female; Guadeloupe; presumably lost with Hamburg Mus.); Wood, 1972, Great Basin Nat. 32:49. *Synonymy*

*Stephanoderes rufescens* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:29 (Holotype, female; Allegheny, Pennsylvania; U.S. Nat. Mus., 7527); Wood, 1972, Great Basin Nat. 32:49. *Synonymy*

*Stephanoderes buscki* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:30 (Holotype, female; Trinidad, West Indies; U.S. Nat. Mus., 7537); Wood, 1972, Great Basin Nat. 32:49. *Synonymy*

*Stephanoderes amazonicus* Eggers, 1934, Ent. Blätt. 30:78 (Lectotype, female; Manaos, Brazil; U.S. Nat. Mus., 60142; designated by Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:4); Wood, 1972, Great Basin Nat. 32:49. *Synonymy*

*Hypothenemus emarginatus* Schedl, 1942, Tijdschr. Ent. 85:11 (Holotype, female; Buitenzorg, Java; Schedl Coll.); Wood, 1966, Great Basin Nat. 26:29. *Synonymy*

DIAGNOSIS.— This species is distinguished from *seriatus* (Eichhoff) by the minutely rugose or rugose-reticulate elytral surface, and by the deeper, more elongate frontal groove.

FEMALE.— Length 1.2–1.4 mm, 2.3 times as long as wide; color very dark brown.

Frons broadly convex, a deep, narrow, median groove from upper level of eyes almost to epistoma; surface finely rugose-reticulate, becoming more nearly punctate toward epistoma; vestiture inconspicuous. Pronotum as in *crudiae* and *seriatus* except entire surface conspicuously rugose-reticulate. Elytra as in *crudiae* and *seriatus* except entire surface densely, very minutely rugose to granulate-punctate; erect interstrial scales each four to six times as long as wide.

MALE.— Similar to female except differing as indicated for *crudiae*.

DISTRIBUTION.— Florida and Costa Rica and Puerto Rico to Brazil.

USA: **Florida**: Miami. COSTA RICA: Río Damitas in Dota Mts., San José, 18-II-64, 250 m, No. 433, *Hymenea* pods, S. L. Wood. PANAMA: Canal Zone: Balboa Heights, 5-X-17, H. Morrison; Paraíso, 2-IV-11, E. A. Schwarz. OTHER COUNTRIES: Dominican Republic, Jamaica, Puerto Rico, Colombia, Venezuela, Brazil, and intercepted in Brazil nuts throughout the world.

HOSTS.— *Bertholletia excelsa, Hymenea courbaril, Myristica fragrans, Tamarindus indica, Theobroma cacao.*

BIOLOGY.— This economically important species breeds in the fruiting pods and seeds of a wide variety of hosts. Apparently it is also capable of breeding in the twigs of certain hosts, although such records have not adequately been confirmed. It is best known from interceptions in Brazil nuts.

NOTES.— The above treatment was based on the holotypes of *rufescens* and *buscki*, on the lectotypes of *obscurus*, *asperulus*, *künnemanni*, and *amazonicus*, and on several specimens of *moschatae* determined by Schedl (who had examined the type and/or homotypes). A total of 271 specimens was examined.

The Fabricius type series of *obscurus* now includes three specimens belonging to two closely related species. The first two are identical. The third specimen is of a different species, possibly *crudiae* (Panzer), but the frontal tubercle is almost obsolete and the frons is largely concealed by the pronotum. Because the author presumably had the first two specimens in mind when the species was named and because the identity of the third specimen is not clear, the second specimen was designated as the lectotype of *Hylesinus obscurus* Fabricius. The first specimen has the right elytron missing and a large hole in the left one; consequently, it was not selected.

Three female syntypes of *asperulus* Eichhoff in the Chapuis collection at Brussels were examined. The first and third specimens are of *obscurus* and the second is of *seriatus* (Eichhoff); the third syntype is in the best condition and is here designated as the lectotype of *Stephanoderes asperulus* Eichhoff. Eichhoff originally labeled these specimens as *Cryphalus asperulus*, a preoccupied name, but published the name as *Stephanoderes asperulus*. He incorrectly assumed his name was a junior homonym and replaced it with *cassiae*.

Several series of this species have been intercepted in imported seeds at Miami, Florida, and one series of living specimens was taken from native plants at Miami. Whether or not it can maintain its identity without being swamped by *seriatus* remains to be seen. Several series of this species, *seriatus*, and intermediate forms were taken from cof fee beans in western Guatemala. Apparently this area is in a zone of overlap between the two forms, and some hybridization may be occurring. Additional time and specimens are required to determine whether or not a taxonomic change is required.

### 18. *Hypothenemus multidentatus* (Hopkins)

*Stephanoderes multidentatus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:28 (Holotype, female; Tampico, Tamaulipas, Mexico; U.S. Nat. Mus., 7532)

*Stephanoderes ferrugineus* Hopkins, 1915 (nec Hopkins, 1915:20), U.S. Dept. Agric. Rept. 99:29 (Holotype, female; Livingston, Guatemala; U.S. Nat. Mus., 7535); Wood, 1972, Great Basin Nat. 32:49. *Synonymy*

*Stephanoderes nitidifrons* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:31 (Holotype, female; Tampico, Tamaulipas, Mexico; U.S. Nat. Mus., 7546); Wood, 1972, Great Basin Nat. 32:49. *Synonymy*

*Hypothenemus hopkinsi* Browne, 1963, Ent. Bericht. 23:53. Replacement name for *ferrugineus* Hopkins.

DIAGNOSIS.— This species is distinguished from *seriatus* (Eichhoff) by the larger size and smaller strial punctures. There is a strong possibility it represents nothing more than a size variation in a normal population.

FEMALE.— Length 1.6–1.8 mm, 2.3 times as long as wide; color very dark brown.

Head and pronotum as in *seriatus* except anterior margin of pronotum usually with four teeth (in six of eight specimens), and posterolateral areas more brightly shining. Elytra as in *seriatus* except strial punctures averaging smaller; declivital interstrial scales four to six times as long as wide.

DISTRIBUTION.— Tamaulipas to Colombia.

MEXICO: **Puebla**: 11 km W Villa Juarez, 25-VI-53, 400 m, S. L. Wood. **Tamaulipas**: Tampico, 24, 26-XII, E. A. Schwarz. COLOMBIA: Palermo, V-59, café, F. Vasquez.

HOSTS.— *Coffea aribica*, etc.

BIOLOGY.— Specimens were collected from *dissimilis*-like tunnels in twigs.

NOTES.— The above treatment was based on the holotypes of *multidentatus*, *ferrugineus*, and *nitidifrons* and on five other specimens.

### 19. *Hypothenemus seriatus* (Eichhoff)

Fig. 194

*Stephanoderes seriatus* Eichhoff, 1872, Berliner Ent. Zeitschr. 15:133 (Lectotype, female; New Orleans, Louisiana; Institut Royal des Sciences Naturelles, Brussels, designated by Wood, 1973, Great Basin Nat. 33:177)

*Stephanoderes pulverulentus* Eichhoff, 1872, Berliner Ent. Zeitschr. 15:133 (Syntypes, female; Mexico; presumably lost with Hamburg Mus.); Wood, 1973, Great Basin Nat. 33:177. *Synonymy*

*Stephanoderes vulgaris* Schaufuss, 1897, Tijdschr. Ent. 40:209 (Syntypes, female; La Digue, Sechelle Islands; presumably lost with Hamburg Mus.); Wood, 1972, Great Basin Nat. 32:50. *Synonymy*

*Stephanoderes georgiae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:26 (Holotype, female; Georgia; U.S. Nat. Mus., 7385); Wood, 1972, Great Basin Nat. 32:50. *Synonymy*

*Stephanoderes texanus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:26 (Holotype, female; Columbus, Texas; U.S. Nat. Mus., 7373); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1048. *Synonymy*

*Stephanoderes minutus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:26 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7366); Wood, 1972, Great Basin Nat. 32:50. *Synonymy*

*Stephanoderes tamarindi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:27 (Holotype, female; Manila, Philippine Islands; U.S. Nat. Mus., 7530); Wood, 1972, Great Basin Nat. 32:50. *Synonymy*

*Stephanoderes pini* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:27 (Holotype, female; Kanawha Station, West Virginia; U.S. Nat. Mus., 7376); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1048. *Synonymy*

*Stephanoderes salicis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:27 (Holotype, female; Morgantown, West Virginia; U.S. Nat. Mus., 7359); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1048. *Synonymy*

*Stephanoderes floridensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:27 (Holotype, female; Haw Creek, Florida; U.S. Nat. Mus., 7375); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1048. *Synonymy*

*Stephanoderes fiebrigi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:27 (Holotypes, female; San Bernardino, Paraguay; U.S. Nat. Mus., 7387); Wood, 1972, Great Basin Nat. 32:50. *Synonymy*

*Stephanoderes ficus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:28 (Holotype, female; Alabama; U.S. Nat. Mus., 7374); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1048. *Synonymy*

*Stephanoderes soltani* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:28 (Holotype, female; New Orleans, Louisiana; U.S. Nat. Mus., 7529); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1048. *Synonymy*

*Stephanoderes lucasi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:28 (Holotype, female; southern United States; U.S. Nat. Mus., 7531); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1048. *Synonymy*

*Stephanoderes virentis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:28 (Holotype, female; Lakeland, Florida; U.S. Nat. Mus., 7558); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1048. *Synonymy*

*Stephanoderes pecanis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:29 (Holotype, female; Orlando, Florida; U.S. Nat. Mus., 7360); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1048. *Synonymy*

*Stephanoderes nitidipennis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:29 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7533); Wood, 1972, Great Basin Nat. 32:50. *Synonymy*

*Stephanoderes nitidulus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:29 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus.); Wood, 1977, Great Basin Nat. 37:513. *Synonymy*

*Stephanoderes subopacicollis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:30 (Holotype, female, Cayamas, Cuba; U.S. Nat. Mus.); Wood, 1977, Great Basin Nat. 37:513. *Synonymy*

*Stephanoderes niger* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:31 (Holotype, female; Brownsville, Texas; U.S. Nat. Mus., 7382); Wood, 1972, Great Basin Nat. 32:50. *Synonymy*

*Hypothenemus robustus* Blackman, 1922, Mississippi Agric. Expt. Sta. Tech. Bull. 11:88 (Syntypes, female; Newton, Mississippi; U.S. Nat. Mus.); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1048. *Synonymy*

*Stephanoderes darwinensis* Schedl, 1942, Mitt. München Ent. Ges. 32:178 (Syntypes; Australia); Wood, 1972, Great Basin Nat. 32:50. *Synonymy*

*Stephanoderes andersoni* Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1045 (Holotype, female; Coconut Grove, Florida; U.S. Nat. Mus.); Wood, 1972, Great Basin Nat. 32:50. *Synonymy*

*Stephanoderes liquidambarae* Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1046 (Holotype, female; Jacksonboro, South Carolina; Snow Ent. Mus., Univ. Kansas); Wood, 1972, Great Basin Nat. 32:51. *Synonymy*

DIAGNOSIS.— This common, widely distributed species is distinguished from *multidentatus* Hopkins by the smaller size and by the larger strial punctures. From *obscurus* (Fabricius) this species is distinguished by the smoother elytral surface and by the shorter, less well-developed (often obsolete) frontal groove.

FEMALE.— Length 1.3–1.6 mm, 2.4 times as long as wide; color very dark brown.

Head as in *obscurus* except median groove shallow, varying from half as long to entirely

obsolete, punctures from obscure to rather coarse. Pronotum as in *crudiae* (Panzer).

Elytra as in *crudiae*; strial punctures coarse, rather deep; interstriae as wide as striae, almost smooth, shining, punctures fine, uniseriate. Interstrial scales varying from two to six times as long as wide, local clones usually exhibiting little or no variation, scales longer and more slender in posterolateral areas.

MALE.— Similar to female but differing as indicated for *crudiae*.

DISTRIBUTION.— Texas and West Virginia to Brazil, Hawaii to Australia, Indonesia, and Madagascar.

USA: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Texas, Virginia, West Virginia. MEXICO: Chiapas, Jalisco, Nayarit, Oaxaca, Puebla, San Luis Potosí, Tamaulipas, Veracruz, Yucatan. CENTRAL AMERICA: Guatemala, Honduras, El Salvador, Costa Rica, Panama. OTHER AREAS: Australia, Barbados, Brazil, Colombia, Cuba, Fiji Islands, Haiti, Hawaiian Islands, Ivory Coast, Java, Madagascar, Micronesia, Paraguay, Philippine Islands, Puerto Rico, Virgin Islands.

HOSTS.— *Acacia farnesiana, Acras sapota, Acrocomia sclerocarpa, Aleurites fordii, Bauhinia tomentosa, Bursera* sp., *Cajanus cajon, Calliandra confusa, Callicarpa* sp., *Canavalia* sp., *Carya* spp., *Cecropia* sp., *Citrus aurantifolia, Coccothrinax alta, Cordia* sp., *Dipholis salicifolia, Eleagnus pungens, Erythrina* sp., *Eugenia buxifolia, Ficus* spp., *Galactia spiciformis, Guacea quara, Hyracreptans* sp., *Ipomoea cathartica, Juglans nigra, Liquidambar styraciflua, Maclura pomifera, Mangifera indica, Muouna* sp., *Ochroma* sp., *Ocotea catesbiana, Persea americana, P. borbonea, Philabertella clausa, Pinus* spp., *Pithecellobium guadeloupense, Prunus persica, Quercus* spp., *Rhamnus* sp., *Saba parviflora, Salix* sp., *Serjania* sp., *Sida rhombigolia, Tectona grandis, Theobroma cacao, Thespersia pulpulnea, Trachylobium narrucosum, Trema floridana, Trichilia arborea, Wisteria* sp., *Urena* sp., *Yucca* sp.

BIOLOGY.— This species is most commonly taken in twigs and branches, but it may also breed in pods, seeds, herbaceous weeds, and other plant material. The habits are essentially as in *crudiae*.

NOTES.— The above treatment was based on the holotypes of *georgiae, texanus, tamarindi, pini, salicis, floridensis, soltani, lucasi, virentis, pecanis, niger, robustus, andersoni,* and *liquidambarae*, on the lectotype of *seriatus*, on syntypes of *emarginatus* and *darwinensis*, and on specimens of *pulverulentus* and *vulgaris* identified by Eggers, and on 302 other specimens.

All previous authors, including myself, have recognized several species in what is here grouped into a single species. The frontal area varies in punctation and in the presence or absence of a median groove and/or shining area, and the elytral scales vary from two to six times as long as wide. Most series from a given locality may tend to be constant in these characters, and may contrast with other series from the same or neighboring areas. Other one-gallery series or series from neighboring localities may exhibit virtually every known variation. This species evidently is at least partly parthenogenetic and, when mating does occur, it normally involves siblings or a mother-son combination. This intense inbreeding apparently results in the observed uniformity of many series. It is presumed that the variable series result from the occasional hybrid matings.

### 20. *Hypothenemus sparsus* Hopkins
Fig. 194

*Hypothenemus sparsus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:20 (Holotype, female; Columbus, Texas; U.S. Nat. Mus., 7368)

*Hypothenemus similis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:20 (Holotype, female; Victoria, Texas; U.S. Nat. Mus., 7554); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1040. *Synonymy*

*Stephanoderes tridentatus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:31 (Holotype, female; San Diego, Texas; U.S. Nat. Mus., 7369); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1040. *Synonymy*

DIAGNOSIS.— This species is almost identical to *pubescens* Hopkins, but it is distinguished by the slightly larger, deeper strial punctures, by the subvulcanate, discal interstrial punctures, and by the slightly narrower interstrial scales.

FEMALE.— Length 1.1–1.3 mm, 2.1 times as long as wide; color very dark brown.

Frons broadly convex; surface rugose-reticulate, punctures rather obscure, a small, smooth, shining median area often present on lower half; vestiture inconspicuous. Pronotum essentially as in *crudiae*; four teeth arm anterior margin; scales in posterior area slightly longer than wide.

Elytra 1.3 times as long as wide; sides straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures moderately large, rather deep; interstriae as wide as striae, punctures uniseriate, subvulcanately granulate from base to declivity. Declivity steep, convex; striae weakly impressed; interstriae slightly narrower, granules higher. Vestiture of rows of uniseriate, fine, recumbent strial hair and rows of erect interstrial scales; each scale on declivity about half as long as distance between rows, slightly shorter than distance between scales within a row, each about twice as long as wide.

DISTRIBUTION.— S Texas to Tamaulipas.

USA: Texas: Columbus, 6-VI, Hubbard and Schwarz; Karnes City, 25-III-51, *Celtis pallida*, S. L. Wood; Lexington, 24-III-51, *Rhamnus*, S. L. Wood; San Diego, 19-V, Hubbard and Schwarz; Victoria, 21-III, E. A. Schwarz. MEXICO: **Tamaulipas**: Encinal, 15-VI-53, *Condalia*, S. L. Wood.

HOSTS.— *Celtis pallida*, *Condalia* sp., *Rhamnus* sp.

BIOLOGY.— This species breeds in twigs of trees and shrubs.

NOTES.— The above treatment was based on the holotypes of *sparsus*, *similis*, and *tridentatus*, and on eight other specimens.

### 21. *Hypothenemus californicus* Hopkins

Fig. 194

*Hypothenemus californicus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:19 (Holotype, female; Pomona, California; U.S. Nat. Mus., 7364)

*Hypothenemus tritici* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:19 (Holotype, female; Dallas, Texas; U.S. Nat. Mus., 7526); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1055 (Subspecies); Wood, 1972, Great Basin Nat. 32:44. *Synonymy*

*Hypothenemus thoracicus* Hopkins, 1916, *in* Blatchley and Leng, Rhynchophora of North Eastern America, p. 598 (Holotype, female; Clark Co., Indiana; U.S. Nat. Mus., 7487); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1055. *Synonymy*

DIAGNOSIS.— This species is distinguished from all other American species in the genus by the combination of the coarsely, deeply punctured posterolateral areas of the pronotum, the slender body form, and the long, slender interstrial scales.

FEMALE.— Length 1.0–1.4 mm, 2.5 times as long as wide; color dark brown to black.

Frons convex above, shallowly, transversely impressed on lower half; median line shining and indistinctly elevated in impressed area; remaining surface reticulate-granulate, particularly in marginal areas, becoming more nearly punctate toward ventromedian area; vestiture inconspicuous.

Pronotum 1.0 times as long as wide; widest one-third length from base, sides moderately, evenly arcuate, rather broadly rounded in front; anterior margin armed by six coarse teeth of equal size; summit in front of middle, not high; posterior and lateral areas closely, rather coarsely, deeply punctured, with fine, indistinct granules intermixed. Vestiture of hair and, on posterior half, with slender, erect scales intermixed.

Elytra 1.6 times as long as wide; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures small, shallow; interstriae about one and one-half times as wide as striae, smooth, punctures fine, uniseriate. Declivity convex, steep; essentially as on disc. Vestiture of rows of fine, short, strial hair on disc, with a few similar supplemental interstrial setae on lateral areas of declivity, and rows of erect interstrial scales; each scale slightly longer than distance between rows and between scales within a row, each about six times as long as wide.

MALE.— Similar to female except 0.75–0.85 mm, 2.2 times as long as wide; eye reduced; funicle often 3-segmented, club smaller, more slender; one or more marginal teeth on pronotum absent; pubescence longer, more slender.

DISTRIBUTION.— S California, Texas, and New Jersey to Florida, Veracruz, and Michoacán; Africa.

USA: **California**: Laguna, Pasadena, Pomona, Redondo, Westwood Hills. **District of Columbia**: Washington. **Florida**: Gainesville, Homestead, Key Largo, Key Vaca, Key West, Long Key, Matecumbe Key, Perrine, Plantation Key. **Indiana**: Clark Co. **Kansas**: Lawrence, Wellington. **Kentucky**: Fulton. **Maryland**: College Park. **Missouri**: Charleston. **New Jersey**: Haddon Heights. **South Carolina**: Charleston, Frogmore, Isle of Palms, Pawley's Beach. **Tennessee**: Chapin Sanctuary at East Ridge. **Texas**: Alamo, Big Bend N.P., Boca Chica, Brownsville, Dallas, Kerrville, Pharr, Port Arthur. **Virginia**: Spotsylvania, Lynchburg. MEXICO: **Michoacán**: Quiroga. **Mexico**: Morelos. **Tamaulipas**: Victoria. **Veracruz**: 5 km E Orizaba. OTHER AREAS: Israel, Liberia.

HOSTS.— *Aloe vera*, *Bauhinia alba*, *Bidens pilosa*, *Boehmeria scabra*, *Cajanus cajon*, *Cappria bifolia*, *Galactia spiciformis*,

*Ipomoea cathartica*, *I. litoralis*, *Iva imbricata*, *Malvastrum* sp., *Mangifera indica*, *Paspalum vaginatum*, *Quisqualis indica*, *Salix babylonica*, *Uniola paniculata*, *Verbena* sp., *Zea mays*.

BIOLOGY.— This species breeds in weed stocks, twigs of trees, and shrubs, vines, etc. The tunnels vary with the type of host material, but the habits are basically as in *eruditus*.

NOTES.— The above treatment was based on the holotypes of *californicus*, *tritici*, and *thoracicus*, and on 96 other specimens.

One specimen of this species was seen from Israel and one from Liberia in western Africa. Two syntypes of *albipilis* Reitter, in the Budapest Museum, described from Syria, differ only by minor characters (although they clearly are specifically distinct). Because *californicus* is not closely related to any American species, but does appear to have a definite relationship to one or more species from Africa, there is a distinct possibility that it was introduced to North America from Africa. A more thorough knowledge of the African fauna is necessary to answer this question. Separate introductions, from different African sources, to the east and west coasts of the United States could explain the apparent geographical races in America.

### 22. *Hypothenemus vesculus* Wood

*Hypothenemus vesculus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):21 (Holotype, female; Ocosingo Valley, Chiapas, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nanellus* Wood by the smooth, shining posterolateral areas of the pronotum, with the punctures entirely devoid of granulation, by the unimpressed striae, with small, shallow, strial punctures, by flat, smooth interstriae, and by the much more slender interstrial scales.

FEMALE.— Length 1.0 mm, 2.2 times as long as wide; color dark brown.

Frons as in *nanellus* but surface below upper level of eyes smooth, shining, punctures more distinct. Pronotum as in *nanellus* except surface smooth, shining, no trace of reticulation, punctures larger, deeper, devoid of granules; scales in posterior area more slender.

Elytra about 1.5 times as long as wide; outline as in *nanellus*; striae not at all impressed, punctures small, shallow, distinct; interstriae flat, smooth, shining, two to three times as wide as striae, punctures very fine, uniseriate. Declivity rather steep, convex; essentially as on disc. Vestiture of rows of fine, short, strial hair on disc with similar supplemental interstrial hair on lower declivity, and rows of erect interstrial scales; each scale as long as distance between rows, more closely spaced within a row, each about four to six times as long as wide.

DISTRIBUTION.— Chiapas.

MEXICO: Chiapas: Ocosingo Valley, 7-VII-50, L. J. Stannard; 16 km S Malpaso, 24-V-69, J. M. Campbell; 5 km N Simojovel, 10-VI-69, J. M. Campbell.

NOTES.— The above treatment was based on the holotype and on seven other specimens.

### 23. *Hypothenemus ascitus* Wood

*Hypothenemus ascitus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):35 (Holotype, female; Puerto Viejo, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nanellus* Wood by the larger size, by the narrower elytral scales and the more abundant hairlike elytral vestiture, and by the smaller, oval, antennal club.

FEMALE.— Length 1.2–1.3 mm, 2.2 times as long as wide; color dark reddish brown, elytra almost black.

Frons convex above, slightly, transversely impressed above epistoma; surface coarsely reticulate above level of eyes, punctate and slightly granulate below; a weak median carina on lower third; vestiture sparse, rather short, hairlike, inconspicuous. Antennal club rather small, oval, 1.5 times as long as wide; eye 1.5 times as long as club.

Pronotum 0.9 times as long as wide; as in *nanellus* except teeth on anterior margin spaced by distances at least twice basal width of a tooth, and posterior area densely, not clearly punctured, with scattered granules; vestiture of slender scales and bristles.

Elytra 1.2 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae moderately impressed, punctures rather coarse, deep; interstriae

almost as wide as striae, somewhat convex, almost smooth, punctures uniseriate, rather close, minutely subvulcanate. Declivity confined to posterior third, convex, rather steep. Vestiture consisting of uniseriate rows of interstrial scales; each scale about three times as long as wide; and shorter, rather abundant, fine strial and interstrial hair.

MALE.— Similar to female except smaller, eye partly reduced.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Puerto Viejo, Heredia, 12-III-64, 70 m, No. 482, S. L. Wood. PANAMA: Barro Colorado Island, Canal Zone, XII-46, J. Zetek.

BIOLOGY.— Specimens were removed from the outermost living bark of a very large living tree. The attack apparently had continued for years without injury to the tree.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 24. *Hypothenemus nanellus* Wood

*Hypothenemus nanellus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):34 (Holotype, female; Turrialba, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is very similar to *sparsus* Hopkins, but it is distinguished by the smaller size, by the more distinctly punctured posterolateral areas of the pronotum, by the more gradual declivity, and by other characters.

FEMALE.— Length 1.0 mm, 2.2 times as long as wide; color rather dark yellowish brown.

Frons rather weakly convex, a small median pit or impression at upper level of eyes; surface finely rugose-reticulate; sparsely clothed with fine, hairlike setae of moderate length. Antennal club large, 1.1 times as long as wide; eye 1.3 times as long as club.

Pronotum 0.9 times as long as wide; widest on basal third, sides moderately arcuate, rather narrowly rounded in front; anterior margin armed by six teeth, teeth spaced by distances not greater than their basal width; summit at middle, slightly impressed behind; posterior surface rather coarsely reticulate, with small setiferous granules of moderate abundance on disc and lateral areas. Vestiture consisting of small erect scales in posterior areas, small bristles in asperate area.

Elytra 1.3 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal half, then gradually, arcuately converging toward narrowly rounded apex; striae weakly impressed, punctures small, shallow; interstriae about one and one-half times as wide as striae, feebly convex, subreticulate, punctures granulate, granules in uniseriate rows, rather coarse, moderately close. Declivity beginning at middle, convex; essentially as on disc. Vestiture consisting of uniseriate rows of erect interstrial scales and shorter, inconspicuous strial hair; each scale about twice as long as wide, spaced between rows by slightly more than length of a scale, and within rows by slightly less than length of a scale.

MALE.— Similar to female except smaller and eye slightly reduced.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Turrialba, Cartago, 5-VII-63, 800 m, No. 24, S. L. Wood.

BIOLOGY.— Specimens were removed from phloem tissues of dead twigs of a large shade tree.

NOTES.— The above treatment was based on the type series of six specimens.

### 25. *Hypothenemus pubescens* Hopkins

Fig. 194

*Hypothenemus pubescens* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:19 (Holotype, female; Key West, Florida; U.S. Nat. Mus., 7524)

*Hypothenemus subelongatus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:19 (Holotype, female; Victoria, Texas; U.S. Nat. Mus., 7581); Wood, 1972, Great Basin Nat. 32:50. *Synonymy*

*Stephanoderes opacifrons* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:25 (Holotype, female; Aguadilla, Puerto Rico; U.S. Nat. Mus., 7565); Wood, 1972, Great Basin Nat. 32:50. *Synonymy*

DIAGNOSIS.— This species is almost identical to *sparsus* Hopkins, but it is distinguished by the smaller strial punctures, by the absence of discal, interstrial granules, and by the broader interstrial scales. The hairlike elytral ground cover may be restricted to uniseriate rows of strial setae or it may include a few similar interstrial setae.

FEMALE.— Length 1.0–1.1 mm, 2.3 times as long as wide; color yellowish brown.

Frons broadly convex, surface finely rugose-reticulate, punctures coarse, not sharply formed.

Pronotum 1.0 times as long as wide; widest near base, sides moderately arcuate, converging slightly, rather broadly rounded in front; anterior margin armed by six equal, very coarse, rather widely spaced teeth; summit at middle; posterior areas reticulate, punctures weakly granulate, those behind summit slightly larger. Vestiture of hair, intermixed on posterior areas with rather broad, erect scales.

Elytra 1.3 times as long as wide; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures small, rather shallow; interstriae very minutely irregular, two to three times as wide as striae, punctures fine, uniseriate. Declivity steep, convex; essentially as on disc, with interstriae narrower. Vestiture of rows of fine, short, strial hair, with or without similar, supplemental, interstrial hair on declivity, and rows of erect, interstrial scales; each scale slightly shorter than distance between rows, much longer than distance between scales within a row, each scale one and one-half times as long as wide.

MALE.— Similar to female except 0.8 mm, 2.2 times as long as wide; eye reduced in size; funicle usually 3-segmented, club smaller, more slender; some pronotal teeth absent; vestiture longer, more slender.

DISTRIBUTION.— S Florida, Texas, Durango, Yucatan, Puerto Rico, and Hawaiian Islands.

USA: **Florida**: Key Vaca, 29-VI-51, *Andropogon*, *Paspalum vaginatum*, S. L. Wood; Missouri Key, 28-VI-51, *Paspalum vaginatum*, S. L. Wood; Key West, 5-IV-03, E. A. Schwarz. **Texas**: Victoria, 26-III, E. A. Schwarz. MEXICO: **Durango**: 16 km W El Salto, VII-64, J. B. Thomas. **Yucatán**: Chichen-Itza, 30-VI-51, L. J. Stannard. PUERTO RICO: Aguadilla, I-99, A. Busck; Villalba, 30-IV-40, *Brysonima spicata*, D. DeLeon. HAWAIIAN ISLANDS: Keawekapa, Maui, 17-IX-64, Bermuda grass.

HOSTS.— *Andropogon* sp., *Cynodon dactylon*, and *Paspalum vaginatum*.

BIOLOGY.— All specimens for which a host is known were taken from fruiting stems of the above grasses.

NOTES.— The above treatment was based on the holotypes of *pubescens*, *subelongatus*, and *opacifrons*, and on 26 other specimens.

## 26. *Hypothenemus eruditus* Westwood

Figs. 192–194

*Hypothenemus eruditus* Westwood, 1836, Trans. Ent. Soc. London 1(1):34 (Syntypes, England?; some in British Mus. Nat. Hist.)

*Cryphalus aspericollis* Wollaston, 1860, Ann. Mag. Nat. Hist. (3)5:365 (Syntypes; Madera); Schedl, 1959, Soc. Sci. Fennica Biol. 22(2):16. *Synonymy*

*Bostrichus boieldieui* Perroud, 1864, Ann. Soc. Linn. Lyon, p. 188 (Syntypes?; New Caledonia); Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:166. *Synonymy*

*Cryphalus obscurus* Ferrari, 1867 (nec Fabricius, 1802), Die Forst- und Baumzuchtschädlichen Borkenkäfer, p. 17 (Holotype, female; Cuba; Vienna Mus.); Wood, 1974, Great Basin Nat. 34:282. *Synonymy*

*Stephanoderes germari* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:159 (Syntypes?; Mexico; apparently lost with Hamburg Mus.); Wood, 1977, Great Basin Nat. 37:513. *Synonymy*

*Stephanoderes myrmedon* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:160 (Holotype, female; Colombia; Brussels Mus.); Wood, 1977, Great Basin Nat. 37:513. *Synonymy*

*Stephanoderes chlersii* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:493 (Syntypes?; Spain); Balachowsky, 1949, Faune de France 50:202. *Synonymy*

*Hypothenemus insularis* Perkins, 1900, Fauna Hawaiiensis 2(3):181 (Syntypes; Kauai, Hawaiian Islands; British Mus. Nat. Hist.); Wood, 1960, Insects of Micronesia 18:42. *Synonymy*

*Cryphalus basjoo* Niisima, 1910, Trans. Sapporo Nat. Hist. Soc. 3:9 (Syntypes; Tokyo, Japan); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Hypothenemus tuberculosus* Hagedorn, 1912, Rev. Zool. Afr. 1:339 (Syntypes; Congo); Schedl, 1957, Ann. Mus. Roy. Congo Belge Tervuren, ser. 8, Sci. Zool. 56:11. *Synonymy*

*Cosmoderes schwarzi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:11 (Holotype, female; Haw Creek, Florida; U.S. Nat. Mus.); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Hypothenemus bradfordi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:15 (Holotype, female; Honolulu, Hawaii; U.S. Nat. Mus., 7567); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Hypothenemus flavosquamosus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:15 (Holotype, female; Mount Coffee, Liberia; U.S. Nat. Mus., 7591); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Hypothenemus nigricollis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:16 (Holotype, female; Capetown, South Africa; U.S. Nat. Mus., 7568); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Hypothenemus pruni* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:16 (Holotype, female; Tryon, North Carolina; U.S. Nat. Mus., 7367); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1058. *Synonymy*

*Hypothenemus rumseyi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:16 (Holotype, female; Little Falls, West Virginia; U.S. Nat. Mus., 7362); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1058. *Synonymy*

*Hypothenemus asiminae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:16 (Holotype, female; Plummers Island, Maryland; U.S. Nat. Mus., 7365); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1058. *Synonymy*

*Hypothenemus hamamelidis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:16 (Holotype, female; Morgantown, West Virginia; U.S. Nat. Mus., 7363); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1058. *Synonymy*

*Hypothenemus tenuis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:16 (Holotype, female; Trece Aguas, Alta Verapaz, Guatemala; U.S. Nat. Mus., 7569); Wood, 1972, Great Basin Nat. 32:47. *Synonymy*

*Hypothenemus myristicae* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:16 (Holotype, female; Buitenzorg, Java; U.S. Nat. Mus., 7589); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Hypothenemus lineatifrons* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:17 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7570); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Hypothenemus sacchari* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:17 (Holotype, female; Nevis, West Indies; U.S. Nat. Mus., 7379); Wood, 1972, Great Basin Nat. 32:47. *Synonymy*

*Hypothenemus webbi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:17 (Holotype, female; Calapan, Mindoro, Philippine Islands; U.S. Nat. Mus., 7587); Wood, 1972, Great Basin Nat. 32:47. *Synonymy*

*Hypothenemus koebelei* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:17 (Holotype, female; Brazil; U.S. Nat. Mus., 7572); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Hypothenemus mali* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:17 (Holotype, female; Capetown, South Africa; U.S. Nat. Mus., 7573); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Hypothenemus parvus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:17 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7574); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Hypothenemus flavipes* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:18 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7575); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Hypothenemus punctifrons* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:18 (Holotype, female; Lakeland, Florida; U.S. Nat. Mus., 7525); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1059. *Synonymy*

*Hypothenemus nigripennis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:19 (Holotype, female; Tallulah, Louisiana; U.S. Nat. Mus., 7582); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1059. *Synonymy*

*Hypothenemus ferrugineus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:20 (Holotype, female; Trece Aguas, Alta Verapaz, Guatemala; U.S. Nat. Mus., 7584); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Hypothenemus heathi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:20 (Holotype, female; Independencia, Parahyba, Brazil; U.S. Nat. Mus., 7521); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Hypothenemus punctipennis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:20 (Holotype, female; Capetown, "West" Africa; U.S. Nat. Mus., 7585); Wood, 1972, Great Basin Nat. 32:46. *Synonymy*

*Stephanoderes elongatus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:25 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7561); Wood, 1972, Great Basin Nat. 32:47. *Synonymy*

*Stephanoderes evonymi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:26 (Holotype, female; Morgantown, West Virginia; U.S. Nat. Mus., 7358); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1059. *Synonymy*

*Stephanoderes flavicollis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:24 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7559); Wood, 1972, Great Basin Nat. 32:47. *Synonymy*

*Stephanoderes pygmaeus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:24 (Holotype, female; Pagbilao, Philippine Islands; U.S. Nat. Mus., 7560; Wood, 1972, Great Basin Nat. 32:47. *Synonymy*

*Stephanoderes subconcentralis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:25 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7563); Wood, 1972, Great Basin Nat. 32:47. *Synonymy*

*Stephanoderes unicolor* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:25 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7562); Wood, 1972, Great Basin Nat. 32:47. *Synonymy*

*Hypothenemus bicolor* Eggers, 1919, Ent. Blätt. 15:241 (Lectotype, female; Amani, East Africa; U.S. Nat. Mus., 60171, designated by Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:6); Schedl, 1957, Ann. Mus. Roy. Congo Belge Tervuren, ser. 8, Sci. Zool. 56:11. *Synonymy*

*Hypothenemus ehlersi rotroui* Peyerimhoff, 1919, Ann. Soc. Ent. France 88:255 (Syntypes; Sidi-bel-Abbes, Oran, North Africa; Paris Mus.); Balachowsky, 1949, Faune de France 50:202. *Synonymy*

*Hypothenemus juglandis* Blackman, 1922, Mississippi Agric. Expt. Sta. Tech. Bull. 11:88 (Syntypes; Port Gibson, Mississippi; U.S. Nat. Mus.); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1058. *Synonymy*

*Hypothenemus intersetosus* Eggers, 1928, Archiv. Inst. Biol. Def. Agric. Anim. 1:85 (Lectotype, female; São Paulo, Brazil; U.S. Nat. Mus., 60153; designated by Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:16); Wood, 1972, Great Basin Nat. 32:47. *Synonymy*

*Stephanoderes gracilis* Eggers, 1929, Wiener Ent. Zeit. 46:51 (replacement name for *Cryphalus obscurus* Ferrari)

*Hypothenemus lezjavai* Pjatinzky, 1929, Lezhava Izd. Narod Kom. Zem Gruzii, p. 15 (Syntypes; Georgia, USSR); Schedl, 1961, Rev. Ent. Moc. 4(2):482. *Synonymy*

*Hypothenemus citri* Ebling, 1935, Pan-Pacif. Ent. 11:21 (Holotype, female; Orange, California; California Acad. Sci.); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1059. *Synonymy*

*Stephanoderes erythrinae* Eggers, 1936, Ann. Mag. Nat. Hist. (10)17:628 (Holotype, female; Sakalaspur, India; British Mus. Nat. Hist.); Wood, 1972, Great Basin Nat. 32:47. *Synonymy*

*Stephanoderes subcylindricus* Eggers, 1940, Rev. Zool. Bot. Afr. 33:233 (Holotype, female; Mosolo Kwenge, Kwango, Congo; Tervuren Mus.); Schedl, 1957, Ann. Mus. Roy. Congo Belge Tervuren, ser. 8, Sci. Zool. 56:10. *Synonymy*

*Hypothenemus dubiosus* Schedl, 1940, Arb. Morph. Tax. Ent. Berlin-Dahlem 7:207 (Syntypes; Hamburgfarm, Ebene Limón, Costa Rica); Wood, 1972, Great Basin Nat. 32:47. *Synonymy*

*Hypothenemus glabratus* Schedl, 1942, Kolonialforstl. Mitt. 5:175 (Syntypes; Kuala Lumpur, Malaya); Schedl, 1961, Rev. Ent. Moc. 4(2):482. *Synonymy*

*Archeophalus calensis* Eggers, 1944, Rev. Zool. Bot. Afr. 12:94 (Holotype, female; Eala, Congo; Tervuren Mus.); Schedl, 1957, Ann. Mus. Roy. Congo Belge Tervuren, ser. 8, Sci. Zool. 56:10. *Synonymy*

*Hypothenemus glabratellus* Schedl, 1953, Ann. Mag. Nat. Hist. (12)6:292 (Syntypes; Selangor Kepong, Malaya); Schedl, 1961, Rev. Ent. Moç. 4(2):482. *Synonymy*

DIAGNOSIS.— This is the most common and widely distributed species in the genus. It is somewhat variable in certain characters (frons and elytral vestiture) and not always as easily recognized as other species. The frons is convex, usually with a short, narrow, median groove near the upper level of the eyes (groove occasionally replaced by a granule), with punctures obscure to conspicuous. The principal diagnostic characters are summarized in the above key.

FEMALE.— Length 1.0–1.3 mm, 2.4–2.6 times as long as wide; mature color black.

Frons convex, a slight, transverse impression immediately above epistoma; surface rugose-reticulate, punctures fine to moderately coarse, median line shining or not, usually with a small median groove (rarely replaced by a tubercle) at upper level of eyes; vestiture inconspicuous.

Pronotum 0.85–0.95 times as long as wide; widest on basal third, sides moderately arcuate, converging slightly anteriorly on basal two-thirds, rather broadly rounded in front; anterior margin armed by six teeth (may vary from four to eight), lateral ones smaller; summit slightly in front of middle, rather well developed; posterior areas obscurely rugose-reticulate, punctures small, shallow, a few of them subgranulate particularly behind summit. Vestiture of coarse hair in asperate anterior area, fine hair and erect scales intermixed on posterior half.

Elytra 1.6 times as long as wide; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures moderately large; interstriae almost smooth, as wide as striae, punctures fine, uniseriate, very finely, often obscurely subvulcanate. Declivity steep, convex; about as on disc except interstrial granules very slightly larger. Vestiture of rows of fine, short, strial hair, often supplemented by similar interstrial hair on disc, supplemental hair almost always present on declivity, and rows of erect interstrial scales; each scale as long as distance between rows and between scales within a row, each scale from three to five times as long as wide.

MALE.— Similar to female except length 0.7–0.8 mm, 2.2 times as long as wide; eye reduced in size; funicle usually 3-segmented, club smaller, more slender; one or more marginal teeth on pronotum absent; vestiture slightly longer, more slender.

DISTRIBUTION.— S California, Texas, Michigan, and New Jersey south to Argentina; S Europe and Asia to Africa and Australia.

USA: Alabama, California, District of Columbia, Florida, Georgia, Illinois, Louisiana, Maryland, Michigan, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, West Virginia. MEXICO: Chiapas, Colima, Jalisco, Michoacán, Nayarit, Oaxaca, Puebla, San Luis Potosí, Veracruz, Yucatán. CENTRAL AMERICA: Guatemala, Honduras, Costa Rica, Panama. OTHER AREAS: South America, Antilles Islands, Africa, Australia, Europe, Asia, Pacific islands.

HOSTS.— Several hundred host species are known.

BIOLOGY.— The habits are adjusted to meet the requirements of the host material. This species is reported as breeding in the cover of a book, in the fruiting bodies of fungi, in the fruiting stalks of grass, in weeds, and in numerous other plants. The tunnels may be restricted to the central axis of pith, or they may be in the phloem and engrave the cambium as in other phloeophagous bark beetles.

NOTES.— The above treatment was based on a syntype of *eruditus*, on the holotypes of *bradfordi, flavosquamosus, nigricollis, pruni, rumseyi, asiminae, hamamelidis, tenuis, myrmidon, myristicae, lineatifrons, obscurus, sacchari, webbi, koebelei, mali, parvus, flavipes, punctifrons, nigripennis, ferrugineus, heathi, punctipennis, elongatus, evonymi, flavicollis,*

*pygmaeus*, *subconcentralis*, *unicolor*, *erythrinae*, and *subcylindricus*, on lectotypes (where designated) or syntypes of *aspericollis*, *insularis*, *basjoo*, *bicolor*, *juglandis*, *intersetosus*, *dubiosus*, *glabratus*, and *ealensis*, and on paratypes of *citri*. I have not seen authentic specimens of *germari*, *ehlersii*, *boieldieui*, *tuberculosus*, *rotroui*, *lezjavai*, and *glabratellus*; they are listed here only because they have previously been placed in synonymy by the authors cited. In addition to the above type material, 894 other specimens were examined.

The large number of synonyms has resulted partly from diversity, partly from the inability of taxonomists to see the minute characters due to limitations of their optical equipment, partly from the inaccessibility of previously described material, and largely from a faulty host selection principle conceived by Hopkins. Almost no two series of this species taken from different localities are exactly alike in the sculpture of the frons; the variability of other characters is insignificant by comparison. The beetles evidently reproduce either by arrhenotokic parthenogenesis and/or from sibling matings, thus reducing the genetic variability in a series or in a local population derived from one female. The resulting uniformity of characters seen in material from one locality contrasted with similar uniformity of a slightly different type at another has been difficult to interpret without knowledge of the genetics of this species. Until more is known these minor variants should be grouped.

*Cosmoderes schwarzi* Hopkins is known only from the balsam mount of one antenna. The funicle is 4-segmented, not 3-segmented as described, as can be seen in Hopkins' illustration and on the slide. In view of Hopkins' other taxonomic work and the form of the antenna of the type, it is almost certain that *schwarzi* is another synonym of *eruditus*.

### 27. *Hypothenemus gossypii* (Hopkins)

Fig. 194

*Stephanoderes gossypii* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:25 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7557)

*Hypothenemus beameri* Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1056 (Holotype, female; Homestead, Florida; Snow Ent. Mus., Univ. Kansas); Wood, 1972, Great Basin Nat. 32:48. *Synonymy*

DIAGNOSIS.— This species is distinguished from *eruditus* Westwood by the differently sculptured frons, by the widely separated median pair of teeth on the anterior pronotal margin, and by the very slender interstrial scales.

FEMALE.— Length 1.2–1.4 mm, 2.6 times as long as wide; color black.

Frons below upper level of eyes shallowly, transversely impressed; median area above upper level of eyes with an indefinite elevation; surface finely rugose-reticulate, with coarse, deep, close punctures, median line smooth and shining on lower half; vestiture inconspicuous.

Pronotum 1.03 times as long as wide; about as in *eruditus* except anterior margin more broadly rounded; median pair of teeth on anterior margin widely separated; reticulation in lateral areas less distinct.

Elytra as in *eruditus* except interstrial scales more slender, each six to eight times as long as wide.

MALE.— Similar to female except 0.75–0.95 mm, 2.4 times as long as wide; eye reduced in size; funicle usually 3-segmented, club smaller, more slender; one or more marginal teeth on pronotum absent; pubescence slightly longer.

DISTRIBUTION.— S Florida, Cuba, and Hidalgo.

USA: **Florida**: Everglades N.P., 6-VII-51, *Ichthyomethia communis*, S. L. Wood; Homestead, 22-VI-51, *Cappris bifolia*, *Annona*, *Bidens pilosa*, *Mangifera indica*, *Parmentiera edulis*, *Tectona grandis*, S. L. Wood; Key Largo, 25-VI-51, *Cajanus cajon*, *Waltheria americana*, S. L. Wood; Key West, 3-VII-51, *Sida rhombifolia*, S. L. Wood; Long Key, 27-VI-51, *Iva imbricata*, S. L. Wood; Matecumbe Key, 28-VI-51, *Poinsettia heterophylla*, S. L. Wood; Plantation Key, 28-VI-51, *Persea americana*, S. L. Wood. CUBA: Cayamas, 7-I, *Gossypium*, E. A. Schwarz. MEXICO: **Hidalgo**: 25 km N Ixmiquilpan, 10-VII-67, 1900 m, No. 191, *Nolena* leaf bases, S. L. Wood. OTHER AREAS: Cuba.

BIOLOGY.— Apparently as in *eruditus*.

NOTES.— The above treatment was based on the holotypes of *gossypii* and *beameri* and on 45 other specimens.

### 28. *Hypothenemus distinctus* Wood

Fig. 194

*Hypothenemus distinctus* Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1065 (Holotype, female; Union, Missouri; Snow Ent. Mus., Univ. Kansas).

DIAGNOSIS.— This species is distinguished from all other American *Hypothenemus* by the narrowly produced anterior margin of the pronotum that is armed by four basally contiguous teeth, by the small, slender, shining body form, and by the widely spaced interstrial scales.

FEMALE.— Length 0.9 mm, 2.5 times as long as wide; color dark brown.

Frons convex, a slight transverse impression above epistoma; median line impressed from upper level of eyes one-fourth distance to epistoma; surface coarsely reticulate, punctures fine, inconspicuous, sparse; vestiture inconspicuous.

Pronotum 0.97 times as long as wide; sides on basal half subparallel, weakly arcuate; anterior margin narrowly produced on median fourth and armed by four closely set teeth, median pair slightly larger; posterior area obscurely rugose-reticulate behind summit, smooth elsewhere, with sparse, fine, shallow punctures, a few of them subgranulate. Vestiture of coarse hair in asperate area, of fine hair and slender scales on posterior half.

Elytra as in *eruditus*, with strial punctures slightly larger, interstrial granules distinctly larger; supplemental interstrial hairlike setae absent; interstrial scales shorter, much more widely spaced within a row (about twice length of a scale), each scale about three times as long as wide.

DISTRIBUTION.— Missouri.

USA: Missouri: Union, 26-VI-51, *Rhus aromatica*, S. L. Wood.

HOST.— *Rhus aromatica*.

BIOLOGY.— The type series was removed from the cambium region in a small, broken twig.

NOTES.— The above treatment was based on the holotype and one paratype. One other specimen of unknown origin was examined.

### 29. *Hypothenemus miles* (LeConte)

Fig. 194

*Cryphalus miles* LeConte, 1878, Proc. Amer. Philos. Soc. 17:433 (2 syntypes; Tampa, Florida; one syntype missing from pin at Mus. Comp. Zool., second syntype possibly at U.S. Nat. Mus.)

DIAGNOSIS.— This species is allied to *distinctus* Wood, but it is distinguished by the strongly, narrowly produced, hornlike, median, anterior margin of the pronotum, with no other marginal teeth, by the very small, obscure, strial punctures, by the smaller interstrial granules, and by the broader interstrial scales.

FEMALE.— Length 1.05–1.15 mm, 2.7 times as long as wide; color almost black.

Frons as in *distinctus* except median impression usually replaced by a feeble elevation. Pronotum as in *distinctus* except anterior margin narrowly, strongly produced into a fingerlike process, anterior margin not armed by other teeth; posterior and lateral areas reticulate.

Elytra as in *distinctus* except strial punctures minute, interstriae much wider than striae; interstrial granules small to obscure; interstrial scales broader, each about twice as long as wide.

DISTRIBUTION.— Georgia to Florida.

USA: **Florida**: Tampa, 15-VII. **Georgia**: St. Catherine Island, 19-IV, Hubbard and Schwarz.

NOTES.— The syntype and also the second specimen in the LeConte Collection, from Columbus, Texas, were missing from their pins in 1952. A specimen recovered from the bottom of the unit tray was of *distinctus*; presumably it was the Columbus specimen. The other syntype evidently was returned to the U.S. National Museum, where several other Tampa specimens are deposited. The above treatment was based on the U.S. National Museum series of eight specimens.

### 30. *Hypothenemus teretis* Wood

*Hypothenemus teretis* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):35 (Holotype, female; Finca La Lola, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This is the only American *Hypothenemus* with erect, scalelike interstrial bristles on the disc, but with these setae reduced to minute, slender hair on the declivity. In this respect it resembles the unrelated *dipterocarpi* Hopkins from the western Pacific Islands.

FEMALE.— Length 1.0–1.2 mm, 2.2 times as long as wide; color almost black.

Frons moderately, transversely impressed on lower two-thirds, convex above, with low, distinct elevation at upper level of eyes occupying median sixth; surface rugose-reticulate, punctures moderately coarse, shallow; vestiture inconspicuous.

Pronotum 0.94 times as long as wide; as in *eruditus*.

Elytra 1.5 times as long as wide; outline as in *eruditus*; striae not impressed, punctures fine, very shallow, seen with difficulty; interstriae subrugose, at least twice as wide as striae, punctures fine, obscure, uniseriate. Declivity rather steep, convex; striae weakly impressed, otherwise as on disc. Vestiture of rows of very minute strial hair, and rows of interstrial setae; interstrial setae on disc scalelike, each about four to six times as long as wide, these setae on posterior half of elytra represented by shorter, fine, slender, hairlike setae resembling strial setae.

DISTRIBUTION.— Costa Rica and Venezuela.

COSTA RICA: Playón, San José, 22-II-64, 50 m, No. 449, *Canavalia villosa*, S. L. Wood; Beverley, Limón, 26-VIII-63, 7 m, No. 154, vine, S. L. Wood; Finca La Lola, 10-I-63, *Theobroma cacao*, J. L. Saunders. VENEZUELA: 5 km W El Pino, Zulia, 20-X-69, 10 m, No. 139, *Inga*, S. L. Wood, 20 km SW El Vigia, 22-X-69, 100 m, No. 81, *Cecropia* petiole, S. L. Wood; 9 km S Barrancas, Barinas, 5-XI-69, 150 m, No. 101, *Serjania*; S. L. Wood; 30 km E Palmar, Bolivar, 12-VI-70, 200 m, No. 575, *Sterculia pruriens*, S. L. Wood.

HOSTS.— *Canavalis villosa*, *Cecropia* sp., *Inga* sp., *Serjania* sp., and *Sterculia pruriens*.

BIOLOGY.— Specimens were taken from recently cut or broken vines, small lianas, and twigs. Only small numbers of specimens were taken on each occasion the species was collected, and these were always mixed with other species of *Hypothenemus*. It is presumed the habits are much as in *eruditus*.

NOTES.— The above treatment was based on the type series of 18 specimens.

### 31. *Hypothenemus parallelus* (Hopkins)

*Stephanoderes parallelus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:25 (Holotype, female; Tampico, Mexico; U.S. Nat. Mus., 7556).

DIAGNOSIS.— This probably is not a valid species. It is distinguishable from *eruditus* Westwood only by the presence of a small, low, transverse, median, frontal tubercle at the upper level of the eyes.

FEMALE.— Length 1.0–1.1 mm, 2.6 times as long as wide; color almost black.

As indicated in the above diagnosis, the frontal tubercle provides the only means of distinguishing this form from *eruditus*.

DISTRIBUTION.— Tamaulipas, Colima, and the Hawaiian Islands.

MEXICO: Colima: 24 km W Armeria, 30-VI-65, 30 m, No. 153, tree branch, S. L. Wood. Tamaulipas: Tampico, 26-XII, E. A. Schwarz. HAWAIIAN ISLANDS: Honolulu, Oahu, 24-VII-64, *L. glauca*, C. Hammond; Moanalua, Oahu, 7-IX-50, E. J. Ford.

NOTES.— The above treatment was based on the holotype of *parallelus*, on 2 specimens from Colima, and on 11 specimens from Hawaii.

Some specimens of *eruditus* have a very small median granule or tubercle at the upper level of the eyes strongly resembling the distinctly larger, transverse tubercle of *parallelus*. In the Hawaiian specimens there is a feeble transverse impression below this tubercle. Until future collecting demonstrates complete intergradation between these forms, it appears best to maintain *parallelus* as a distinct species.

### 32. *Hypothenemus cylindricus* (Hopkins)

*Stephanoderes cylindricus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:25 (Holotype, female; Trece Aguas, Alta Verapaz, Guatemala; U.S. Nat. Mus., 7564)

*Hypothenemus pallidus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:18 (Holotype, female; Mt. Coffee, Liberia; U.S. Nat. Mus., 7590); Wood, 1972, Great Basin Nat. 32:45. *Synonymy*

*Stephanoderes transatlanticus* Eggers, 1941, Arb. Morph. Tax. Ent. Berlin-Dahlem 8:99 (Holotype, female; Trois Rivières, Guadeloupe; Paris Mus.); Wood, 1972, Great Basin Nat. 32:45. *Synonymy*

*Hypothenemus guadeloupensis* Schedl, 1951, Dusenia 2:98 (Syntypes, female; Guadeloupe; Schedl Coll.); Wood, 1976, Great Basin Nat. 36:348. *Synonymy*

DIAGNOSIS.— This species is distinguished from *eruditus* Westwood only by characters of the frons. The frons is rather abruptly impressed on the median sixth or less at the upper level of the eyes; the shallow impression continues on the median third to the epistoma. The impression is stronger than in *parallelus*, with its upper limits usually not resembling a tubercle.

FEMALE.— Length 1.1–1.3 mm, 2.7 times as long as wide; color almost black.

As indicated in the above diagnosis, the frontal impression is the only means of distinguishing this form from *parallelus*.

DISTRIBUTION.— Veracruz to Colombia and Venezuela; Africa.

MEXICO: Veracruz: 5 km w Jaltipan, 25-VI-67, 50 m, Bamboo, S. L. Wood. GUATEMALA: Rodeo, Esquintla, 4-VI-64, 150 m, No. 676, tree branch, S. L. Wood; Trece Aguas, Alta Verapaz, 15-IV, Cacao, Barber and Schwarz. HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 560, *Dioclea megacarpa*, S. L. Wood; La Lima, Cortez, 5-V-64, 200 m, *Cayaponia microdonta*, S. L. Wood. COSTA RICA: Río Tempisque, Guanacaste, 25-III-64, 15 m, No. 501, *Ficus*, S. L. Wood; Río Damitas in Dota Mts., San José, 18-II-64, 250 m, No. 436, tree seedling, S. L. Wood; San Isidro del General, San José, 13-XII-63, 1000 m, No. 309, *Daphnopsis seibertii*, S. L. Wood; Playón, Puntarenas, 22-II-64, 50 m, No. 449, *Canavalia villosa*, S. L. Wood; Dominical, Puntarenas, 9-XII-63, 3 m, No. 297, tree branch, S. L. Wood; Volcán, Puntarenas, 11-XII-63, 500 m, No. 304, tree branch, S. L. Wood. PANAMA: Barro Colorado Island, Canal Zone, 27-XII-63, 70 m, No. 347, tree branch, S. L. Wood; Ft. Clayton, 22-XII-63, 30 m, No. 318, *Serjania*, S. L. Wood; Madden Forest, Canal Zone, 2-I-64, 70 m, No. 306, tree branch, S. L. Wood. OTHER COUNTRIES: Colombia, Venezuela, Guadeloupe, Liberia.

NOTES.— The above treatment was based on the holotypes of *cylindricus*, *pallidus*, and *transatlanticus*, on a syntype of *guadeloupensis*, and on 59 other specimens.

The specimens from Mexico and northern Central America are distinguished with difficulty from *parallelus* only by the slightly stronger and more extensive impression on the lower frons. Those from Costa Rica southward usually have the impression stronger, almost concave on a narrow area. The frontal structure of *parallelus* is intermediate between this species and *eruditus*, but the transition, based on available material is neither gradual nor orderly.

### 33. *Hypothenemus suspectus* Wood

*Hypothenemus suspectus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):22 (Holotype, female; Pandora, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the closely allied *cylindricus* Hopkins by the less extensive frontal impression, and by the much more slender interstrial scales. It could easily be confused with *areccae* (Hornung), but it is smaller, and the frontal impression is much less extensive and more shallow.

FEMALE.— Length 1.1–1.3 mm, 2.4 times as long as wide; color almost black.

Frons as in *cylindricus* except lower frons shallowly, transversely impressed, not concave. Pronotum and elytra as in *cylindricus* except interstrial supplemental hairlike setae in ground vestiture more abundant on and near declivity, and erect interstrial scales much more slender, each scale about eight times as long as wide.

DISTRIBUTION.— Costa Rica to Panama, and Venezuela.

MEXICO: Nayarit: 8 km E San Blas, 12-VII-65, tree branch, S. L. Wood. COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 58, *Cecropia* petiole, S. L. Wood; Cañas, Guanacaste, 3-II-67, *Cecropia* petiole; Pandora, Limón, 23-VIII-63, 50 m, No. 148, cucurbit vine, No. 149, tree branch, S. L. Wood; Finca La Lola, Limón, 10-I-63, *Theobroma cacao*, J. L. Saunders. PANAMA: 13 km S El Hato del Volcán, Chiriquí, 7-I-64, 1000 m, No. 371, tree seedlings, S. L. Wood; Barro Colorado Island, I-VIII-41. VENEZUELA: 32 km SW El Vigía, Merida, 10-XII-69, 50 m, No. 188, vine, S. L. Wood; 17 km SE Mirí, Barinas, 17-XII-69, 150 m, No. 196, *Albizzia caribaea*, S. L. Wood; 3 km NE Creole, Barinas, 18-XII-69, 150 m, No. 203, *Inga*, S. L. Wood.

HOSTS.— *Albizzia caribaea*, *Cecropia* sp., *Inga* sp., *Theobroma cacao*, etc.

BIOLOGY.— The habits are as in *eruditus*.

NOTES.— The above treatment was based on the type series of 17 specimens.

### 34. *Hypothenemus areccae* (Hornung)

*Bostrichus areccae* Hornung, 1842, Stett. Ent. Zeit. 3:117 (Lectotype, female; in Betel palm nuts presumably of East Indian origin; Berlin Zool. Mus., designated by Wood, 1974, Great Basin Nat. 34:282)

*Hypothenemus vafer* Blandford, 1896, Ann. Soc. Ent. Belgique 40:241 (Syntypes; Noumea, New Caledonia); Wood, 1974, Great Basin Nat. 34:282. *Synonymy*

*Stephanoderes fungicola* Eggers, 1908, Ent. Blätt. 4:216 (Holotype, female; Java; Fiori Coll.); Eggers, 1929, Wiener Ent. Zeit. 46:52. *Synonymy*

*Stephanoderes polyphagus* Eggers, 1924, Ent. Blätt. 20:104 (Syntypes; Congo; Tervuren Mus.); Wood, 1972, Great Basin Nat. 32:52. *Synonymy*

*Stephanoderes hispidus* Eggers, 1925, Ent. Odd. Narod. Mus. Prage 3:156 (2 syntypes, Birma and India orient., both probably from Tenasserim, both lost with Hamburg Mus.); Wood, 1960, Insects of Micronesia 18(1):41. *Synonymy*

*Hypothenemus heterolepsis* Costa Lima, 1928, Suppl. Mem. Inst. Oswaldo Cruz 4:117 (Syntypes) (Article not seen); Wood, 1972, Great Basin Nat. 32:52. *Synonymy*

*Hypothenemus capitalis* Beeson, 1935, Bull. B.P. Bishop Mus. 142:102 (Lectotype, female; Hakehetau Valley, Uapou, Marquesas Isl.; Bishop Mus., 1109, present designation); Wood, 1960, Insects of Micronesia 18(1):41. *Synonymy*

*Hypothenemus eupolyphagus* Beeson, 1940, Occas. Pap. Bishop Mus. 15(18):193 (Holotype, female; Dehra Dun, India: Beeson Coll. at Dehra Dun); Wood, 1960, Insects of Micronesia 18(1):41. *Synonymy*

*Stephanoderes subvestitus* Eggers, 1940, Rev. Zool. Bot. Afr. 33:232 (Holotype, female; Mosolo Kwenge, Kwango, Congo; Tervuren Mus.); Wood, 1972, Great Basin Nat. 32:52. *Synonymy*

*Stephanoderes martiniquensis* Eggers, 1941, Arb. Morph. Tax. Ent. Berlin-Dahlem 8:99 (Holotype, female; St. Pierre, Martinique; U.S. Nat. Mus., 60156); Wood, 1972, Great Basin Nat. 32:52. *Synonymy*

*Hypothenemus oahuensis* Schedl, 1941, Proc. Hawaiian Ent. Soc. 11:110 (Syntypes, female; Punaluu, Oahu, Hawaiian Islands; Bishop Mus.); Wood, 1960, Insects of Micronesia 18(1):41. *Synonymy*

DIAGNOSIS.— This species is distinguished from *columbi* Hopkins by the larger average size, by the more slender interstrial scales, and by the more broadly concave frons, with upper limits of concavity rather abrupt but not carinate. From *suspectus* Wood it is distinguished by the much more broadly, more deeply impressed frons, with the abrupt upper margin occupying at least the median two-thirds of the area between the eyes.

FEMALE.— Length 1.2–1.4 mm, 2.4 times as long as wide; color light to very dark yellowish brown.

Frons rather strongly, broadly, transversely impressed to upper level of eyes, upper margin of impression abrupt, obtuse, not actually carinate, on more than median two-thirds of area between eyes; surface of impressed area smooth, shining, finely, deeply, closely punctured, upper area reticulate to very slightly subrugulose; vestiture inconspicuous.

Pronotum as in *eruditus* Westwood, but surface of posterior areas tending to be smoother, shining.

Elytra as in *eruditus*, with strial and interstrial punctures finer, granules entirely absent; hairlike ground vestiture slightly more abundant; interstrial scales slightly longer, more slender, each scale six or more times as long as wide.

DISTRIBUTION.— S Florida, Brazil, Pacific Islands to India, and Africa.

USA: **Florida**: West Palm Beach, 19-V–60, *Delonix regia* recently imported from the Bahama Islands. OTHER COUNTRIES: Brazil, Puerto Rico, Virgin Islands, Martinique, Hawaiian Islands, Micronesia, Philippine Islands, New Caledonia, Indonesia, Ceylon, India, Ghana, Congo, Liberia.

HOSTS.— Many dozens of hosts have been recorded from the Indo-Malayan area and Africa.

BIOLOGY.— Apparently as variable as in *eruditus*, but more commonly found in seeds and fruits.

NOTES.— The above treatment was based on the lectotype of *areccae*, on the holotype of *martiniquensis*, on syntypes of *vafer*, *polyphagus*, *heterolepsis*, *capitalis*, and *oahuensis*, on Eggers homotype of *fungicola*, and on paratypes or cotypes of *hispidus*, *eupolyphagus*, and *subvestitus*, and on 266 other specimens.

From the 2 female syntypes of *areccae* in the Berlin Zoologisches Museum, the second specimen was designated as the lectotype of *Bostrichus areccae* Hornung. Presumably, because Eggers was not familiar with the frontal characters in this species group, he designated specimens of both *areccae* and *eruditus* Westwood as having been compared to the "type." This error led to a great deal of confusion involving this species. Four cotypes of *Cryphalus basjoo* Niisima and 10 specimens of *Stephanoderes fungicola* Eggers in the Eggers Collection are of this species. The first specimen in the type series of *capitalis* Beeson, a female from Hakehetau Valley Uapou, is labeled as the type of Beeson's species, although it has never been so designated. I here designate that specimen as the lectotype of *capitalis*. A cotype of *Stephanoderes bambesanus* Eggers is of this species; the type was not located to check the suspected synonymy.

### 35. *Hypothenemus columbi* Hopkins

Fig. 194

*Hypothenemus columbi* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:18 (Holotype, female; Columbus, Texas; U.S. Nat. Mus., 7361)

*Hypothenemus abdominalis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:18 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7576); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1062. *Synonymy*

*Hypothenemus rufopalliatus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:18 (Holotype, female; Charleston, South Carolina; U.S. Nat. Mus., 7577); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1062. *Synonymy*

*Hypothenemus brunneipennis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:18 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7578); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1062. *Synonymy*

*Hypothenemus amplipennis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:19 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7579); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1062. *Synonymy*

DIAGNOSIS.— This species is distinguished from the closely allied *cylindricus* Hopkins by the much deeper frontal impression and the transversely carinate frontal elevation, and by the broader elytral scales. It is much more likely to be confused with *areccae* (Hornung), from which it differs by the smaller size, by the less extensive frontal impression, by the more strongly elevated, acute, transverse frontal carina that occupies less than the median third, and by the shorter, broader, interstrial scales.

FEMALE.— Length 1.0–1.2 mm, 2.6 times as long as wide; color dark brown.

Frons strongly, transversely impressed from epistomal margin to two-thirds distance to upper level of eyes, upper margin of impressed area on median fourth of area between eyes strongly, subacutely elevated as a short, transverse carina; surface of impressed area smooth, shining in median area, finely punctured laterally, upper area above carina convex, rugose-reticulate, rather coarsely, deeply punctured; vestiture inconspicuous.

Pronotum as in *eruditus*, with teeth on anterior margin more widely spaced; surface of lateral areas subreticulate to densely marked by minute points, sublateral areas more nearly shining.

Elytra 1.7 times as long as wide; as in *eruditus*, except strial punctures usually very slightly larger and deeper; interstrial scales slightly more than half as long as distance between rows, spaced within a row by distances greater than length of a scale, each scale two to (rarely) four times as long as wide.

MALE.— Similar to female except 0.8 mm, 2.4 times as long as wide; eye reduced in size; funicle usually 3-segmented, club reduced in size; one or more marginal teeth on pronotum usually absent; pubescence longer, more slender.

DISTRIBUTION.— Texas and Florida to Colombia and Venezuela.

USA: **Florida**: Everglades N.P., Homestead, Perrine. **Georgia**: Richmond Hill. **Louisiana**: Creole, New Orleans. **Mississippi**: Nicholson, Picayune, Poplarville. **South Carolina**: Burton, Charleston, Mt. Pleasant. **Texas**: Brownsville, Columbus, Victoria. MEXICO: **Colima**: 3 km E and 24 km W Armeria. **Nayarit**: Los Corchos, 32 km N Tepic. **Sinaloa**: 8 km N Mazatlán. **Veracruz**: 8 km S San Andres Tuxtla. COSTA RICA: Finca Taboga near Cañas. PANAMA: Canal Zone. OTHER AREAS: Bahamas Islands (Nassau), Cuba, Colombia, Venezuela.

HOSTS.— *Bauhinia alba*, *Citrus aurnatifolia*, *Ficus* spp., *Ichthyomethia communis*, *Morus rubra*, *Quercus* spp., *Salix* sp., *Serjania* sp.

BIOLOGY.— Evidently as in *eruditus*.

NOTES.— The above treatment was based on the holotypes of *columbi*, *abdominalis*, *rufopalliatus*, *brunneipennis*, and *amplipennis*, and on 43 other specimens.

### 36. *Hypothenemus africanus* (Hopkins)

*Stephanoderes africanus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:30 (Holotype, female; Capetown, South Africa; U.S. Nat. Mus., 7542)

DIAGNOSIS.— This species is distinguished from *setosus* Eichhoff by the slightly larger size, by the less strongly impressed, less extensive frontal concavity, by the confused discal interstrial punctures, and by the shorter, closer, much broader interstrial scales.

FEMALE.— Length 1.7–1.9 mm, 2.3 times as long as wide; color brown.

Frons as in *setosus* except less strongly impressed, concavity on upper half of impressed area only (variable). Pronotum as in *setosus*, with six to eight teeth on anterior margin; posterolateral areas smooth and shining.

Elytra as in *setosus*, strial punctures usually more distinctly impressed, interstrial punctures on disc fine, confused; interstrial scales two-thirds as long as distance between rows, spaced within a row by distances less than length of a scale, each scale two to three times as long as wide.

DISTRIBUTION.— Alabama and Louisiana to Venezuela and Brazil, Indonesia, Malaya, and Africa.

USA: **Alabama**: Mobile, 19-I-46, *Delonix* pods (probably intercepted in port). **Louisiana**: New Orleans, 19-VI-33, intercepted in bean pods from Honduras. COSTA RICA: 1940, Nevermann. JAMAICA: 13-IX-35, Poinciana pods, lot no. 35-19295. BAHAMA ISLANDS: Nassau, 21-I-47, *Morus*. DOMINICAN REPUBLIC: Santo Domingo. PUERTO RICO: 29-I-47, pods. VENEZUELA: 3 km E Lagunillas, Merida, 12-I-70, 1000 m, No. 237, Mimosa twig, S. L. Wood. OTHER COUNTRIES: Brazil, Java, Malaya, South Africa.

BIOLOGY.— Evidently variable; fruiting pods and twigs of trees were infested.

NOTES.— The above treatment was based on the holotype of *africanus* and on 54 other specimens.

### 37. *Hypothenemus setosus* (Eichhoff)

*Hypoborus* (?) *setosus* Eichhoff, 1868, Berliner Ent. Zeitschr. 11:391 (Syntypes; Guadeloupe; one syntype in U.S. Nat. Mus., others lost in Hamburg Mus.)

*Stephanoderes obscurus* Eichhoff, 1872, (nec Ferrari, 1867), Berliner Ent. Zeitschr. 15:133 (Holotype, female; Antilles; Institut Royal des Sciences Naturelles, Brussels); Wood, 1975, Great Basin Nat. 35:393. *Synonymy*

*Stephanoderes depressus* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8: 155 (Replacement name for *obscurus* Eichhoff)

*Stephanoderes congonus* Hagedorn, 1912, Rev. Zool. Afr. 1:337 (Lectotype, female; Eala, Congo; Tervuren Mus., designated by Wood, 1975, Great Basin Nat. 35:393). *Synonymy*

DIAGNOSIS.— This species is distinguished from *javanus* (Eggers) by the details of head sculpture mentioned below, by the presence of six to eight serrations on the anterior margin of the pronotum, by the smaller, more numerous pronotal asperities, and by the more slender body form.

FEMALE.— Length 1.6–1.7 mm, 2.4 times as long as wide; color brown.

Head as in *javanus* except punctures on frons slightly larger and more abundant; areas above impression coarsely reticulate.

Pronotum 0.95 times as long as wide; as in *javanus* except anterior slope armed by more than 25 small asperities; anterior margin armed by six to eight serrations.

Elytra 1.5 times as long as wide; as in *javanus*.

MALE.— Similar to female except sexes differing as in *javanus*.

DISTRIBUTION.— Florida and Chiapas to Brazil, and Africa.

USA: **Florida**: Miami. MEXICO: **Chiapas**: Cotaxtla. HONDURAS: Zamorano. COSTA RICA: Playón in San José, Finca Gromaco on Río Coto Brus in Puntarenas, Finca La Lola in Limón. PANAMA: Canal Zone: Ft. Clayton, Gatun Dam, Paraíso. OTHER AREAS: Brazil, Colombia, Guadeloupe, Haiti, Puerto Rico, Venezuela, Congo, Cameroon.

HOSTS.— *Acacia pennatula, Cecropia* sp., *Theobroma cacao*.

BIOLOGY.— This species occurs in fruiting bodies, *Cecropia* petioles, and twigs of a wide variety of hosts.

NOTES.— The above treatment was based on the syntype of *setosus*, on the holotype of *obscurus*, on four female syntypes of *congonus*, and on 92 other specimens. The original description of *congonus* obviously was based on a syntypic series; however, a severely damaged specimen in the Tervuren Museum is labeled "Holotypus." In view of the syntypic description, the severely damaged "Holotypus," the fact that all four syntypes bear identical data labels, and that a lectotype has not previously been designated, I here designate the third syntype as the lectotype of *Stephanoderes congonus* Hagedorn.

### 38. *Hypothenemus javanus* (Eggers)

Fig. 194

*Stephanoderes javanus* Eggers, 1908, Ent. Blätt. 4:215 (Lectotype, female; Java U.S. Nat. Mus. 60124, designated by Anderson and Anderson, 1971, Smithsonian Contrib. Zool. 94:16); Wood, 1975, Great Basin Nat. 35:393. *Status discussed*

*Stephanoderes obesus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:30 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 7543); Wood, 1957, Canadian Ent. 89:402. *Synonymy*

*Stephanoderes philippinensis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:31 (Holotype, female; Angat, Philippine Islands; U.S. Nat. Mus., 7544); Wood, 1957, Canadian Ent. 89:402. *Synonymy*

*Stephanoderes bananensis* Eggers, 1922, Ent. Blätt. 18:167 (2 syntypes: Banana, Congo; Eggers Coll.); Wood, 1972, Great Basin Nat. 32:51. *Synonymy*

*Stephanoderes kalshoveni* Schedl, 1939, Tijdschr. Ent. 82:35 (Syntypes; Pasoeroean, Java; Buitenzorg Mus.); Wood, 1972, Great Basin Nat. 32:51. *Synonymy*

*Stephanoderes subagnatus* Eggers, 1940, Rev. Zool. Bot. Afr. 33:101 (Holotype, female; Eala, Congo; Tervuren Mus.); Wood, 1972, Great Basin Nat. 32:51. *Synonymy*

*Stephanoderes pistor* Schedl, 1951, Dusenia 2:102 (2 syntypes; Havana, Cuba; Schedl Coll.); Wood, 1976, Great Basin Nat. 36:348. *Synonymy*

*Stephanoderes prosper* Schedl, 1951, Dusenia 2:103 (Holotype, female; Guadeloupe; Schedl Coll.); Wood, 1976, Great Basin Nat. 36:348. *Synonymy*

DIAGNOSIS.— This species is distinguished from *brunneus* Hopkins by the slightly larger size, by the more slender, longer interstrial scales, and by the smoother, more closely punctured posterolateral areas of the pronotum.

FEMALE.— Length 1.4–1.7 mm, 2.2 times as long as wide; color brown.

Frons transversely, subconcavely impressed on median two-thirds from epistoma to

rather well above upper level of eyes, upper margin of impressed area rather sharply defined but not carinate; surface of concave area smooth, shining, with fine punctures particularly in lateral areas, upper areas above impression minutely, longitudinally etched, punctures rather fine, deep, close; scanty vestiture hairlike, confined to impressed area.

Pronotum 0.9 times as long as wide; widest one-third length from base, sides on basal half weakly arcuate, broadly rounded in front; anterior margin armed by two to four teeth, median pair often absent or at least reduced in size; 12–18 coarse asperities on anterior slope; summit moderately high; posterolateral areas almost smooth, shining, with moderately abundant, small, shallow, sharply impressed punctures. Vestiture of coarse hair in asperate area, of fine, short hair intermixed with slightly longer, slender scales on posterior half.

Elytra 1.3 times as long as wide; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures fine, shallow; interstriae almost smooth, about twice as wide as striae, punctures very fine, uniseriate, not at all granulate. Declivity convex, moderately steep; strial punctures obsolete before apex. Vestiture of rows of fine, rather short strial hair, supplemented by some similar interstrial hair, and rows of erect interstrial scales; each scale equal in length to distance between rows and between scales within a row, each about six to eight times as long as wide.

MALE.— Similar to female except 1.4 mm or less, 2.2 times as long as wide; eye reduced in size; funicle usually 3-segmented; teeth on anterior margin of pronotum absent or abnormal; pubescence longer.

DISTRIBUTION.— S Florida, Cuba, and Jalisco; Indonesia, Philippines, Africa.

USA: **Florida**: Coconut Grove, Delray Beach, Dade City, Everglades N.P., Homestead, Key Largo, Miami, Paradise Key, Perrine, Royal Palm Hammock St. Pk. MEXICO: **Jalisco**: La Huerta. OTHER AREAS: Philippine Islands, Java, Ghana, Congo, Cameroon.

HOSTS.— *Bauhinia alba, Conocarpus erecta, Eleagnus pungens fruitlandi, Ficus aurea, Hevea brasiliensis, Leucania glauca, Mangifera indica, Ochroma* sp., *Ocotea catesbiana, Persea borbonia, Rheedia* sp., *Rhizophora mangle, Trema floridana, Vitis* sp.

BIOLOGY.— Essentially as in *dissimilis*.

NOTES.— The above treatment was based on the lectotype of *javanus*, on the holotypes of *obesus, philippinensis*, and *subagnatus*, on syntypes of *bananensis, kalshoveni*, and *pistor*, and on 118 other specimens.

This species evidently was introduced to other areas from Africa.

### 39. *Hypothenemus brunneus* (Hopkins)

Fig. 194

*Stephanoderes brunneus* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:31 (Holotype, female; Brownsville, Texas; U.S. Nat. Mus., 7545)

*Stephanoderes frontalis* Hopkins, 1915, U.S. Dept. Agric. Rept. 99:31 (Holotype, female; Brownsville, Texas; U.S. Nat. Mus., 7384); Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1031. *Synonymy*

*Hypothenemus cryphalomorphus* Schedl, 1939, Proc. Roy. Ent. Soc. London 8(1):14 (Holotype, female; Trinidad, British West Indies; British Mus. Nat. Hist.); Wood, 1977, Great Basin Nat. 37:208. *Synonymy*

*Stephanoderes bituberculatus* Eggers, 1940, Arb. Morph. Taxon. Ent. Berlin-Dahlem 7:126 (Holotype, female; Env. de Trois Rivières, Guadeloupe; Paris Mus.); Wood, 1977, Great Basin Nat. 37:208. *Synonymy*

DIAGNOSIS.— This species is distinguished from *javanus* (Eggers) by the slightly smaller size, by the shorter, stouter interstrial bristles, and by the reticulate posterolateral areas of the prontum, with fewer subgranulate punctures.

FEMALE.— Length 1.3–1.45 mm, 2.3 times as long as wide; color brown.

Frons as in *javanus* except less strongly concave, upper margin of impression acutely, strongly carinate. Pronotum as in *javanus* except posterolateral areas reticulate, subshining, punctures minute, less numerous, some of them usually finely granulate. Elytra as in *javanus*, strial punctures possibly smaller; discal surface minutely subrugose in most specimens; interstrial scales two-thirds as long as in *javanus*, each about four times as long as wide.

MALE.— As in female except sexes differing as in *javanus*.

DISTRIBUTION.— S Texas and Florida to Panama.

USA: **Alabama**: Mobile. **Florida**: Biscayne Bay, Delray Beach, Everglades N.P., Homestead, Key Largo, Key West, Matecumbe Key, Miami, Sugar Loaf Key. **Texas**: Brownsville, Port isabel, Southmost, Thayer. MEXICO: **Colima**: 3 km E Armeria, 53 km S Colima, 6 km S

Cihuatlán. **Jalisco**: 8 km S La Huerta. **Nayarit**: Los Corchos, 25 km NW Ixtlán, 8 km S Rosamorada, 8 and 27 km E San Blas. **Oaxaca**: 9 km W Zanatepec. **Puebla**: 13 km NW Acatlán. **Sinaloa**: Concha, Mazatlán. **Sonora**: "Sonora." **Tamaulipas**: Tampico. **Veracruz**: Cerro Gordo, 35 km SE Jalapa, 3 km S Rinconada, 24 km W Veracruz. **Yucatán**: Chichen-Itza. HONDURAS: La Ceiba. PANAMA: Taboga Island. OTHER AREAS: Bahama Islands, Cuba, Puerto Rico, Trinidad, Virgin Islands.

HOSTS.— *Acacia farnesiana*, *Albizzia lebbekoides*, *Annona* sp., *Ardesia paniculata*, *Bauhinia grandiceps*, *Berria amonilla*, *Cajanus cajon*, *Canavalia* sp., *Celtis iguana*, *C. laevigata*, *Clematis* sp., *Condalia obtusifolia*, *Dalbergia ecastophyllum*, *Ficus* sp., *Galactia spiciformis*, *Gliricidia sepium*, *Grewia asiatica*, *Hovenia dulcis*, *Ichthyomethia communis*, *Leucania glauca*, *Lysiloma bahamensis*, *Mimosa* sp., *Ocotea catesbyana*, *Poinsettia heterophylla*, *Serjania* sp., *Trema floridana*, *Vachellia farnesiana*.

BIOLOGY.— Essentially as in *dissimilis*.

NOTES.— The above treatment was based on the holotypes of *brunneus*, *frontalis*, *bituberculatus*, and *cryphalomorphus*, and on 205 other specimens.

This species almost certainly was introduced from Africa or a neighboring area, but I have not yet seen African specimens. It differs so slightly from *javanus* that it is possible these two forms were introduced from two or more widely separated areas and appear as two species in the American fauna only because of intensive inbreeding resulting from arrhenotokic parthenogenesis.

## GENUS *CRYPTOCARENUS* EGGERS

*Cryptocarenus* Eggers, 1937, Rev. de Ent. 7:79 (Type-species: *Cryptocarenus diadematus* Eggers, original designation)

*Tachyderes* Blackman, 1943, J. Washington Acad. Sci. 33:35 (Type-species: *Tachyderes floridensis* Blackman = *Cryptocarenus seriatus* Eggers, original designation); Schedl, 1951, Dusenia 2:72. *Synonymy*

DIAGNOSIS.— This genus is distinguished by the large, deeply emarginate, very coarsely faceted eyes, by the aseptate antennal club that has two procurved sutures marked only by setae, by the smooth, shining appearance, with virtually all vestiture obsolete (except some South American species), and by the strong, superficial resemblance to *Pityophthorus*.

DESCRIPTION.— Length, female 1.4–3.0 mm, males about one-third smaller, 2.6–2.7 times as long as wide; color yellowish or reddish brown to dark brown.

Sexually dimorphic, males reduced in size and slightly deformed. Female frons variously sculptured, vestiture inconspicuous. Eye very large, deeply emarginate; coarsely faceted. Antennal scape elongate; funicle 5-segmented, club moderately small, oval, aseptate, sutures 1 and 2 weakly procurved, indicated only by rows of setae. Pronotum about as long as wide, basal and posterior three-fourths of lateral margins marked by a fine, raised line; summit moderately developed, asperities on anterior slope rather small, numerous, anterior margin armed by 8 to 14 teeth; posterior areas smooth, shining, finely punctured, vestiture sparse, hairlike. Elytra conservatively sculptured; striae not impressed, punctures fine; interstriae impunctate on disc, smooth, shining, minute points often present; declivity moderately steep, convex, a few interstrial punctures present; vestiture confined to declivity, consisting of sparse interstrial bristles, their apices usually flattened. Tibiae usually more slender than in *Hypothenemus*.

DISTRIBUTION.— Texas and Florida to Argentina; one species introduced into Africa; 10 species are known.

BIOLOGY.— As in *Hypothenemus*, the males are dwarfed, rare, and flightless. Mating, when it occurs in the brood tunnels, usually is either between siblings or between mother and son. Adult females attack small cut or unthrifty stems less than 2–3 cm in diameter of lianas, shrubs, or trees. They enter the twig and construct an elongate, axial pith tunnel. Larvae extend the parental tunnel and usually do not excavate the hardy, woody tissues unless there is crowding.

NOTES.— Due to the superficial resemblance of representatives of this genus to certain of the Pityophthorini, Schedl (1962) included this genus in the Pityophthorini, although the metepisternum is not covered by the elytra, the sutures on the posterior face of the antenna are strongly displaced, the costal margins near the elytral apex ascend significantly, and the males are dwarfed, rare, and do not participate in the construction of new galleries for the next generation.

Key to the Species of *Cryptocarenus*

1. Frons at least weakly convex from epistoma to upper level of eyes ..... 2
– Frons moderately to rather strongly impressed or subconcave from epistoma to upper level of eyes ..... 4

2(1). Area from epistoma to upper level of eyes and from eye to eye uniformly sculptured, deeply punctured, punctures indistinctly oriented into obscure longitudinal rows, sculpture changing abruptly at upper level of eyes; anterior margin of pronotum armed by 10–14 teeth; Oaxaca to Panama, Venezuela, Brazil; 2.3–3.0 mm ..... 1. ***diadematus*** **Eggers**
– Frons more finely, rugosely sculptured from epistoma to well above eyes, either punctured or with rugosities obscurely aciculate; anterior margin of pronotum armed by 7–9 teeth; smaller ..... 3

3(2). Frons evenly convex, punctured from epistoma to above eyes, entirely devoid of rugosities, no indication of a median carina or tubercle; eight serrations on anterior margin of pronotum and asperities coarse, slender; Panama; 1.9 mm ... ..... 5. ***laevigatus*** **(Blandford)**
– Frons with fine, often obscure, subaciculate rugosities; a fine median carina extending from epistoma to above upper level of eyes (lower half sometimes obsolete); lower frons often flattened or slightly, transversely impressed; Oaxaca to Colombia; 1.5–1.8 mm ..... 2. ***lepidus*** **Wood**

4(1). An arcuate row of at least five rather coarse, longitudinally elongate tubercles at upper level of eyes, median one continued dorsad as short median carina; Texas and Florida to Brazil; 2.0–2.4 mm ..... 3. ***seriatus*** **Eggers**
– Frons bearing only one rather well-developed (median) tubercle at upper level of eyes, rather coarsely rugose-punctate; Florida and Colima to Brazil, etc.; 1.4–1.8 mm ..... 4. ***heveae*** **(Hagedorn)**

### 1. *Cryptocarenus diadematus* Eggers

*Cryptocarenus diadematus* Eggers, 1937, Rev. de Ent. 7:80 (Holotype, female; Corumba, Matto Grosso, Brazil; U.S. Nat. Mus., 60247)

DIAGNOSIS.— This species is distinguished by the broadly convex frons, which is rather coarsely, broadly subgranulate-punctate from the epistoma to the upper level of the eyes, and by the larger average size.

FEMALE.— Length 2.3–3.0 mm, 2.7 times as long as wide; color light reddish brown.

Frons broadly convex, a short, low, median carina at upper level of eyes; surface subgranulate-punctate from epistoma to upper level of eyes, sculpture changing abruptly at upper level of eyes to finely rugose; vestiture of fine, moderately abundant, short, inconspicuous hair.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on basal half; rather abruptly arcuately converging then constricted just before rather broadly rounded anterior margin; anterior margin armed by 14–16 rather coarse teeth; posterior areas smooth, shining, with a few minute points, punctures very fine, moderately close. Vestiture of sparse short hair.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures very small, shallow; interstriae at least three times as wide as striae, smooth, shining, punctures obsolete, minute points often indicated. Declivity moderately steep, convex; sutural striae narrowly impressed, interstriae 2 feebly impressed; interstriae with fine, rather widely spaced punctures. Vestiture confined to declivity, consisting of sparse, erect, interstrial bristles of moderate length, each slightly flattened on its distal half.

MALE.— Similar to female except 1.4 mm, stouter; eye reduced in size; punctation of frons simple; surface of pronotum and elytra

callow, details of features not clearly defined. Only one callow example at hand.

DISTRIBUTION.— Oaxaca to Brazil.

MEXICO: Oaxaca: Matías Romero, 29-VI-67, 150 m, No. 121, *Serjania*, S. L. Wood. COSTA RICA: "Costa Rica," XII-65,, Avocado, No. 582, N. L. H. Krauss. PANAMA: Ft. Clayton, Canal Zone, 22-XII-63, 30 m, No. 332 tree branch, S. L. Wood; Summit, *Saraca indica*. OTHER COUNTRIES: Jamaica, Colombia, Venezuela, Brazil.

HOSTS.— *Persea americana*, *Saraca indica*, *Serjania* sp., and many other lianas, shrubs, and trees (in Venezuela).

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotype and on 61 other specimens.

### 2. *Cryptocarenus lepidus* Wood

*Cryptocarenus lepidus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):36 (Holotype, female; Beverley, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *diadematus* Eggers by the smaller size, by the darker color, by the more finely sculptured frons, and by the median, subcarinate elevation on the lower frons.

FEMALE.— Length 1.5–1.8 mm, 2.6 times as long as wide; color dark reddish brown.

Frons very weakly, transversely impressed on lower half, a weak median carina usually extending from epistomal margin to upper level of eyes; surface rather coarsely subgranulate-punctate to well above upper level of eyes, transition in sculpture above eyes gradual; vestiture about as in *diadematus*.

Pronotum 1.0 times as long as wide; as in *diadematus* except anterior margin armed by about 10 teeth.

Elytra about as in *diadematus* except strial punctures deeper, slightly larger, minute impressed points more evident; declivital interstriae 2 not at all impressed; interstrial scales shorter.

MALE.— Presumably differing as in *diadematus*; only one male, its head and prothorax missing, was available for study.

DISTRIBUTION.— Oaxaca to Colombia.

MEXICO: Oaxaca: 11 km N Matías Romero, 24-VI-67, 150 m, No. 121, *Serjania*, S. L. Wood. Veracruz: 8 km S San Andres Tuxtla, 5-V-69, D. E. Bright. GUATEMALA: Palín, Esquintla, 19-V-64, 350 m, No. 591, Cola de Pavo, S. L. Wood. COSTA RICA: Playon, San José, 22-II-64, 50 m, No. 449, *Canavalia*, S. L. Wood; Santa Ana, San José, 30-VIII-63, 1300 m, No. 158, liana, S. L. Wood; Beverley, Limón, 26-VIII-63, 7 m, No. 154, liana, S. L. Wood; Volcán, Puntarenas, 11-XII-63, 700 m, No. 304, tree branch, S. L. Wood. PANAMA: Cerro Campana, 26-VII-66, 1000 m, No. 32, tree branch, S. L. Wood; Río Hato, 22-V-60, V. J. Tipton. COLOMBIA: 24 km E Barbosa, Antioquia, 18-VII-70, 1200 m, No. 694, *Xeiopia*, S. L. Wood; Caicedonia, Valle de Cauca, 30-VI-59, *Coffea robusta*, J. Restrepo.

HOSTS.— *Canavalia villosa*, *Coffea robusta*, *Serjania* sp., *Xeiopia* sp.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 27 specimens and on 22 other specimens.

### 3. *Cryptocarenus seriatus* Eggers

Fig. 194

*Cryptocarenus seriatus* Eggers, 1933, Orig. Mem. Trav. Lab. Ent. Paris 1(1):10 (Holotype, female; Nouveau Chantier, French Guayana; Paris Mus.)

*Cryptocarenus adustus* Eggers, 1933, Orig. Mem. Trav. Lab. Ent. Paris 1(1):11 (Holotype, female; St. Jean du Maroni, French Guayana; Paris Mus.); Wood, 1972, Great Basin Nat. 32:194. *Synonymy*

*Tachyderes floridensis* Blackman, 1943, J. Washington Acad. Sci. 33:36 (Holotype, female; Paradise Key, Florida; U.S. Nat. Mus., 56415); Schedl, 1962, Ent. Blätt. 58:205. *Synonymy*

*Cryptocarenus bolivianus* Eggers, 1943, Mitt. Münchner Ent. Ges. 33:356 (Holotype, female; Cochabamba, Bolivia; U.S. Nat. Mus.); Wood, 1975, Great Basin Nat. 35:21. *Synonymy*

DIAGNOSIS.— This species is distinguished by the size, by the shallowly concave frons, and by the transverse row of about five frontal tubercles at the upper level of the eyes.

FEMALE.— Length 2.0–2.4 mm, 2.6 times as long as wide; color rather light reddish brown.

Frons shallowly concave on median three-fifths from epistoma to upper level of eyes, its upper margin armed by a transverse row of five widely spaced tubercles, median one distinctly larger; surface of concavity rather finely, deeply, closely punctured, upper and lateral areas punctate-granulate, granulations usually arranged in indefinite longitudinal rows; vestiture inconspicuous.

Pronotum 1.06 times as long as wide; as in *diadematus* Eggers except sides weakly arcuate; anterior margin armed by eight teeth.

Elytra as in *diatematus*, except interstrial bristles very slightly shorter.

MALE.— Similar to female except 1.5–1.6 mm, 2.5 times as long as wide; eye reduced in size; one or more pronotal teeth absent;

surface sculpture on pronotum and elytra obscure, not sharply formed.

DISTRIBUTION.— S Texas and Florida to Brazil and Bolivia.

USA: **Florida**: Big Pine Key, Biscayne, Everglades N.P., Grassy Key, Key Largo, Key Vaca, Key West, Lower Matecumbe Key, Ochoppee, Paradise Key, Royal Palm Hammock St. Pk., Sebring, Sugar Loaf Key. **Texas**: Brownsville. MEXICO: **Colima**: 3 km W Armeria. **Nayarit**: San Blas. **Oaxaca**: 29 km N Matías Romero. **Sinaloa**: Mazatlan. HONDURAS: Olanchito, Zamorano. COSTA RICA: Playon, Santa Ana. OTHER AREAS: Cuba, Haiti, Virgin Islands, Jamaica, Venezuela, Bolivia, Brazil.

HOSTS.— *Canavalia villosa, Chenopodium ambrosioides, Conocarpus erecta, Dipholis salicifolia, Ficus aurea, Ipomoea pes-caprae, Mangifera indica, Metopium toxiferum, Persea borbonea, Pithecellobium guadaloupense, Rhacoma crossopetalum.*

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotypes of *seriatus, adustus, bolivianus*, and *floridenus*, and on 79 other specimens.

### 4. *Cryptocarenus heveae* (Hagedorn)

Figs. 192–194

*Stephanoderes heveae* Hagedorn, 1912, Rev. Zool. Afr. 1:338 (Lectotype, female; Eala, Congo; Tervuren Mus., present designation)

*Cryptocarenus caraibicus* Eggers, 1937, Rev. de Ent. 7:82 (Holotype, female; Guadeloupe; U.S. Nat. Mus., 60246); Wood, 1975, Great Basin Nat. 35:393. *Synonymy*

*Tachyderes parvus* Blackman, 1943, J. Washington Acad. Sci. 33:36 (Holotype, female; Cayamas, Cuba; U.S. Nat. Mus., 56416); Wood, 1962, Great Basin Nat. 22:78. *Synonymy*

*Cryptocarenus porosus* Wood, 1954, Univ. Kansas Sci. Bull. 36(2):1014 (Holotype, female; Royal Palm Hammock St. Pk., Florida; Snow Ent. Mus., Univ. Kansas); Wood, 1957, Canadian Ent. 89:396. *Synonymy*

DIAGNOSIS.— This species is distinguished from *lepidus* Wood by the rather strongly, transversely impressed frons, with longitudinal rugae above upper level of eyes arranged to form a transverse row of one to five (usually three) indefinite denticles.

FEMALE.— Length 1.4–1.8 mm, 2.6 times as long as wide; color very dark brown.

Frons rather strongly, transversely impressed from epistoma to upper level of eyes; surface of impressed area rather closely, deeply punctured, punctures on lower third not at all rugose; surface above and near upper level of eyes rugose-punctate, indefinite rugae arranged in longitudinal rows and ending in three (rarely five) indefinite denticles, median one much larger and never continued ventrad as a carina into impressed area.

Pronotum as in *lepidus*; anterior margin usually armed by eight teeth. Elytra as in *lepidus*.

MALE.— Similar to female except length 1.0 mm, 2.5 times as long as wide; eye reduced in size; some pronotal teeth absent; surface sculpture less clearly formed.

DISTRIBUTION.— Florida and Colima to Brazil; Africa.

USA: **Florida**: Everglades Nat. Pk., 6-VII-51, *Vitis*, S. L. Wood; Royal Palm Hammock St. Pk., 22-VI-51, *Vitis*, S. L. Wood. MEXICO: **Colima**: 3 km E Armeria, 28-VI-65, 70 m, No. 130, liana, S. L. Wood. **Veracruz**: 37 km N Matías Romero, 29-VI-67, 100 m, No. 125, tree branch, S. L. Wood. COSTA RICA: Playón, 22-II-64, 50 m, No. 449, *Canavalia villosa*, S. L. Wood. PANAMA: Madden Forest, Canal Zone, 2-I-64, tree branch, S. L. Wood. OTHER COUNTRIES: Cuba, Jamaica, Colombia, Venezuela, Brazil, Ghana, Congo.

HOSTS.— *Canavalia villosa, Vitis*, and other lianas, shrubs, and trees in other tropical countries.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on three syntypes of *heveae*, on the holotypes of *caraibicus, parvus*, and *porosus*, and on 127 other specimens. Three female syntypes of *heveae* are at the Tervuren Museum; all are labeled: Musée Du Congo Belge; Eala, Bakusu (lith 1160 m, 1911); D. Hevea brasiliensis. The first specimen also bears a printed label "Holotypus" and also a pencil label "Hypothenemus, Congo, 1911." The second and third specimens also bear a printed label "Paratypus." Because Hagedorn did not designate a holotype and because a lectotype has not been designated in print by subsequent workers, I here designate the first specimen as the lectotype of *Stephanoderes heveae* Hagedorn.

### 5. *Cryptocarenus laevigatus* (Blandford)

*Hypothenemus laevigatus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):230 (Lectotype, female; Los Remedios, Chiriquí, Panama; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished from *lepidus* Wood by the more convex, punctured frons that is entirely devoid of rugae, tubercles, or a carina, by the large, slender, pronotal asperities and anterior

serrations, and by the slightly longer, more slender elytral setae.

FEMALE.— Length 1.9 mm, 2.4 times as long as wide; color rather dark yellowish brown.

Frons very broadly convex; surface shining, coarsely, closely punctured from epistoma to slightly above upper level of eyes; no indication of rugae, tubercles, or carina; vestiture of sparse, fine, long hair.

Pronotum as in *lepidus* except asperities and anterior serrations higher.

Elytra 1.5 times as long as wide; as in *lepidus* except strial punctures very slightly larger, impressed points obscure or absent; declivital interstriae 2 as wide as 1 or 3, bristles distinctly longer than width of discal interstriae, each slightly flattened on its apical fourth.

DISTRIBUTION.— Panama.

PANAMA: Los Remedios, Chiriquí, G. C. Champion.

NOTES.— Blandford's syntypic series of *laevigatus* is composite. Only three of the original four female specimens are now in the British Museum; one of the Bugaba specimens is missing. The first specimen, from Los Remedios, has been regarded as the type for many years; it is here designated as the lectotype of *Hypothenemus laevigatus* Blandford. The second specimen, from Chontales, Nicaragua, is of *heveae* (Hagedorn). The above treatment was based on the lectotype.

## Tribe CORTHYLINI

Corthyli LeConte, 1876, Proc. Amer. Philos. Soc. 15:347 (Type-genus: *Corthylus* Erichson, 1836)
Pityophthoridae Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:173 (Type-genus: *Pityophthorus* Eichhoff, 1864)
Araptidae Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:305 (Type-genus: *Araptus* Eichhoff, 1872)
Amphicranidae Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:460 (Type-genus: *Amphicranus* Erichson, 1836)

Anatomical features.— The frons is usually sexually dimorphic, but the dimorphism is expressed in numerous different ways, the eye is emarginate, the antennal funicle is 1–5-segmented, the club if flattened, when sutures are present those on the posterior face are almost equal to those on the anterior face, the pronotum is usually declivous and asperate in front, the lateral margins may be rounded or marked by a fine, raised line, the procoxae are contiguous, the metepisternum has a unique locking mechanism (a groove) for the elytra and is largely covered by the elytra, the costal margin of the elytra usually descends slightly toward the apex, and the tibiae are slender and rarely armed by more than three denticles.

Biological features.— Both monogamy and heterosanguineous polygyny are widespread. The subtribe Pityophthorina includes phloeophagous and spermophagous forms, Corthylina xylomycetophagous forms. Eggs are placed in niches or in fully formed cradles (*Corthylus*). Larval mines in Pityophthorina are independent, follow a definite course, and rarely cross; in Corthylina they enlarge the egg niches into cradles just large enough to accommodate the adult stage. Symbiotic fungi furnish the principal food of the Corthylina. Two species of *Araptus* practice consanguineous polygyny and have dwarfed, apparently haploid males.

Taxonomy.— Except for *Pityophthorus*, which has a few representatives in Eurasia and Africa, this tribe is uniquely American. The differences between genera are minute and classification is unusually difficult.

### Genus *STYPHLOSOMA* Blandford

*Styphlosoma* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):232 (Type-species: *Styphlosoma granulatum* Blandford, monobasic)

Diagnosis.— This genus is distinguished from *Dendroterus* Blandford by the 5-segmented antennal funicle, by the strongly procurved sutures of the antennal club, and, in the female, by the deeply emarginate epistoma and the mandibular spine.

Description.— Length 1.3–1.6 mm, 2.4 times as long as wide; color very dark brown.

Frons dimorphic, male transversely carinate at upper level of eyes, impressed below; female frons flattened with epistoma very deeply emarginate, a pair of mandibular spines projecting into emargination. Antennal scape elongate; funicle 5-segmented; club flattened, with sutures strongly procurved, suture 1 extending one-fourth and 2 three-fourths of club length from base. Pronotum declivous and finely asperate on anterior half; summit poorly defined; transition from asperate to punctured areas gradual. Elytra striate; declivity steep, unarmed.

Distribution.— Costa Rica to Venezuela; two species are known.

Biology.— The thick bark on the bole of fallen trees is selected for attack. The nuptial chamber is a small tabular cavity having its longest axis perpendicular to the surface of the wood and its width parallel to the grain of the wood. From the inner extremity of the nuptial chamber one or two egg galleries branch from the upper and one or two from the lower corner near the cambium. The egg galleries gradually descend through the

phloem then continue for about two thirds of their length along the cambium layer. The eggs evidently are deposited in niches along the sides of the gallery only after it reaches the cambium. The larval mines follow an erratic course in the cambium region (only very young larvae were observed).

### *Styphlosoma granulatum* Blandford
Fig. 195

*Styphlosoma granulatum* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6); 232 (Holotype, male; Bugaba, Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *subulatum* Wood by the flat, less strongly impressed female frons, with punctures slightly larger, by the less deep, somewhat obtuse female epistomal emargination, and by the slightly wider declivital impression on the elytra.

FEMALE.— Length 1.3–1.5 mm, 2.4 times as long as wide; color very dark brown.

Frons flat from eye to eye from epistomal margin to vertex; epistomal margin very deeply emarginate, emargination almost attaining upper level of eyes, rather broadly U-shaped, wider than deep, its arms diverging slightly; surface almost smooth, with dense, uniformly distributed, rather coarse, deep punctures over entire flattened area; dorsomesal angle of cutting surface of mandibles greatly extended and curved cephalad into a median, projecting process; this mandibular process projecting from fundus of epistomal emargination a distance equal to almost half length of scape; vestiture rather abundant, very short, inconspicuous.

Pronotum 1.06 times as long as wide; widest near base, sides feebly arcuate and converging very slightly on basal half, rather broadly rounded in front; anterior margin weakly serrate; summit at middle, broad; anterior slope finely asperate, dense subasperate granules continuing to base in discal area; posterolateral areas closely, deeply, rather coarsely punctured. Vestiture of very short, coarse, close setae.

Elytra 1.4 times as long as wide; sides almost straight and parallel on basal two-thirds, very broadly rounded behind; striae 1 weakly impressed, strial punctures moderately coarse, rather deep, close; interstriae as wide as striae, smooth, punctures fine, close, in rows except moderately confused toward base. Declivity very steep, appearing somewhat flattened from dorsal aspect; strial punctures smaller than on disc; interstrial punctures about as on disc; interstriae 2 narrowed, strongly, narrowly impressed on central two-thirds of declivity. Vestiture on striae and alternate interstrial setae of short, suberect, rather coarse hair; irregular somewhat alternate interstrial setae forming rows of slightly longer scales, each scale about three times as long as wide (alternate arrangement of scales and stout hair much less regular than in *subulatum*).

MALE.— Similar to female except epistoma not emarginate; frons with a strongly developed, transverse carina at upper level of eyes, convex above, strongly, transversely impressed below carina, surface coarsely, closely punctured, upper area also reticulate.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Finca Taboga, 15 km SE Cañas, Guanacaste, 2-II-67, *Spondias mombin*, R. W. Matthews. PANAMA: Bugaba, Chiriquí, G. C. Champion.

HOST.— *Spondias mombin*.

BIOLOGY.— As described for genus.

NOTES.— The above treatment was based on a male compared to the type by R. T. Thompson and on 108 other specimens.

## GENUS *DENDROTERUS* BLANDFORD

*Dendroterus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):233 (Type-species: *Dendroterus mexicanus* Blandford, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:120)

*Plesiophthorus* Schedl, 1940, An. Esc. Nac. Cienc. Biol., Mexico 1:343 (Type-species: *Plesiophthorus perspectus* Schedl, monobasic); Wood, 1959, Great Basin Nat. 19:2. *Synonymy*

*Xylochilus* Schedl, 1956, Pan Pacif. Ent. 32:31 (Type-species: *Xylochilus insularis* Schedl = *Dendroterus sallaei* Blandford, original designation); Wood, 1972, Great Basin Nat. 32:191. *Synonymy*

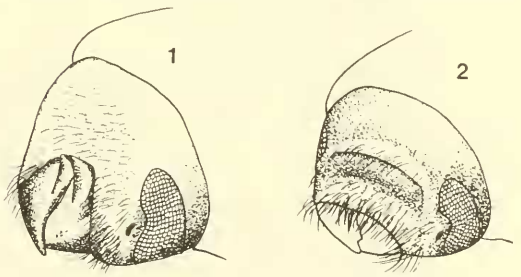



Fig. 195. *Styphlosoma granulatum*, heads: 1, female; 2, male.

DIAGNOSIS.— This genus is distinguished from *Styphlosoma* Blandford by the 3- or 4-segmented antennal funicle, by the straight to slightly recurved sutures of the antennal club, and by the entire frons and normal mandibles in the female.

DESCRIPTION.— Length 1.4–2.9 mm, 2.4–2.8 times as long as wide; color yellowish brown to almost black.

Frons evenly convex in both sexes to strongly dimorphic. Antennal scape elongate; funicle 3- or 4-segmented (variable within a series in a few species); sutures of club straight to weakly recurved. Pronotum and elytral disc as in *Styphlosoma*; elytral declivity convex to weakly impressed, very steep, unarmed.

DISTRIBUTION.— S California and Texas to Panama; 13 species are known.

BIOLOGY.— Unthrifty, injured, or recently cut host material of the genera *Bursera* and *Jatropha* is selected for attack. All species are polygamous and breed in phloem tissues, at times without coming in contact with the cambium region. Larvae cut individual mines that wander in the general direction away from the star-shaped parental galleries.

NOTES.— The segmentation of the antennal funicle varies in this genus. In *striatus* and *luteolus* it is usually 3-segmented, less commonly 2-segmented; in *mexicanus*, *cognatus*, and *decipiens* it is usually 4-segmented, less commonly 3-segmented; in the only known specimen of *perspectus* it is 3-segmented. In all other material at hand the funicle is 4-segmented. The type of *perspectus* was not available when the key was written.

## Key to the Species of *Dendroterus*

1. Pro- and mesotibiae each armed by two apical and four lateral socketed teeth; interstrial setae fine, long, one and one-half to two times as long as distance between rows; pronotal asperities coarse, less abundant, confined to anterior half, posterior half almost smooth to weakly subreticulate, shining, punctures coarse, deep, interspaces averaging as wide as punctures, not granulate; strial punctures coarse, deep, declivity moderately steep, narrowly convex; frons similar in both sexes; Texas; *Jatropha spathulata*; 2.1–2.9 mm ..... 1. ***texanus*** **Wood**

— Pro- and mesotibiae each armed by two apical and one lateral socketed teeth; interstrial setae not longer than distance between rows; pronotal asperities smaller; more abundant, often extending to part of posterior half; posterior half either strongly reticulate or much more closely punctured; frons strongly dimorphic (except *sodalis*); *Bursera* ..... 2

2(1). Pronotum reticulate and finely punctured on posterior half, interspaces averaging at least twice as wide as punctures, devoid of granules; strial punctures very small, less than half as wide as interstriae; interstrial punctures obsolete (confused impressed points usually present); elytral declivity more gradual, more narrowly convex ..... 3

— Posterior areas of pronotum shining, much more closely, coarsely, deeply punctured, often granulate; strial punctures larger; interstrial punctures distinctly impressed, rather coarse in most species; elytral declivity steeper, more broadly convex to moderately impressed ..... 5

3(2). Female frons convex above, flattened on less than lower half, pubescence short, sparse; elytral surface brightly shining, strial punctures more sharply impressed, interstriae with comparatively few, obscure, impressed points; sutural interstriae on declivity distinctly elevated; Guatemala; *Bursera*; 1.4–1.8 mm ..... 2. ***sodalis*** **Wood**

— Female frons flattened to upper level of eyes and ornamented by rather abundant, moderately long hair; strial punctures not sharply impressed, interstriae either subreticulate or with numerous, deep, impressed points; sutural interstriae not elevated ..... 4

4(3). Elytral disc shining, with dense, deep, confused, minute, impressed points; interstrial setae on declivity more widely spaced, separated by distances almost equal to length of a seta; upper half of female frons subconcave, median area at upper level of eyes distinctly elevated; Costa Rica; *Bursera simarubra*; 1.9–2.0 mm ..... 3. ***parilis*** **Wood**

— Elytral disc subreticulate; interstrial setae on declivity twice as long as distance between setae of same row; upper area of female frons flat, without median prominence; Guatemala; *Bursera*; 1.7–2.1 mm ..... 4. ***eximius*** **Wood**

5(2). Discal interstriae with numerous, strongly confused punctures; female frons subconcavely impressed and ornamented by rather abundant long hair from epistoma to well above eyes; male frons with a conspicuous transverse impression just below upper level of eyes; punctures of declivital interstriae not granulate; Costa Rica and Panama; *Bursera simarubra*; 2.3–2.9 mm ..... 5. ***defectus*** **Wood**

— Interstrial punctures uniseriate; frons not conspicuously impressed in either sex ..... 6

6(5). Male frons weakly to moderately convex above epistoma, without special sculpture; female frons flattened to weakly convex and ornamented by a conspicuous brush of long hair; either larger than 2.0 mm or else declivital interstriae armed by granules ..... 7

— Female frons with a conspicuous, sharply elevated, transverse carina at upper level of eyes; male frons convex, usually slightly inflated above epistomal margin; 1.3–2.0 mm ..... 11

7(6). Declivital punctures on interstriae not granulate; lateral areas of male epistoma conspicuously elevated; female frons punctate-granulate, weakly convex, vestiture of uniform length and distribution; 1.9–2.7 mm ..... 8

— Declivital interstriae each armed by a row of granules; male epistoma without elevations; female frons at least partly flattened, vestiture more abundant and longer at margins; 1.5–2.1 mm ..... 9

8(7). Body slender, 2.8 times as long as wide; male frons more broadly, evenly rounded, epistomal elevations rather poorly developed; punctures on pronotal disc coarse; lower elytral declivity more distinctly impressed; Nayarit; *Bursera*; 1.9–2.2 mm ..... 6. ***cognatus*** **Wood**

— Body rather stout, 2.5 times as long as wide; male frons strongly convex above, much more weakly convex below, epistomal elevations moderately to very strongly elevated; punctures on pronotal disc averaging smaller; lower elytral declivity less distinctly impressed; Nayarit to Oaxaca; *Bursera*; 1.8–2.7 mm ..... 7. ***mexicanus*** **Blandford**

9(7). Discal interstriae as wide as striae, strial punctures coarse; granules on pronotal disc larger, punctures largely obliterated by reticulation; strial punctures on declivity larger, interstrial granules averaging smaller; frons finely granulate-punctate in both sexes; female frons often with a callus at upper margin of pubescent area; Nayarit to Costa Rica; *Bursera*; 1.6–1.9 mm (8. ***perspectus*** **Schedl** fits near here) ..... 9. ***sallaei*** **Blandford**

— Discal interstriae at least one and one half times as wide as striae, strial punctures smaller; pronotal disc with punctures distinct, granules very small, no evidence of reticulation; frons punctate ..... 10

10(9). Female frons weakly convex on upper two-thirds, very finely punctured; epistomal process slightly elevated medially, its lower margin usually marked by a procurved line separate from epistomal margin; discal interstriae smooth, impressed points almost obsolete, sparse; male declivity with interstriae 2 more strongly impressed, tubercles on 1 and 3 larger; Costa Rica; *Bursera simarubra*; 1.5–1.9 mm ..... 10. ***resolutus*** **Wood**

— Female frons flat to feebly impressed on upper two-thirds, rather coarsely punctured; epistomal process not indicated, epistoma not elevated in median area; elytral disc smooth, impressed points usually clearly indicated, more numerous; male declivital interstriae 2 less strongly impressed, punctures on 1 and 3 smaller; Jalisco to Oaxaca; *Bursera*; 1.6–2.0 mm ..... 11. ***decipiens*** **Wood**

11(6). Interstrial setae slender, almost hairlike; female transverse carina occupying median half of distance between eyes; male frons with weak transverse impression at upper level of eyes, subinflated below, impression marks abrupt transition in surface sculpture of upper and lower areas; S California to Baja California; *Bursera microphylla*; 1.6–2.0 mm ..... 13. ***striatus*** **(LeConte)**

— Interstrial setae stout, almost scalelike on declivity; female transverse carina occupying median three-fourths of distance between eyes; male frons evenly convex from epistoma to vertex; change in sculpture gradual; Nayarit to Chiapas; *Bursera*; 1.3–1.7 mm ..... 12. ***luteolus*** **(Schedl)**

### 1. *Dendroterus texanus* Wood
Fig. 196

*Dendroterus texanus* Wood, 1959, Great Basin Nat. 19:4 (Holotype, male; Presidio, Texas; U.S. Nat. Mus.)

DIAGNOSIS.— This unique species is distinguished by the absence of secondary sexual characters on the frons, and by the smooth surface of the pronotal disc between the coarse punctures.

FEMALE.— Length 2.1–2.9 mm, 2.8 times as long as wide; body color dark brown.

Frons rather weakly convex from eye to eye, epistomal margin gradually elevated; surface almost smooth, with rather coarse, abundant, subgranulate punctures; vestiture sparse, short, hairlike. Eye deeply emarginate; finely granulate. Antennal funicle 3-segmented, pedicel almost equal in length to combined lengths of segments 2 and 3; club oval, sutures straight except recurved at extreme side margins.

Pronotum 1.1 times as long as wide; widest at base, sides feebly arcuate, converging very slightly toward rather narrowly rounded anterior margin; anterior margin armed by eight rather large, subcontiguous teeth, median ones slightly longer; summit near middle, indefinite; surface of disc very minutely reticulate, between coarse, deep, abundant punctures, posterior areas devoid of granules; lateral and basal lines not present. Vestiture fine, semierect, hairlike, of moderate length.

Elytra 1.7 times as long as wide; sides straight and subparallel on basal two-thirds, gradually, rather narrowly rounded behind; striae not impressed, punctures rather coarse, deep; interstriae as wide as striae, almost smooth, punctures fine, about equal in number to those of striae. Declivity moderately steep, convex; striae 1 and 2 slightly impressed, punctures greatly reduced in size, but deeply, distinctly impressed; interstriae 1 slightly elevated, punctures as on disc but some very feebly granulate. Vestiture consisting of minute, inconspicuous strial hairs, and moderately long, erect interstrial hairlike setae; not longer on declivity.

MALE.— Similar to the female; distinguished externally only by segmentation of abdomen.

DISTRIBUTION.— Texas.

USA: **Texas**: Juniper Canyon, Big Bend N.P., 5-VI-70, *Jatropha spathulata*, L. B. and C. W. O'Brien; Presidio, 16-V-47, *J. spathulata*, J. H. Russell; Starr Co., 27-III-60; Uvalde Co., 13-VI-49.

HOST.— *Jatropha spathulata.*

BIOLOGY.— Specimens were reared from branches of the above shrub.

NOTES.— The above treatment was based on the type series of 118 specimens, and on 21 other specimens.

### 2. *Dendroterus sodalis* Wood

*Dendroterus sodalis* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):44 (Holotype, female; Volcán de Agua, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *eximius* Wood by the convex subglabrous female frons, by the subshining pronotum and elytra, with sharply impressed, moderately large punctures, and by the weakly impressed declivital interstriae 2.

FEMALE.— Length 1.4–1.8 mm, 2.6 times as long as wide; color dark reddish brown.

Frons broadly convex; surface subshining, small, finely granulate punctures rather close, uniformly distributed; vestiture very short, hairlike, moderately abundant. Funicle 4-segmented.

Pronotum 1.2 times as long as wide; as in *eximius* except teeth on anterior margin much smaller; posterior area subshining, surface subreticulate with many impressed points, punctures moderately large, deep, sparse. Glabrous.

Elytra 1.6 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures moderately large, deep; interstriae almost twice as wide as striae, almost smooth, shining, impunctate except on 1 and on others toward declivity. Declivity steep, broadly convex; strial punctures slightly smaller, not as deep; interstriae 1 abruptly, slightly elevated, 2 impressed, 3 weakly elevated, each with a row of fine rounded granules except absent on lower half of 2.

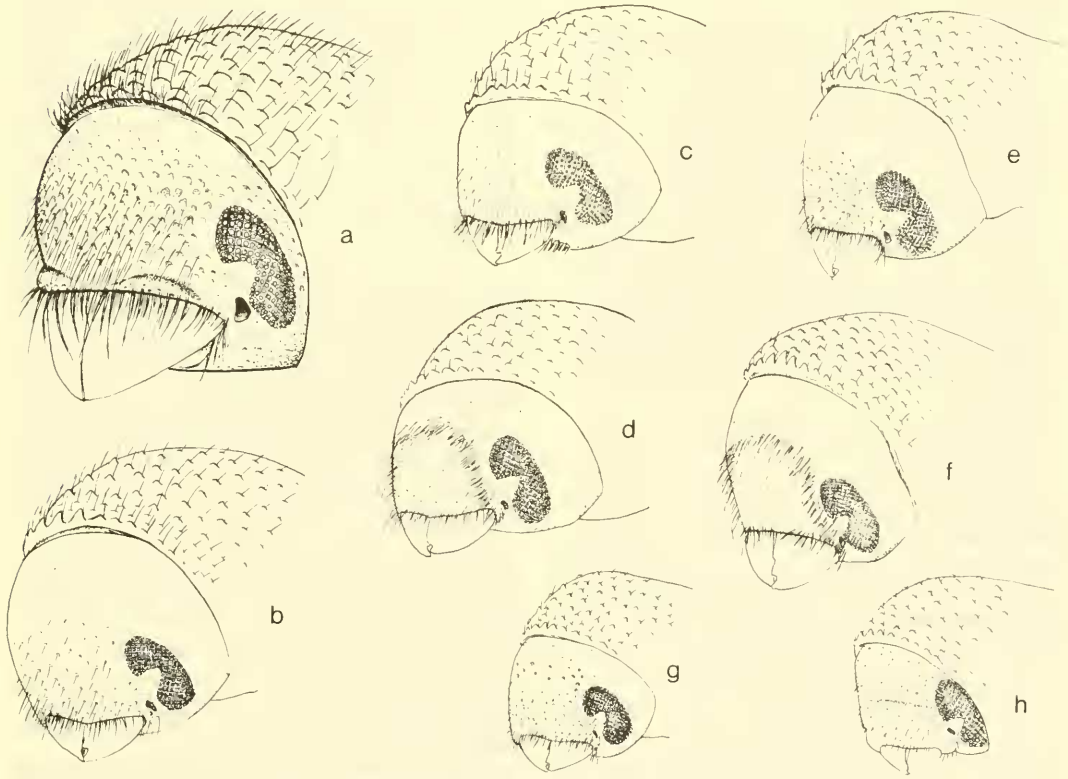



Fig. 196. *Dendroterus* spp., heads: a, *mexicanus*, male; b, *texanus*, female; c, *resolutus*, female, d, same, female; e, *eximius*, male, f, same, female; g, *luteolus*, male, h, same, female.

Vestiture of moderately long, coarse, rather widely spaced hair on and near declivity.

MALE.— Similar to female except frons more narrowly convex, vestiture less distinct.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán de Agua, Esquintla, 19-V-64, 1000 m, No. 595, *Bursera*, probably *simarubra*, S. L. Wood.

BIOLOGY.— Specimens were taken from the outer bark of a limb.

NOTES.— The above description was based on the type series of 45 specimens.

### 3. *Dendroterus parilis* Wood

*Dendroterus parilis* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):44 (Holotype, female; Santa Ana, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the closely allied *eximius* Wood by the more strongly impressed female frons, by the deeper pronotal punctures, by the greatly reduced strial punctures, by the much more numerous, deeper, impressed points on the elytra, and by the much less abundant elytral hair.

FEMALE.— Length 1.9–2.0 mm, 2.8 times as long as wide; color very dark reddish brown.

Frons as in *eximius* except very slightly more strongly impressed. Pronotum as in *eximius* except discal reticulation stronger, punctures deeper, more sharply impressed.

Elytra as in *eximius* except surface shining, strial punctures minute, shallow, some of them little larger than abundant, sharply impressed, minute points; surface of disc with many shallowly impressed, irregular lines; interstrial punctures on declivity less distinctly granulate. Vestiture about half as abundant as in *eximius*.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Santa Ana, San José, 8-XI-63, 1300 m, No. 253, *Bursera simarubra*, S. L. Wood.

BIOLOGY.— Specimens were taken from the outer bark of a small shaded-out branch of a living fence row tree.

NOTES.— The above treatment was based on the two females in the type series.

### 4. *Dendroterus eximius* Wood

Fig. 196

*Dendroterus eximius* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):44 (Holotype, female; Lago Amatitlan, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished by characters presented in the above key.

FEMALE.— Length 1.7–2.3 mm, 2.8 times as long as wide; color reddish brown.

Frons broadly, transversely impressed on lower half, epistoma slightly elevated; surface reticulate above, becoming smooth below, upper area with small, moderately abundant, shallow punctures; vestiture moderately abundant, of rather long, fine hair. Antennal funicle with four strongly compressed segments; club longer than wide.

Pronotum 1.2 times as long as wide; widest on basal half, sides weakly arcuate, narrowly rounded in front; anterior margin armed by about six teeth, median pair much larger; summit at middle; asperities rather coarse, not continued behind summit; posterior area reticulate, punctures very small, shallow, rather sparse. Vestiture rather sparse, hairlike.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, narrowly rounded behind; striae not impressed, punctures rather small, shallow; interstriae wider than striae, rather obscurely reticulate, dull, punctures fine, very sparse except toward declivity. Declivity rather steep, convex; strial punctures minute, weakly impressed; interstrial punctures replaced by fine, uniseriate rows of granules. Vestiture largely confined to declivity, consisting of minute strial hair and rows of much longer, erect, interstrial hair; each hair stout, about as long as distance between rows, spaced more closely within a row; all declivital setae diverge very slightly away from suture.

MALE.— Similar to female except frons convex, weakly impressed immediately above epistoma, surface very finely, obscurely punctured, vestiture sparse, inconspicuous.

DISTRIBUTION.— Guatemala.

GUATEMALA: Lago Amatitlan, Esquintla, 10-VI-64, 700 m, No. 707, *Bursera*, S. L. Wood; Palín, Esquintla, 19-V-64, 300 m, No. 590, *Bursera*, S. L. Wood.

HOST.— *Bursera*, probably *simarubra*.

BIOLOGY.— Specimens were taken from the bark of dying branches 2–6 cm in diameter, in living trees.

NOTES.— The above treatment was based on the type series of 69 specimens and on 4 other specimens.

### 5. *Dendroterus defectus* Wood

*Dendroterus defectus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):45 (Holotype, female; Rincón de Osa, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This large species is not closely allied to any other species in the genus. It is distinguished by characters summarized in the above key.

FEMALE.— Length 2.3–2.9 mm, 2.4 times as long as wide; color yellowish brown.

Frons broadly impressed from epistomal margin to well above eyes, flat on transverse axis, shallowly concave on longitudinal axis; surface very densely, rather coarsely punctured and evidently very finely granulate except smooth, impunctate and shining on median area along epistoma; vestiture of rather abundant, fine, moderately long hair of uniform length. Antennal funicle 4-segmented; club wider than long.

Pronotum 1.1 times as long as wide; widest at base, sides weakly arcuate, converging slightly on basal half, feebly constricted in front of middle, rather narrowly rounded in front, with a feeble, pseudoemargination on median line; anterior margin weakly elevated, not serrate; summit indefinite, behind middle; asperities small, decreasing in size gradually from median area, posterior area punctate-subasperate to base, punctures rather small, moderately deep, some reticulation present. Glabrous.

Elytra 1.3 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; striae not impressed, punctures small, moderately deep, interstriae shining, twice as wide as striae, surface with many rather deep, irregular, subtransverse lines and moderately large, impressed points, punctures small, slightly irregular. Declivity rather steep, rather broadly flattened; striae slightly impressed, punctures deeper than on disc; flattened between interstriae 4. Almost glabrous, a very few minute, hairlike setae on declivity.

MALE.— Similar to female except frons strongly convex above eyes, a very strong, narrow, transverse impression on median three-fourths, area between impression and epistomal margin moderately inflated, glabrous, coarsely punctured; posterior area of pronotum distinctly less subcrenulate.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 50 m, No. 51, *Bursera simarubra*, S. L. Wood. PANAMA: Ft. Clayton, Canal Zone, 27-VII-66, 70 m, No. 38, *B. simarubra*, S. L. Wood.

HOST.— *Bursera simarubra*.

BIOLOGY.— Specimens were taken from the bark of recently felled limbs and boles 15–40 cm in diameter.

NOTES.— The above treatment was based on the type series of 99 specimens.

### 6. *Dendroterus cognatus* Wood

*Dendroterus cognatus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):46 (Holotype, female; Laguna Santa María, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the very closely related *mexicanus* Blandford by the more slender form, by the more broadly, evenly rounded, more coarsely punctured male frons, by the more convex female frons with shorter, less abundant vestiture, by the more coarsely punctured pronotum and elytra, and by the more distinctly impressed elytral declivity on which there are numerous minute, impressed points. Future collecting could necessitate the reduction of this form to the rank of subspecies.

FEMALE.— Length 1.9–2.2 mm, 2.8 times as long as wide; color black.

Frons broadly, moderately concave to epistoma; surface rather coarsely, evenly granulate-punctate; vestiture finer, shorter, about half as abundant as in *mexicanus*.

Pronotum 1.23 times as long as wide; about as in *mexicanus* except punctures slightly larger, deeper.

Elytra 1.67 times as long as wide; outline as in *mexicanus* but much more broadly rounded behind; strial punctures coarser and deeper than in *mexicanus*, interstriae narrower than striae. Declivity slightly steeper than in *mexicanus*, very slightly more strongly impressed, sculpture as in *mexicanus* except minute impressed points larger and much more numerous. Vestiture averaging longer and coarser than in *mexicanus*.

MALE.— Similar to female except frons as in male *mexicanus*, but more broadly, evenly

convex, more coarsely punctured, with lateral epistomal calli only moderately to poorly developed.

DISTRIBUTION.— Nayarit.

MEXICO: Nayarit: Laguna Santa María, 6-VII-65, 1000 m, No. 194, *Bursera*, S. L. Wood.

BIOLOGY.— Specimens were taken from the bark of a dying branch 4 cm in diameter, on a living tree.

NOTES.— The above treatment was based on the type series of 10 specimens, and on 18 other specimens, all taken from the same branch at the above locality. Due to an error in labeling, the 10 specimens in the type series were erroneously reported in the original description as being from El Salto, Durango.

### 7. *Dendroterus mexicanus* Blandford

Fig. 196

*Dendroterus mexicanus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):233 (Holotype, female; Tehuantepec, Oaxaca, Mexico; British Mus. Nat. Hist.)

*Conophthocranulus umbratus* Schedl, 1937, Arch. Inst. Biol. Veget. Río de Janeiro 3:168 (Holotype, female; Mexico, Schedl Coll.); Wood, 1976, Great Basin Nat. 36:348. *Synonymy*

*Dendroterus confinis* Wood, 1959, Great Basin Nat. 19:6 (Holotype, male; 14 miles or 23 km NW Magdalena, Jalisco, Mexico; Snow Ent. Mus., Univ. Kansas); Wood, 1972, Great Basin Nat. 32:196. *Synonymy*

DIAGNOSIS.— This species is distinguished from the very closely related *cognatus* Wood by characters summarized in the above key.

FEMALE.— Length 1.8–2.7 mm, 2.5 times as long as wide; color almost black.

As in *cognatus* except frons slightly less strongly convex, punctures on pronotal disc averaging smaller, and lower elytral declivity very slightly less distinctly impressed.

MALE.— Similar to female except frons. Frons similar to male *cognatus* except less strongly convex on lower half, more strongly convex above; transverse elevations on lateral thirds of epistoma moderately to very strongly elevated (geographically variable).

DISTRIBUTION.— Nayarit to Oaxaca.

MEXICO: Jalisco: 2 km N Atenquique, 24-VI-65, 1000 m, No. 112, *Bursera*, S. L. Wood; 23 km NW Magdalena, 19-VII-53, 1000 m, *Bursera*, S. L. Wood. Nayarit: Volcán Ceboruco, 5-VII-65, 1100 m, No. 187, *Bursera*, S. L. Wood. Oaxaca: 57 km SE Cameron, 22-VI-67, No. 88, *Bursera*, S. L. Wood; Totolapan, 20-VI-67, 1100 m, No. 62, *Bursera*, S. L. Wood; Tehuantepec, G. C. Champion.

HOSTS.— *Bursera* spp.

BIOLOGY.— Specimens were taken from the limbs and bole of cut or fallen trees 8–30 cm in diameter.

NOTES.— The above treatment was based on the holotype of *mexicanus*, on 8 paratypes of *confinis*, and on 119 other specimens.

The Nayarit and Jalisco specimens average distinctly larger than those from Oaxaca, and the epistomal elevations of the male average distinctly higher than in Oaxaca specimens. The variability of these characters did not becomg apparent until long series were available for study. It is doubtful that the differences warrant the recognition of subspecies.

### 8. *Dendroterus perspectus* (Schedl)

*Plesiophthorus perspectus* Schedl, 1940, An. Esc. Cienc. Biol., Mexico 1:343 (Holotype, female; Omilteme, Guerrero, Mexico; Schedl Coll.)

*Dendroterus perspectus*: Wood, 1959, Great Basin Nat. 19:2

Although the type of *Plesiophthorus perspectus* Schedl was briefly examined at Lienz, Austria, it could not be incorporated into the above key. Notes made at that time are summarized as follows.

Holotype, female, length 1.9 mm, 2.5 times as long as wide; similar to *sallaei* Blandford except pronotum much more broadly rounded in front; pronotal disc with granulation similar to *sallaei* but granules larger, less numerous, and more widely spaced; striae much less strongly impressed and interstrial punctures smaller than in *sallaei*; interstrial punctures not granulate on declivity; striae 1 and 2 on declivity very narrowly impressed; frons very shallowly concave on more than median half from epistoma to upper level of eyes, its surface covered by minute, setiferous, flattened granules, each side at upper level of concavity armed by a poorly formed carina (interrupted at median line), evidently derived from two pairs of partly fused granules; vestiture shorter, finer, and less abundant than in *sallaei*.

This species is unique and evidently is intermediate in phyletic position between *defectus* Wood and *sallaei*.

### 9. *Dendroterus sallaei* Blandford

*Dendroterus sallaei* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):233 (Holotype, female; Veracruz, Veracruz, Mexico; British Mus. Nat. Hist.)

*Xylochilus insularis* Schedl, 1956, Pan Pacif. Ent. 32:31 (Holotype, male; Arroyo Hondo, María Madre, Tres Marías Islands, Gulf of California; California Acad. Sci.); Wood, 1972, Great Basin Nat. 32:195. *Synonymy*

DIAGNOSIS.— This species is distinguished from *resolutus* Wood by the larger strial punctures and proportionately narrower interstriae, by the larger granules on the pronotal disc, with the punctures and spaces between granules largely obliterated by reticulation, by the larger strial punctures and smaller granules on the elytral declivity, and by the more nearly granulate-punctate frons in both sexes.

FEMALE.— Length 1.6–1.9 mm, 2.4 times as long as wide; yellowish brown to rather dark reddish brown.

Frons moderately convex on upper two-thirds, a distinct transverse impression on lower half, epistoma ascending to margin; epistomal margin almost straight, not modified in median area; surface rather finely punctured, with very fine granules interspersed; many specimens with a variable arcuate callus at and above upper level of eyes, usually interrupted at median line; vestiture of fine, rather long, moderately abundant hair, distinctly more conspicuous on upper half.

Pronotum as in *decipiens* and *resolutus* except discal granules larger, shining, punctures obliterated by rugose-reticulate surface of intervening spaces.

Elytra as in *resolutus* except strial punctures larger, deeper; interstriae about as wide as striae. Declivity more broadly rounded than in *resolutus*, from dorsal aspect appearing flattened on more than median half; interstriae 1 weakly elevated, 2 weakly impressed, granules uniseriate, small, rounded; strial punctures rather coarse, deep, almost as wide as interstriae. Vestiture as in *resolutus* and *decipiens*.

DISTRIBUTION.— Gulf of California and Tamaulipas to Costa Rica.

MEXICO: **Chiapas**: Tuxtla Gutierras, 2-IV-53, R. C. Bechtel. **Jalisco**: La Huerta, 1-VII-65, 500 m, No. 172, flight, S. L. Wood. **Nayarit**: 24 km E San Blas, 12-VII-65, 250 m, No. 230, *Bursera simarubra*, S. L. Wood. **Oaxaca**: 31 km SE Cameron, 21-VI-67, No. 77, *Bursera*, S. L. Wood; Donaji, 17-IV-53, R. C. Bechtel; Matías Romero, 24-VI-67, 200 m, No. 91, *B. simarubra*, S. L. Wood; Tehuantepec, 23-VII-64, at light, P. J. Spangler. **Tamaulipas**: Bocatoma, 7 km SE Gomez Farias, 18-V-79, E. G. Riley. **Tres Marías Islands**: Arroyo Hondo, María Madre, 17-V-25, H. H. Keifer. COSTA RICA: 21 km SE Liberia, Guanacaste, 10-VII-66, *B. simarubra*, S. L. Wood.

HOSTS.— *Bursera simarubra*, *B.* sp.

BIOLOGY.— Specimens were taken from the phloem of broken limbs 15–25 cm in diameter.

NOTES.— The above treatment was based on the holotypes of *sallaei* and *insularis* and on 82 other specimens. The specimen of *insularis* in the Schedl collection labeled female holotype actually is a paratype.

### 10. *Dendroterus resolutus* Wood
Fig. 196

*Dendroterus resolutus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):45 (Holotype, female; Playa del Coco, Guanacaste, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *sallaei* Blandford by the very different frons in both sexes, by the smooth, shining pronotal disc with the punctures much more sharply defined, and by the finer elytral punctures.

FEMALE.— Length 1.5–1.9 mm, 2.7 times as long as wide; color yellowish brown to almost black.

Frons moderately convex on upper two-thirds, lower third broadly, rather strongly, transversely impressed, epistomal margin slightly elevated, a distinct, median tubercle on epistomal margin; surface shining, punctures moderately large, rather deep, sparse in central area, rather dense on lateral and upper margins, extending well above upper level of eyes; vestiture of fine, long hair, sparse at center, rather abundant on margins. Antennal funicle 4-segmented; club 1.3 times as long as wide, sutures straight, 1 partly septate.

Pronotum 1.2 times as long as wide; as in *sallaei* except asperities distinctly larger; posterior area shining, deeply, coarsely, closely punctured. Hairlike vestiture short on disc, longer at sides, moderately abundant.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; striae not impressed, punctures moderately small, deep; interstriae shining, about as wide as striae, punctures rather small, uniseriate. Declivity steep, flattened, striae 1 and 2 moderatey impressed, punctures as on

disc; interstriae 1 convex, weakly elevated, 2 impressed but weakly convex, 3 weakly elevated; all interstriae with a row of fine, rounded tubercles, those on 2 smaller. Vestiture of rows of stout, moderately long, interstrial hair, much shorter on declivity.

MALE.— Similar to female except frons convex to epistoma, punctures rather coarse, uniformly distributed, vestiture sparse, evenly distributed, epistomal tubercle absent.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Playa del Coco, Guanacaste, 18-X-63, 15 m, No. 499, *Bursera simarubra*, S. L. Wood.

BIOLOGY.— Specimens were taken from the bark of limbs, bole, and the stumps of unthrifty or recently cut material 7–40 cm in diameter.

NOTES.— The above treatment was based on the type series of 30 specimens.

### 11. *Dendroterus decipiens* Wood

*Dendroterus decipiens* Wood, 1959, Great Basin Nat. 19:5 (Holotype, male; Tequila, Jalisco, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *resolutus* Wood by characters summarized in the above key.

FEMALE.— Length 1.5–1.9 mm, 2.5 times as long as wide; color very dark brown.

Frons flattened from eye to eye, more finely, closely punctured and ornamented by a brush of long, fine, incurved yellow setae, those at center of brush somewhat shorter; antennal funicle variable, (usually) 4-segmented.

Pronotum 1.1 times as long as wide; widest just behind middle, sides weakly arcuate, anterior margin rather broadly rounded and armed by 10 coarse, subcontiguous teeth; summit at center, indefinite; anterior asperate region gradually blending into coarsely, closely granulate posterior area on disc, almost smooth between rather coarse, close, deep punctures in posterolateral areas; lateral and basal lines absent. Vestiture semierect, hairlike, of moderate length.

Elytra 1.4 times as long as wide; sides straight and subparallel on basal three-fourths, rather abruptly, very broadly rounded behind; striae not impressed except 1, punctures rather small, distinct but not deep; interstriae wider than striae, smooth, punctures almost as large as those of striae and slightly less numerous and less distinctly impressed. Declivity very steep; interstriae 2 slightly impressed; all interstriae with a row of fine granules; striae not impressed, punctures reduced in size. Vestiture consisting of fine, rather short, recumbent strial hair, and longer, erect, rather coarse interstrial setae, perhaps coarser but not longer on declivity.

MALE.— Similar to female except frons moderately convex except flattened near bisinuate epistomal margin, surface smooth, punctures rather coarse, close, deep, vestiture sparse; declivital interstriae 2 much more strongly impressed and unarmed, granules on 1 and 3 distinctly larger.

DISTRIBUTION.— Jalisco to Oaxaca.

MEXICO: Jalisco: 5 km NW Tequila, 19-VII-53, *Bursera*, S. L. Wood. Oaxaca: Totolapan, 20-VI-67, 1100 m, No. 64, *Bursera*, S. L. Wood.

HOST.— *Bursera* sp.

BIOLOGY.— Specimens were taken from the bark of a cut bole 20 cm in diameter.

NOTES.— The above treatment was based on the type series of 10 specimens and on 19 other specimens.

### 12. *Dendroterus luteolus* (Schedl)

Fig. 196

*Plesiophthorus luteolus* Schedl, 1951, Dusenia 2:111 (Holotype, male; Mexico; Schedl Coll.)

*Dendroterus mundus* Wood, 1959, Great Basin Nat. 19:3 (Holotype, male; Tehuitzingo, Puebla, Mexico; Snow Ent. Mus., Univ. Kansas); Wood, 1972, Great Basin Nat. 32:194. *Synonymy*

DIAGNOSIS.— This species is distinguished from *striatus* (LeConte) by the smaller average size, by the different frons in both sexes, and by the stouter elytral vestiture particularly on the declivity.

FEMALE.— Length 1.3–1.7 mm, 2.6 times as long as wide; color light brown.

Frons with a strongly subacutely elevated, transverse carina slightly above middle, convex and coarsely punctured above, slightly, transversely impressed and finely, obscurely punctured below carina; sparsely pubescent.

Pronotum 1.2 times as long as wide; sides straight and subparallel on posterior two-thirds, anterior margin rather broadly rounded and armed by about 12 coarse, low, subcontiguous teeth; summit indefinite, at center; asperities coarser on anterior third, gradually blending into granulate posterior areas of disc; posterolateral areas almost

smooth, shallowly, coarsely punctured; fine, raised lateral and posterior lines absent. Pubescence hairlike, short, suberect.

Elytra 1.5 times as long as wide; sides straight and subparallel on basal three-fourths, abruptly, very broadly rounded behind; striae not impressed except 1, punctures rather coarse and deep; interstriae narrower than striae, punctures in more or less uniseriate rows, very close, about half diameter of those of striae, distinctly impressed. Declivity rather steep, flattened; striae narrower than on disc, 1, 2, and part of 3 impressed, punctures much smaller and less definite; interstriae 1 slightly elevated, 1, 2, and lower part of 3 convex, punctures subequal to those of striae and in less definite rows than on disc. Vestiture rather abundant, short; consisting of fine semierect strial hairs and slightly longer, coarser erect interstrial setae; not longer on declivity, very slightly longer on sides.

MALE.— Similar to female except frons broadly convex from epistoma to vertex, rather coarsely granulate-punctate to well above eyes, vestiture inconspicuous; interstrial setae stouter, almost scalelike on declivity.

DISTRIBUTION.— Nayarit to Chiapas.

MEXICO: **Chiapas**: Ocosingo Valley, 7-VII-50, L. J. Stannard. **Morelos**: Las Piedras, 17-VII-80, *Bursera*, T. H. Atkinson. **Nayarit**: Volcán Ceboruco, 5-VII-65, 1100 m, No. 188, *Bursera*, S. L. Wood. **Puebla**: 19 km SE Matamoros, 3-VII-53, 1200 m, S. L. Wood; Tehuitzingo, 13-VII-53, *Bursera*, S. L. Wood.

HOST.— *Bursera* spp.

BIOLOGY.— Specimens were taken from the bark of branches of two host species.

NOTES.— The above treatment was based on the holotype of *luteolus*, on the type series of 19 specimens of *mundus*, and on 34 other specimens. The holotype of *luteolus* resembles *striatus* in all respects except for the sculpture of the frons, which is as in *mundus*. On the basis of this feature and on the indefinite type locality for *luteolus*, the type was associated with *mundus* rather than *striatus*. It is not impossible that these two forms eventually will be made subspecies of one another when the distributions are more fully known.

### 13. *Dendroterus striatus* (LeConte)

*Hypothenemus striatus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:156 (Lectotype, female; Cape San Lucas, Baja California; Mus. Comp. Zool., 993, prsent designation)

*Plesiophthorus californicus* Schedl, 1952, Pan Pacif. Ent. 23:123 (Holotype, female; Angeles Bay, Gulf of California, Baja California, Mexico; California Acad. Sci.); Wood, 1972, Great Basin Nat. 32:195. *Synonymy*

DIAGNOSIS.— This species is distinguished from the very closely related *luteolus* Schedl by the larger average size, by the frontal differences in both sexes, and by the more slender, almost hairlike interstrial setae on the declivity.

FEMALE.— Length 1.6–2.0 mm, 2.6 times as long as wide; color brown.

Frons as in *luteolus* except transverse carina shorter, occupying half of distance between eyes; upper area less closely punctured, lower area more coarsely punctured. Interstrial setae much more slender than in *luteolus*, particularly on declivity.

MALE.— Similar to female except frons indistinctly, transversely impressed at upper level of eyes, lower area distinctly, irregularly inflated, coarsely, subgranulately punctured.

DISTRIBUTION.— S California to Baja California.

USA: **California**: Anza-Borrego St. Pk., 11 km S Ocotillo Wells, 11-IV-65, *Bursera microphylla*, C. W. O'Brien. MEXICO: **Baja California**: Cape San Lucas; Bahía de los Angeles, 27-VI-21, J. C. Chamberlin.

HOST.— *Bursera microphylla*.

BIOLOGY.— Specimens were taken from the bark of limbs.

NOTES.— The above treatment was based on 5 syntypes of *striatus*, on the holotype and 3 paratypes of *californicus*, and on 13 other specimens. The first syntype in the LeConte series is labeled Type No. 993; that female is here designated as the lectotype of *striatus*.

## GENUS *ARAPTUS* EICHHOFF

*Araptus* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:305 (Type-species: *Araptus rufopalliatus* Eichhoff, monobasic)

*Neodryocoetes* Eggers, 1933, Mém. Trav. Lab. d'Ent. Mus. Nat. d'Hist. Nat., Paris 1(1):9 (Type-species: *Neodryocoetes hymenaeae* Eggers, monobasic); Wood, 1973, Great Basin Nat. 33:170. *Synonymy*

*Thamnophthorus* Schedl, 1938, Archiv Naturgesch. 7:174 (Type-species: *Thamnophthorus volastos* Schedl, subsequent designation by Blackman, 1942, Proc. U.S. Nat. Mus. 92:178); Wood, 1973, Great Basin Nat. 33:170. *Synonymy*

*Neopityophthorus* Schedl, 1938, Archiv Naturgesch. 7:180 (Type-species: *Pityophthorus laevigatus* Eggers, present designation); Schedl, 1951, Dusenia 2:72. *Synonymy*

*Sphenoceros* Schedl, 1939, Mitt. Münchn. Ent. Ges. 29:565 (Type-species: *Sphenoceros limax* Schedl, monobasic); Wood, 1973, Great Basin Nat. 33:170. *Synonymy*

DIAGNOSIS.— This genus is distinguished from *Pityophthorus* Eichhoff by the partly to completely septate suture 1 of the antennal club—suture 2 is never septate and all external evidence of all sutures may be absent in certain species—and by the denticles or rugae on the posterolateral margin of the protibiae that extend to the basal fourth. Most species also lack a transverse impression behind the poorly developed pronotal summit, and the transition from the asperate to the punctured area on the pronotum is gradual.

DESCRIPTION.— Length 1.1–2.7 mm, 2.4–3.2 times as long as wide; color yellowish brown to almost black.

Frons usually sexually dimorphic, varying in either sex from convex to elaborately excavated; greater abundance of frontal vestiture usually a female character. Eye oval, emarginate. Antennal scape elongate; funicle 5-segmented; club small to very large, external sutures distinct to obsolete, straight to profoundly procurved, suture 1 at least partly septate in all species, 2 never septate. Pronotum usually without distinct summit, anterior slope finely asperate, transition from asperate to punctured area gradual. Scutellum rather large, flat. Elytra usually weakly striate, declivity convex to moderately impressed, conservatively sculptured. Legs as in *Pityophthorus* except denticles and rugae on lateral margins extend nearer base, particularly on protibiae.

DISTRIBUTION.— Nayarit and S Florida to Argentina; about 100 nominate species have been described; 53 species occur in North and Central America.

BIOLOGY.— The species are phloeophagous or spermophagous; a few evidently may adapt to either habitat. They vary from monogamous to polygamous. The males are of normal size and occur in parental galleries with the females, except in *laevigatus* Eggers and *costaricensis* Schedl, where dwarfed, flightless males mate with sibling females in the brood host and die there. The larvae always form individual mines. Unthrifty, cut, or injured host material is usually selected for attack, including recently fallen fruit containing large seeds.

NOTES.— Due to the diversity of this large genus and the unavailability of the types of many species belonging to this and similar genera, the genus is seriously in need of further study. Judging from the large number of unique specimens at hand, many species remain undescribed.

The name *Neopityophthorus* Schedl was originally erected for *Pityophthorus insularis* Eggers, *P. laevigatus* Eggers, *P. poricollis* Blandford, *N. laevis* Schedl, *N. glabricollis* Schedl, and *N. eruditus* Schedl, without a type-species being designated. I here designate *P. laevigatus* Eggers as the type-species of *Neopityophthorus* Schedl.

## Key to the Species of *Araptus*

1. Male frons moderately to profoundly excavated, median carina entirely absent except in species with major part of excavated area above upper level of eyes; female frons usually convex, with a conspicuous, low, median carina (impressed and ornamented by hair in three species, but conspicuous carina also present); elytral declivity convex to shallowly impressed ..... 2

— Male frons convex, with or without a median carina, or if impressed then impression confined to area below upper level of eyes and all cusps confined to lower margin of impression; female frons convex to rather strongly impressed, usually ornamented by hair, never with a median carina; elytral declivity convex to strongly impressed ..... 8

2(1). Male frons without a median denticle below upper level of eyes, excavation at upper level of eyes occupying less than half distance between eyes; female frons convex to weakly, transversely impressed, with a fine median carina, frontal vestiture sparse, inconspicuous; in leguminous seeds and pods ..... 3

— Male frons armed by a conspicuous median denticle below upper level of eyes, excavation at upper level of eyes broad, occupying at least three-fourths of distance between eyes; female frons flattened to concave, ornamented by rather abundant hair, and by a conspicuous median carinate elevation; in vine or liana stems ..... 5

3(2). Smaller; male frons triangularly, rather strongly impressed from near epistoma to upper level of eyes, armed laterally by a pair of small tubercles at bases of mandibles and laterally near its upper margin by a (usually) nontuberculate prominence; interstrial punctures on disc sparse to obsolete; Panama and Colombia to Bamaica and Surinam; 1.4–1.8 mm ..... 1. ***hymenaeae*** **(Eggers)**

— Larger; male frontal excavation armed above upper level of eyes by a pair of longitudinal, subcarinate cusps, unarmed by tubercles or other prominences below upper level of eyes; discal interstriae regularly punctured ..... 4

4(3). Elytral declivity narrowly impressed at sutural striae only; female frons weakly, transversely impressed near middle; Nayarit to Guatemala; 1.8–2.4 mm ..... 2. ***fossifrons*** **Wood**

— Elytral declivity with entire width of interstriae 2 distinctly, moderately impressed; female frons not visible in material at hand; "Mexico" to Honduras; 1.6–2.1 mm ..... 3. ***deyrollei*** **(Blandford)**

5(2). Male frons transversely excavated from middle to well above eyes, its upper margin unarmed, armed on lower half at extreme lateral margins by a pair of denticles and by a stronger median denticle at same level midway between epistomal margin and upper level of eyes; female frons flattened to weakly impressed on median half from epistoma to vertex, with an obtuse median carina, and with a rather sparse brush of moderately long hair in lateral areas; discal interstriae with punctures sparse to obsolete; Jalisco to Guatemala; 2.4–2.7 mm ..... 4. ***foveifrons*** **(Schedl)**

— Upper limits of male frontal excavation at vertex armed by acutely projecting margin, a conspicuous median elevatin or carina occupying two-thirds length of floor of excavation, a small tubercle at its lower end; lateral areas of male frons unarmed below upper level of eyes; female frons essentially as in male except more broadly impressed and ornamented on all margins by a fringe of very long, yellow hair; discal interstriae sparsely to regularly punctured ..... 6

6(5). Upper margin of male impressed frontal area rounded on median line, lateral cusps acute; upper margin of female frontal impression unarmed; Puebla; 2.1–2.5 mm ..... 5. ***accinctus*** **Wood**

— Upper margin of male and female frontal impression acutely projecting ..... 7

7(6). Upper limits of frontal excavation armed by a continuous U-shaped costa; median frontal carina low, narrow, long, evanescent above; Jalisco to Nayarit; 1.7–2.5 mm ..... 6. ***delicatus*** **Wood**

— Upper limits of frontal excavation armed by a median and a pair of lateral cusps; frontal carina thick, rather high, ending abruptly above; Guatemala; 2.8–3.4 mm ..... 7. ***genialis*** **Wood**

8(1). Male frons armed by a conspicuous median carina (sometimes absent in *politus*) ..... 9

— Male frons devoid of a median carina ..... 17

9(8). Body stouter, less than 2.6 times as long as wide; discal interstriae regularly punctured ..... 10

— Body more slender, 2.7 or more times as long as wide; discal interstriae impunctate or with not more than one or two punctures ..... 12

10(9). Pronotum and frons reticulate in both sexes; granules on pronotal disc minute, flat; frons minutely granulate, punctures obscure; strial punctures very fine, interstriae about six times as wide as striae; elytra glabrous; Florida and Mexico to Costa Rica, Haiti, and Jamaica; 2.0–2.5 mm ..... 8. ***politus*** **(Blandford)**

— Pronotum and frons shining in both sexes; granules on pronotal disc higher, closer; frons finely, densely punctured in both sexes; strial punctures rather coarse, interstriae less than four times as wide as striae; setae on declivity moderately long ..... 11

11(10). Smaller; pronotal disc smooth, shining; punctures on declivital striae 1 and 2 almost as large as on disc, declivital surface almost smooth, brightly shining; elytral vestiture largely confined to declivity, on odd-numbered interstriae, sparse, strial setae minute to obsolete; Veracruz to Panama; 1.5–1.8 mm ..... 9. ***tabogae*** **(Blackman)**

— Larger; pronotal disc obscurely reticulate; punctures on declivital interstriae 1 and 2 minute to obsolete, declivital surface subreticulate, rather dull; elytral vestiture reaching at least middle of disc, on all interstriae, at least twice as abundant, strial setae longer; Guatemala; 2.2 mm ..... 10. ***incommodus*** **(Blandford)**

12(9). Male frontal carina not extending above upper level of eyes; female frontal vestiture less abundant, more generally distributed, shorter, longest setae extending less than one-third distance to epistoma ..... 13

— Male frontal carina extending from just below upper level of eyes to vertex; female frontal vestiture above upper level of eyes abundant, long, some setae extending more than half distance to epistoma ..... 16

13(12). Body rather slender, 2.6 times as long as wide; male frontal carina extending from epistoma to upper level of eyes, low, of almost uniform height, female frons densely punctured and finely, uniformly pubescent; antennal club rather large, its width 1.2 times length of scape; strial punctures on declivity rather coarse; Veracruz to Panama; 1.7–1.9 mm ..... 11. ***carinifrons*** **(Blandford)**

— Body very slender, 3.0 times as long as wide; male frontal carina much shorter, more nearly dentate, female frons granulate to subaciculate; antennal club smaller, its width equal to length of scape; strial punctures on disc small to minute ..... 14

14(13). Male frons flat to feebly convex, median carina moderately strong; female frons punctate-granulate, vestiture uniformly distributed but longer at margins; strial punctures equally fine on disc and declivity; Veracruz to Panama; 1.8–2.0 mm ..... 12. ***confinis*** **(Blandford)**

— Male frons rather strongly impressed, median carina very strong; female frons subaciculate, vestiture largely confined to margins; strial punctures rather coarse on disc, fine on declivity ..... 15

15(14). Smaller; frons less strongly impressed in both sexes; punctures on pronotum and elytra slightly smaller; Sinaloa; 1.1–1.3 mm ..... 13. ***gracilens*** **Wood**

— Larger, frons more strongly impressed in both sexes; punctures on pronotum and elytra slightly larger; Colima and Puebla to Honduras; 1.6–1.9 mm ..... 14. ***dentifrons*** **Wood**

16(12). Female frontal vestiture long above and laterally, continuing ventrad to near bases of mandibles, central area sparsely to moderately pubescent; declivital interstrial setae in rows, longest setae half as long as distance between rows; Jalisco; *Ficus*; 1.4–1.7 mm ..... 15. ***speciosus*** **Wood**

— Female frontal vestiture long, entirely confined to area above eyes, lower area subglabrous; elytral declivity subglabrous, setae when present minute, shorter than distance equal to diameter of a strial puncture; Costa Rica; *Ficus*; 1.2–1.3 mm ..... 16. ***facetus*** **Wood**

17(8). Small, brightly shining species; female frons with a distinct median crest (occasionally partly carinate), almost glabrous; pronotal asperities continued laterally to base as sparse, low, discontinuous ridges; males dwarfed, incapable of flight, mate in brood gallery; antennal club small, with two weakly procurved sutures ..... 18

— Female frons with no indication of a crest or carina, usually pubescent; pronotal asperities not continued to base, or, if continued, confused, not in ridges; males equal in size to females, join females in parental tunnels; antennal club variable ..... 19

18(17). Larger, stouter, averaging 2.7 times as long as wide; frontal punctures averaging larger, deeper; color dark brown to almost black; Costa Rica and Panama to French Guiana; in fruit; females 1.5–1.7 mm, males 1.2–1.3 mm ..... 17. ***laevigatus*** **(Eggers)**

— Smaller, more slender, averaging 2.9 times as long as wide; frontal punctures smaller, obscure; color light brown; Costa Rica to Panama; in phloem; females 1.2–1.4 mm, males 1.0 mm ..... 18. ***costaricensis*** **(Schedl)**

19(17). Antennal club smaller, usually a little longer than scape, suture 1 broadly to rather strongly procurved; if strongly procurved and club larger, then elytral declivity impressed and usually armed by granules; setae on declivital interstriae usually more slender, as long or longer than distance between rows; elytral declivity convex or impressed ..... 20

— Antennal club larger, about twice as long as scape, suture 1 very strongly procurved or angulate, its apex at or near middle of club; elytral declivity convex, never impressed or granulate, with interstrial setae spatulate, always shorter than distance between rows ..... 49

20(19). Asperities on anterior slope of pronotum confused ..... 21

— All asperities on anterior slope of pronotum fused into four or five independent concentric rows ..... 48

21(20). Elytral declivity convex to very feebly impressed, interstriae 1 and 3 never armed by granules ..... 22

— Elytral declivity moderately to strongly impressed, interstriae 1 and 3 armed by granules or, if absent, then either declivity strongly impressed or antennal club devoid of sutures except for strongly angulate septum or median half of suture 1 ..... 33

22(21). Posterior margin of abdominal sternum 5 armed by a rather strongly elevated, blunt, subtuberculate, median callus; female frons convex, pubescence short, rather sparse, a small central area smooth, shining; Nayarit to Chiapas; tree branch; 1.2–1.4 mm ..... 19. ***tenellus*** **(Schedl)**

— Posterior margin of abdominal sternum 5 normal, without a median callus ..... 23

23(22). Declivital setae obsolete or length equal to less than diameter of an adjacent puncture; male frons below upper level of eyes abruptly, rather strongly, broadly impressed; declivity more evenly convex, striae 1 never impressed, interstriae 1 not elevated; frontal hair on female usually longer, more abundant .... 24

— Declivital setae on interstriae at least equal in length to width of an interstriae, except almost obsolete in *leptus*; male frons convex to shallowly impressed, if impressed, a median callus present at upper level of eyes, callus may extend toward vertex; declivital striae 1 usually impressed and interstriae slightly elevated; frontal hair in female usually shorter, less abundant ..... 26

24(23). Median line in male from upper level of eyes to vertex impunctate, transversely etched; male frons rather strongly impressed below upper level of eyes, with a pair of diagonal lateral calluses midway between epistoma and upper level of eyes; punctures on declivity very small, some lines present, impressed points almost obsolete; Tamaulipas to Veracruz; 1.2–1.4 mm ..... 20. ***schedli*** **(Blackman)**

— Median line from male frons to vertex with sculpture similar to adjacent areas; male frons with an epistomal callus at anterior articulation of mandible, without a submarginal callus ..... 25

25(24). Male frons moderately impressed, area above eyes reticulate, epistomal callus at anterior artification of mandible small; strial punctures on declivity minute, interstriae four to six times as wide as striae, impressed points abundant; Jalisco to Guatemala; 1.3–1.5 mm ..... 21. ***obsoletus*** **(Blandford)**

— Male frons rather strongly impressed, area above eyes smooth between punctures, lateral epistomal callus conspicuous; strial punctures on declivity rather coarse, interstriae twice as wide as striae, impressed points obsolete; Nayarit; 1.3–1.4 mm ..... 22. ***micaceus*** **Wood**

26(23). Strial punctures on basal half of disc confused, some interstrial punctures present ..... 27

— Strial punctures on disc in rows, interstrial punctures absent ..... 29

27(26). Larger; body very stout, less than 2.0 times as long as wide; pronotum wider than long, strongly constricted on anterior third; coarse interstrial punctures almost as large as those of striae; both in recognizable rows; Panama; 2.0–2.2 mm ..... 23. ***crassus*** **Wood**

— Smaller; body slender, at least 2.6 times as long as wide; pronotum distinctly longer than wide; punctures on elytral disc smaller; partly confused ..... 28

28(27). Declivity evenly convex; interstrial bristles regularly placed on disc and declivity, including interstriae 2; female frons convex, sparsely marked by coarse punctures and minute points, vestiture sparse, inconspicuous; Tamaulipas; *Disholcapsis* gall on *Quercus virginiana*; 1.1–1.3 mm ..... 24. ***nanulus*** **Wood**

— Declivity somewhat broadly, shallowly impressed, interstrial bristles confined to declivity, absent on 2; female frons smooth and impunctate on central third, upper third of impunctate area moderately, subcarinately, transversely elevated, marginal areas with abundant long hair; Costa Rica; tree bole; 1.8–1.9 mm ..... 25. ***decorulus*** **Wood**

29(26). Declivital interstriae 2 with a row of fine punctures (usually subgranulate) and interstrial setae as on 1 and 3 ..... 30

— Declivital interstriae 2 devoid of punctures and interstrial setae ..... 31

30(29). Strial punctures on disc and declivity very minute, almost obsolete; female frons planoconcave; Panama; 1.3–1.4 mm ..... 26. ***teres*** **(Blackman)**

— Strial punctures on disc of moderate size, smaller on declivity; female frons weakly convex, a feeble median carina indicated; Veracruz to Honduras; vine; 1.5–1.8 mm ..... 27. ***tenuis*** **(Blackman)**

31(29). Anterior margin of pronotum costiform; male frons evenly convex, without an impunctate median line above eyes; declivital interstriae 2 shallowly, distinctly impressed; Veracruz; 1.2–1.3 mm ..... 28. ***leptus*** **(Bright)**

— Anterior margin of pronotum rather coarsely serrate; male frons with a median callus at upper level of eyes, an impunctate, transversely etched median line extending to vertex; declivital interstriae 2 not impressed ..... 32

32(31). Declivity evenly convex; female frontal vestiture coarser, more abundant, evidently slightly longer, yellowish; Jalisco to Nayarit; *Ficus*, etc.; 1.4–1.7 mm ..... 29. ***consobrinus*** **Wood**

— Declivital striae 1 impressed, interstriae 1 distinctly elevated; female frontal vestiture, finer, less abundant, white; Baja California; *Pedialanthus macrocarpus*; 1.4–1.6 mm ..... 30. ***attenuatus*** **Wood**

33(21). Antennal club solid, without external indications of sutures, median half of suture 1 represented by strongly angled internal septum; declivital interstriae 1 and 3 unarmed by granules ..... 34

— Antennal club with suture 1 clearly indicated by an external groove, if groove doubtful, then elytral declivity more strongly, more broadly impressed and interstriae 1 and 3 armed by granules ..... 36

34(33). Female frons shallowly concave on upper two-thirds, surface finely, closely punctured; discal interstriae impunctate; Veracruz to Panama; 1.8 mm ..... 31. ***blanditus*** **Wood**

— Female frons flat to feebly impressed, finely granulate; discal interstriae punctured ..... 35

35(34). Minute strial hair present, interstrial setae usualy extending to elytral base; declivity more shallowly, narrowly impressed; Hidalgo to Ecuador; *Annona*, *Persea* seeds; 2.0–2.3 mm ..... 32. ***schwarzi*** **(Blackman)**

— Minute strial hair absent, interstrial setae absent except on sides; declivity more deeply, broadly impressed; Honduras; rust cones on *Pinus oocarpa*; 1.9–2.3 mm ..... 33. ***sobrinus*** **Wood**

36(33). Discal interstriae regularly punctured or else all punctures on disc confused ..... 37

— Strial punctures on disc in rows, interstriae impunctate ..... 42

37(36). Suture 1 of antennal club septate throughout, rather weakly procurved; lower half of female frontal area finely reticulate and punctured or dull and finely granulate-punctate, central area above smooth, shining, marginal areas above and dull area below with abundant, rather long hair ..... 38

— Sutures of antennal club, if visible, very strongly procurved, mesal half of suture 1 marked by an internal septum; larger species ..... 39

38(37). Female frons reticulate, distinctly punctured, shining area near vertex poorly developed, vestiture slightly finer and shorter; male frons smooth, polished, shagreened, punctures minute, sparse, glabrous except at epistoma; Costa Rica; *Persea americana*; 1.7–1.9 mm ..... 34. ***mendicus*** **Wood**

— Female frons dull, rugose-reticulate, punctures obscure; male frons subreticulate, more coarsely, closely punctured, at least a few short setae on lower half; Costa Rica; tree branch; 1.4–1.6 mm ..... 35. ***medialis*** **Wood**

39(37). Body stouter, 2.4 times as long as wide; female frons broadly, shallowly concave, densely, finely, uniformly punctured and ornamented by abundant, fine, moderately long hair; Costa Rica; vine; 1.9–2.2 mm ..... 36. ***conditus*** **Wood**

— Body more slender, at least 2.6 times as long as wide; female frons subglabrous, convex or feebly impressed, punctures larger, less abundant, less uniformly distributed ..... 40

40(39). Smaller species; strial punctures very small, in definite rows, interstrial punctures indistinguishable from numerous, confused impressed points, elytral disc without setae except near declivity; declivital impression less abrupt, not as deep; Guatemala; 1.5 mm ..... 37. ***incompositus*** **(Blandford)**

— Larger species; strial punctures larger, either confused with those of equal size on interstriae or interstrial punctures in clearly identifiable rows; declivital impression more abrupt, slightly deeper ..... 41

41(40). Elytral and pronotal punctures minute, shallow; rows of strial and interstrial setae extend from base to apex of elytra; frons transversely impressed in female, convex in male, shining, punctured; Costa Rica to Panama; vine; 1.9–2.2 mm ..... 38. ***frugalis*** **Wood**

— Elytral and pronotal punctures moderately coarse, rather deep, elytra subglabrous, a few short setae on declivity and sides; frons convex, dull, rugose-reticulate in both sexes, epistomal margin distinctly elevated; Costa Rica; tree branch; 1.7–2.1 mm ..... 39. ***laudatus*** **Wood**

42(36). Strial punctures rather fine to minute, interstriae at least twice as wide as striae; declivity weakly to moderately impressed; smaller species ..... 43

— Strial punctures rather coarse, interstriae as wide as striae; declivity more strongly impressed; larger species ..... 45

43(42). Posterior margin of sternum 5 armed by a median, blunt, subtuberculate prominence in both sexes; discal areas of pronotum and elytra smooth and brightly shining; female frons convex except median lower half almost flat, shining, very finely, closely punctured, vestiture fine, short; Nayarit to Panama; tree branch; 1.5–1.8 mm ..... 40. ***eruditus*** **(Schedl)**

— Posterior margin of sternum 5 normal; pronotal disc reticulate; sculpture and adornment of female frons different ..... 44

44(43). Elytral discal interstriae smooth, with rather sparse, minute, impressed points; female frons planoconvex, with a few rather coarse punctures, vestiture very long; Costa Rica; vine; 1.1–1.3 mm ..... 41. ***vesculus*** **Wood**

— Discal interstriae with many irregular impressed lines and a few impressed points; female frons broadly, shallowly concave, very minutely, densely punctured, vestiture fine, very short; Panama; vine; 1.3–1.4 mm . 42. ***exigialis*** **Wood**

45(42). Male frons strongly, evenly convex; female frons weakly convex, more uniformly sculptured, vestiture extending only slightly above eyes; Guatemala; shrub; 1.9–2.3 mm ..... 43. ***refertus*** **Wood**

— Middle third of male frons strongly, transversely impressed; female frons more extensively flat or partly impressed, an impunctate callus on lower median area, vestiture extending well above eyes ..... 46

46(45). Male frons rather strongly, transversely impressed from upper level of eyes to two-thirds distance to epistoma, lower margin of excavation a blunt, transverse carina; female frons broadly flattened, median third of lower half shining, impunctate, slightly inflated, remaining area densely punctured and ornamented by long hair; Guatemala; *Menisperma*; 1.6–1.8 mm ..... 44. ***trepidus*** **Wood**

— Male frons below eyes rather strongly excavated to two-thirds distance to epistoma, lower margin of excavation strongly, acutely carinate except carina interrupted in median area; female frontal callus in *frontalis* smaller, a small, subconcave impression on upper half, more coarsely punctured ..... 47

47(46). Smaller; lateral margins of elytral declivity armed by about three pairs of small denticles; anterior margin of pronotum unarmed; Guatemala; 1.6 mm ..... 45. ***poricollis*** **(Blandford)**

— Larger; lateral margins of elytral declivity unarmed; anterior margin of pronotum rather coarsely serrate; Guatemala; shrub, 2.4–2.7 mm ..... 46. ***frontalis*** **Wood**

48(20). Antennal club rather small, sutures rather equally arcuate, 2 clearly marked by a row of setae; interstriae impunctate; Jalisco to Oaxaca; shrub; 1.3–1.7 mm ..... 47. ***concentralis*** **(Schedl)**

— Antennal club rather large, suture 1 rather strongly angulate, 2 not evident; interstriae with confused punctures; Veracruz to Honduras; 1.2–1.4 mm ..... 48. ***macer*** **(Bright)**

49(19). Strial punctures on disc small to minute, in definite rows, interstriae impunctate; body more slender, more than 2.5 times as long as wide ..... 50

— Discal punctures on elytra larger, confused or interstriae clearly punctured; body rather stout, less than 2.3 times as long as wide ..... 53

50(49). Body more slender, 2.8 times as long as wide; posterior half of pronotum mostly smooth, shining; female frons convex, rugose-reticulate, finely punctured, glabrous; strial punctures small, distinct; Costa Rica; *Myrica pubescens* bole; 1.7–2.0 mm ..... 49. ***nigrellus*** **Wood**

— Body slender, not more than 2.6 times as long as wide; posterior half of pronotum reticulate; female frons flat, pubescent; discal strial punctures minute ..... 51

51(50). Interstrial setae on declivity sparse, spaced within a row by distances greater than length of a seta; strial hair obsolete; female frons densely, coarsely punctured, with sparse, moderately long hair; Costa Rica; *Roupala complicata*; 1.2–1.5 mm ..... 50. ***vinnulus*** **Wood**

— Interstrial setae on declivity close, spaced within a row by distances distinctly less than length of a seta; rows of strial hair present on declivity; female frons sparsely, finely punctured, with a dense brush of long hair ..... 52

52(51). Declivital striae not impressed, punctures obsolete; distance from upper level of eyes to upper limits of female frontal pubescence 1.2 times distance from epistomal margin to upper level of eyes, longest setae on vertex extend two-thirds distance to epistoma; Panama; *Roupala*; 1.7–2.2 mm ..... 51. ***furvus*** **Wood**

— Declivital striae feebly impressed, punctures minute; distance from upper level of eyes to upper limits of female frontal pubescence 1.5 times distance from epistomal margin to upper level of eyes, longest setae on vertex extend almost to epistomal margin; Guatemala; *Roupala*; 1.5–1.9 mm ..... 52. ***furvescens*** **Wood**

53(49). Anterior margin of female pronotum narrowly rounded, not at all angulate; female frons concavely impressed on median third above upper level of eyes, glabrous; Costa Rica; tree limb; 1.7–2.0 mm ..... 53. ***lepidus*** **Wood**

— Anterior margin of female pronotum acutely angulate, ending in a sharp point; female frons broadly flattened above eyes, upper margin ornamented by a dense fringe of long hair; Nayarit to San Luis Potosí; tree limb; 1.7–2.2 mm ..... 54. ***aztecus*** **(Wood)**

1. *Araptus hymenaeae* (Eggers)
Figs. 197–198

*Neodryocoetes hymenaeae* Eggers, 1933, Mém. Trav. Lab. d'Ent. Mus. Nat. d'Hist., Nat. Paris I(I):9 (Holotype, male; Gourdonville, French Guiana, Paris Mus.)

*Neodryocoetes insularis* Eggers, 1940, Arb. Morph. Taxon. Ent. Berlin-Dahlem 7:128 (Holotype, female; Guadeloupe; Fleutiaux Coll.); Wood, 1973, Great Basin Nat. 33:172. *Synonymy*

*Neodryocoetes caribaeus* Blackman, 1942, Proc. U.S. Nat. Mus. 92:185 (Holotype, female; Trinidad; U.S. Nat. Mus., 56004); Wood, 1973, Great Basin Nat. 33:172. *Synonymy*

*Neodryocoetes guianae* Blackman, 1942, Proc. U.S. Nat. Mus. 92:186 (Holotype, female; British Guiana, U.S. Nat. Mus., 56003); Wood, 1973, Great Basin Nat. 33:172. *Synonymy*

*Neodryocoetes hoodi* Blackman, 1942, Proc. U.S. Nat. Mus. 92:187 (Holotype, female; Taboga Island, Panama; U.S. Nat. Mus., 56006); Wood, 1973, Great Basin Nat. 33:172. *Synonymy*

*Neodryocoetes humilis* Blackman, 1942, Proc. U.S. Nat. Mus. 92:188 (Holotype, female; Bonito, Pernambuco, Brazil; U.S. Nat. Mus., 56005); Wood, 1975, Great Basin Nat. 35:392. *Synonymy*

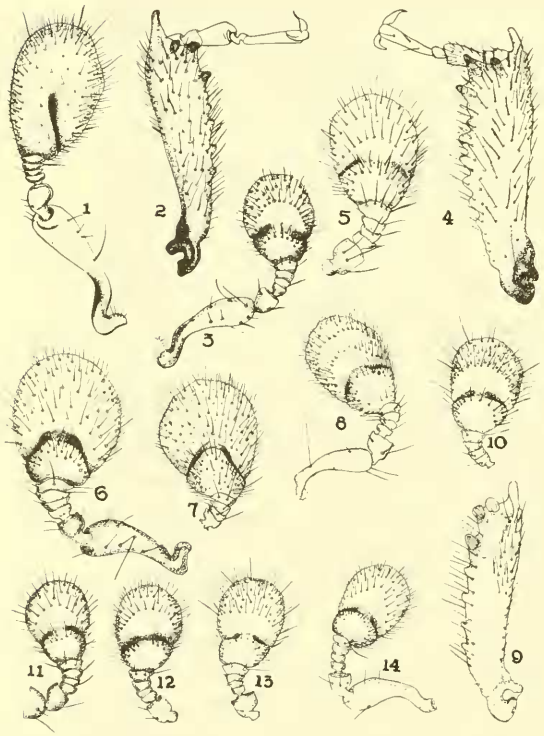



Fig. 197. *Araptus* spp., antennae and protibiae: 1–2, *schwarzi*; 3–4, *politus*; 5, *mucunae*; 6, *columbianus*; 7, *tabogae*; 8–9, *cubensis*; 10, *hostilis*; 11–14, *hymenaeae*. (After Blackman 1942:pl. 20.)

DIAGNOSIS.— This species is distinguished from *sparsipunctatus* (Blackman) by the much more irregularly impressed male frons, with the tubercle at the lower lateral angle (at base of mandible) distinctly larger, and by the more closely punctured pronotum.

MALE.— Length 1.4–1.8 mm, 2.6 times as long as wide; color reddish brown.

Frons rather strongly, subconcavely impressed on a triangular area from epistoma almost to upper level of eyes, upper margins of impression rather abrupt, lower lateral angles armed by a pair of tubercles. Antennal club rather small, suture 1 strongly procurved, not reaching middle, septate throughout, suture 2 obscurely indicated.

Pronotum 1.1 times as long as wide; widest at base, sides weakly arcuate and converging slightly on basal two-thirds, rather broadly rounded in front; anterior margin finely serrate on an acute costa; summit obscure, in front of middle; asperities small, confused; posterior areas reticulate, rather coarsely, deeply, closely punctured. Glabrous.

Elytra 1.5 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on basal half, slightly tapered, then rather broadly rounded behind; striae not impressed, punctures rather small, moderately deep, in very slightly irregular rows; interstriae three times as wide as striae, smooth and shining, with numerous impressed points, punctures obsolete. Declivity rather steep, narrowly convex; striae 1 narrowly, distinctly impressed, interstriae 1 feebly elevated; strial punctures slightly smaller and deeper than on disc. Vestiture largely confined to declivity, sparse, of rather short, flattened bristles, frequently abraded.

FEMALE.— Similar to male except weakly convex, a fine, low, median carina from epistoma to upper level of eyes; surface reticulate, punctures rather small, shallow, rather sparse; frontal vestiture sparse, inconspicuous.

DISTRIBUTION.— Panama and Colombia to Jamaica and Surinam.

PANAMA: Barro Colorado Island, 27-XII-63, 70 m, at light, S. L. Wood; Taboga Island, 16–23-X-13, in plants, J. D. Hood. OTHER COUNTRIES: Colombia, Venezuela, Trinidad, British Guiana, Surinam, Jamaica, Brazil.

HOSTS.— *Cajanus cajon*, *Cicer arietinum*, *Hymenaea courbaril*, etc.

BIOLOGY.— Fallen seed pods of the host are selected for attack. Other host species have been reported, but the identification of specimens could not be confirmed.

NOTES.— The above treatment was based on a male cotype of *hymenaeae* and of *insularis*, on the holotypes of *caribaeus*, *guianae*, and *hoodi*, and on 76 other specimens. The limited material available to previous authors did not reveal the extreme variability within a series in sculpture of the male frons. As a result, several synonyms were named and others will probably be found. In a single series from Jamaica the male frons varied from almost flat to strongly concave and the lateral tubercles from obscure to well developed. Other anatomical parts and the female frons are constant.

### 2. *Araptus fossifrons* Wood

*Araptus fossifrons* Wood, 1975, Great Basin Nat. 35:30 (Holotype, male; Lago Amatitlan, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the distantly related *hymenaeae* (Eggers) by the larger size, by the stouter body form, by the presence of interstrial punctures, and by the very different male frons.

MALE.— Length 1.8–2.4 mm, 2.5 times as long as wide; color rather dark reddish brown.

Frons essentially convex, with median half strongly concave from midway between epistoma and upper level of eyes to well above eyes; surface shining, rather finely punctured; lateral angles of upper margin sharply marked by a pair of cusps, lower slope of concavity sometimes with a very weak median carina; vestiture sparse, short, inconspicuous. Antennal club moderately large, suture 1 strongly procurved, not reaching middle, marked externally throughout, its mesal half septate, suture 2 very obscure.

Pronotum 1.1 times as long as wide; widest on basal half, sides moderately arcuate, distinctly constricted on anterior half, broadly rounded in front; anterior margin armed by about 16 fine serrations; summit obscure, well in front of middle; asperities fine, confused; posterior areas smooth, shining, with numerous fine points, punctures rather coarse, deep, close, broad median line impunctate. Glabrous.

Elytra 1.5 times as long as wide, 1.5 times as long as pronotum; striae not impressed except 1 near declivity, punctures small, rather deep; interstriae about four times as wide as striae, surface smooth, shining, minute impressed points abundant, uniseriate punctures almost as large as those of striae. Declivity steep, rather broadly convex; striae 1 rather deeply, narrowly impressed, all punctures smaller than on disc, entirely devoid of granules. Vestiture usually abraded, when present consisting of minute strial hair and rows of short interstrial bristles, each bristle less than half as long as distance between rows.

FEMALE.— Similar to male except frons convex, with a broad, shallow, transverse impression below upper level of eyes, a fine median carina from epistomal margin to upper level of eyes, surface more finely closely punctured, vestiture of rather abundant, fine, moderately long hair.

DISTRIBUTION.— Nayarit to Guatemala.

MEXICO: **Colima**: 24 km W Armeria, 30-VI-65, 30 m, No. 141, tree seed pods. **Jalisco**: 8 km S Atenquique, 25-VI-65, 1000 m, No. 96, vine seed pods, 21 km N Juchitlán, 2-VII-65, 1000 m, vine seed pods; 24 km S Mazamitla, 22-VI-65, 2500 m, No. 99, vine seed pods; Tuxpan, 23-VI-65, 1300 m, vine seed pods. **Nayarit**: Los Corchos, 10-VII-65, 7 m, vine seed pods; 8 km N Ruiz, 14-VII-65, 100 m, No. 245, vine seed pods. **Oaxaca**: 19 km SE Oaxaca, No. 57, vine seed pods. GUATEMALA: Lago Amatitlan, 10-VI-64, 700 m, No. 702, vine seed pods. All were taken by me.

BIOLOGY.— The mature fruiting bodies of various vines and one tree species were infested by this species.

NOTES.— The above treatment was based on the type series of 124 specimens and on 36 other specimens.

### 3. *Araptus deyrollei* (Blandford)

*Pityophthorus deyrollei* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):245 (Lectotype, male; Mexico; British Mus. Nat. Hist., designated by Wood, 1974, Great Basin Nat. 34:278)

*Araptus insinuatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):43 (Holotype, male; Guatemala; Wood Coll.); Wood, 1974, Great Basin Nat. 34:278. *Synonymy*

DIAGNOSIS.— This species is distinguished from the very closely related *fossifrons* Wood by the strongly impressed declivital interstriae 2, by the longer elytral vestiture, and by the more finely, more closely punctured pronotal disc.

MALE.— Length 1.6–2.1 mm, 2.4 times as long as wide; color reddish brown.

Frons aFd pronotum as in *fossifrons* except punctures on pronotal disc distinctly smaller, closer. Elytra as in *fossifrons* except discal punctures averaging larger; declivital interstriae 2 strongly, rather abruptly impressed; vestiture very slightly longer, finer than in *fossifrons*.

FEMALE.— Similar to male except frons (concealed) apparently as in female *foveifrons*.

DISTRIBUTION.— Mexico to Honduras.

MEXICO: "Mexico." GUATEMALA: Guatemalan seeds intercepted at San Pedro, California, 7-III-63. HONDURAS: La Ceiba, Atlántida, 17-VI-49, at light, E. C. Becker.

BIOLOGY.— This species infests mature seeds.

NOTES.— The above treatment was based on the lectotype of *deyrollei* and on the type series of five specimens of *insinuatus*.

### 4. *Araptus foveifrons* (Schedl)

*Thamnophthorus foveifrons* Schedl, 1963, Ent. Arb. Mus. Frey 14:161 (Holotype, male; Guadalajara, Jalisco, Mexico; Schedl Coll.)

*Araptus interjectus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):44 (Holotype, male; Volcán de Agua, Guatemala; Wood Coll.); Wood, 1975, Great Basin Nat. 35:21. *Synonymy*

DIAGNOSIS.— This species is distinguished from *fossifrons* Wood by the larger size, by the more elongate form, by the near absence of interstrial punctures, and by the different frons in both sexes.

MALE.— Length 2.4–2.7 mm, 2.9 times as long as wide; color rather dark reddish brown.

Frons strongly, transversely impressed from eye to eye from middle to well above upper level of eyes, its margins obtuse, its lower lateral angles armed by a pair of rather coarse tubercles and with a large, pointed, median tubercle at same level; lower third of area below upper level of eyes subaciculate; all surfaces shining; vestiture sparse except along epistomal margin. Antennal club as in *fossifrons*.

Pronotum 1.15 times as long as wide; widest behind middle, sides moderately arcuate on more than posterior half, weakly constricted on anterior third, rather broadly rounded in front; anterior margin armed by about eight irregular serrations; indefinite summit one-third of pronotum length from anterior margin; asperities fine, confused; posterior areas obscurely reticulate in some areas, numerous minute, impressed points present, punctures rather small, deep, moderately close. Glabrous except for a few setae on asperate area and lateral margins.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; sides straight and parallel on basal two-thirds, broadly rounded behind; striae not impressed except 1 near declivity, punctures moderately coarse, spaced by diameter of a puncture; interstriae twice as wide as striae, shining, with rather numerous minute points and moderately abundant, subtransverse impressed lines, punctures obsolete except for an occasional puncture on some specimens. Declivity steep, broadly convex; sutural interstriae distinctly, rather abruptly elevated, 2 slightly wider than 1 or 3 and impunctate, 1 and 3 each with a few small punctures. Vestiture largely abraded, a few short interstrial bristles on declivity.

FEMALE.— Similar to male except frons broadly flattened, weakly impressed near median line, median line with a conspicuous, blunt carina from epistoma to well above eyes; frontal vestiture of moderate abundant, fine, uniformly distributed long hair, distinctly longer at margins.

DISTRIBUTION.— Jalisco to Guatemala.

MEXICO: Jalisco: Guadalajara. GUATEMALA: Volcán de Agua, 19-V-64, 1000 m, Nos. 609, 612, vine, S. L. Wood.

BIOLOGY.— Specimens were removed from pith tunnels in a recently cut vine 2 cm in diameter.

NOTES.— The above treatment was based on the holotype of *foveifrons* and on the type series of 14 specimens of *interjectus*.

### 5. *Araptus accinctus* Wood

*Araptus accinctus* Wood, 1974, Brigham Young University Sci. Bull., Biol. Ser. 19(1):44 (Holotype, male; 3 km SE Acatlán, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *fossifrons* Wood by the more slender body form, by the sparse discal interstrial punctures, and by the very different frons in both sexes.

MALE.— Length 2.1–2.5 mm, 2.8 times as long as wide; color dark reddish brown.

Frons excavated as in *fossifrons* but with lateral cusps longer, extending ventrad to upper level of eyes, a sharply elevated median carina extending from deepest point of excavation ending on epistomal margin in a small tooth, lateral margins of lower half of excavation armed by one or more pairs of small tubercles. Antennal club as in *fossifrons*.

Pronotum and elytra as in *foveifrons* (Schedl) except odd-numbered discal interstriae punctured, even-numbered interstriae very sparsely punctured, and declivity as in *fossifrons* except more narrowly convex, punctures smaller.

FEMALE.— Similar to male except frons shallowly concave from eye to eye from epistoma to vertex, surface shining, finely punctured, subaciculate, a distinctly elevated median carina extending from center of excavation to denticulate epistomal margin; margins of frontal excavation ornamented by a rather dense fringe of fine, long hair.

DISTRIBUTION.— Puebla.

MEXICO: **Puebla**: 3 km SE Acatlán, 15-VI-67, 1500 m, No. 38, vine, S. L. Wood.

BIOLOGY.— Specimens were taken from axial pith tunnels in a recently cut vine 1 cm in diameter.

NOTES.— The above treatment was based on the type series of seven specimens.

### 6. *Araptus delicatus* Wood

*Araptus delicatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):44 (Holotype, male; 8 km S La Huerta, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *genialis* Wood by the smaller size, by the more slender form, and by the very different sculpture of the frons.

MALE.— Length 1.7–2.5 mm, 2.8 times as long as wide; color dark brown except basal half of elytra light brown.

Frons deeply impressed on triangular area from epistoma to vertex, upper angle of triangle on vertex an inverted U-shaped area having its margins acutely costate, floor of impressed area obscurely aciculate and with a low, long, acute carina; vestiture fine, short, moderately abundant, with a conspicuous epistomal brush. Antennal club as in *fossifrons* Wood.

Pronotum 1.2 times as long as wide; sides on basal half almost straight and parallel, broadly rounded in front; anterior margin armed by about 12 low serrations; indefinite summit one-third pronotum length from anterior margin; asperities small, confused; posterior areas shining, with numerous impressed points, punctures moderately coarse, deep, close. Vestiture of moderately abundant, fine, very short hair.

Elytra 1.6 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed except 1 weakly, punctures rather small, deep, spaced by diameter of a puncture; interstriae two to three times as wide as striae, shining, marked by irregular lines, punctures almost as large as those of striae, irregularly placed. Declivity steep, broadly convex; strial and interstrial punctures smaller than on disc; sutural interstriae feebly elevated, area from striae 1 to 3 flat on middle half. Vestiture of rows of short strial and slightly longer interstrial hair, longest interstrial setae slightly shorter than distance between rows.

FEMALE.— Similar to male except frons more extensively, subcircularly impressed, U-shaped carina as in male, vestiture on margins abundant and very long.

DISTRIBUTION.— Jalisco to Nayarit.

MEXICO: **Jalisco**: 8 km S La Huerta, 1-VII-65, 500 m, No. 161, vine, 21 km N. Juchitlán, 2-VII-65, 1000 m, No. 188, vine. **Nayarit**: Laguna Santa María, 6-VII-65, 1000 m, No. 192, vine; Los Corchos, 10-VII-65, 7 m, No. 222, vine. All were taken by me.

BIOLOGY.— Specimens were taken from axial pith tunnels in the stems of a vine having linear leaves.

NOTES.— The above treatment was based on the type series of 64 specimens and on 59 other specimens.

### 7. *Araptus genialis* Wood

*Araptus genialis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):45 (Holotype, male; Volcán de Agua, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *delicatus* Wood by the larger size, by the stouter body form, and by the sculpture of the frons.

MALE.— Length 2.8–3.4 mm, 2.7 times as long as wide; color dark reddish brown.

Frons deeply, triangularly impressed on median three-fourths from epistoma to vertex, upper angle more strongly impressed, its

margin armed by one median and two lateral acutely elevated cusps; floor of impression punctate to obscurely aciculate, with a broad, strongly elevated, median carina from emarginate epistoma to deepest part of concavity, both upper and lower ends terminate abruptly. Antennal club as in *fossifrons*.

Pronotum 1.16 times as long as wide; as in *delicatus* except discal punctures smaller, not as deep.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; as in *delicatus* except discal interstriae three to four times as wide as striae and declivital interstriae 3 feebly elevated.

FEMALE.— Similar to male except frontal impression more extensive, its margins ornamented by a dense fringe of long, yellow hair.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán de Agua, Esquintla, 19-V-64, 1000 m, No. 609, vine, S. L. Wood.

BIOLOGY.— Specimens were taken from axial pith tunnels in stems of a cut vine.

NOTES.— The above treatment was based on the type series of 20 specimens.

### 8. *Araptus politus* (Blandford)

Fig. 197

*Pityophthorus politus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):244 (Lectotype, male; Mexico; British Mus. Nat. Hist., present designation)

*Neodryocoetes mexicanus* Eggers, 1936, Rev. de Ent. 6:391 (Holotype, female; Colonia, prob. Veracruz, Mexico; deposited in but not now in Eggers Coll.); Schedl, 1938, Archiv Naturgesch. N.F., 7:177. *Synonymy*

*Neodryocoetes hubbardi* Blackman, 1942, Proc. U.S. Nat. Mus. 92:182 (Holotype, female; Kingston, Jamaica; U.S. Nat. Mus. 56000); Wood; 1973, Great Basin Nat. 33:173. *Synonymy*

DIAGNOSIS.— This species is distinguished from *tabogae* (Blackman) by the larger size, by the reticulate pronotal disc, by the much smaller punctures on pronotum and elytra, and by the different frons in both sexes.

MALE.— Length 2.0–2.5 mm, 2.5 times as long as wide; color dark reddish brown.

Frons broadly convex above, distinctly, transversely impressed just above epistoma; surface reticulate, with fine obscure punctures; a low median carina extending from transverse impression to slightly above upper level of eyes, carina occasionally partly to entirely obsolete; vestiture sparse, short, inconspicuous. Antennal club much as in *foveifrons* except septum of suture 1 almost complete.

Pronotum 1.07 times as long as wide; sides almost straight and parallel on basal half, distinctly constricted on anterior half, rather narrowly rounded in front; anterior margin armed by about 14 low serrations; indefinite summit at middle; asperities small, confused; posterior areas finely reticulate, punctures very small, spaced by at least two diameters of a puncture. Glabrous.

Elytra 1.5 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, very broadly rounded behind; striae not impressed, punctures in irregular rows, very small, rather shallow; interstriae obscurely subreticulate, about six times as wide as striae, usually with impressed points, punctures very small. Declivity rather steep, broadly convex; striae 1 distinctly impressed, interstriae 1 very weakly elevated; strial punctures deeper than on disc. Vestiture obsolete or of minute setae shorter than diameter of puncture from which they arise.

FEMALE.— Similar to male except frontal vestiture moderately abundant, short to rather long, carina present or not.

DISTRIBUTION.— Florida, Mexico to Costa Rica, Cuba, Haiti, and Jamaica.

USA: Florida: "Fla."; intercepted at Miami in bird seed. MEXICO: Veracruz: Colonia. COSTA RICA: San Isidro del General, 5-XII-63, 1000 m, No. 285, *Mucuna andreana*, S. L. Wood.

HOSTS.— *Mucuna andreana*, *M. fawcetti* (Jamaica), *Cola* sp. (Haiti).

BIOLOGY.— Specimens were reared from seeds of the hosts.

NOTES.— The above treatment was based on the 2 male syntypes of *politus*, on the holotype of *hubbardi*, and on 58 other specimens. The first of Blandford's 2 syntypes is labeled Type, but has never been so designated. I here designate that male as the lectotype of *politus*.

### 9. *Araptus tabogae* (Blackman)

Fig. 197

*Neodryocoetes tabogae* Blackman, 1942, Proc. U.S. Nat. Mus. 92:184 (Holotype, female; Taboga Island, Panama; U.S. Nat. Mus., 56002)

*Neodryocoetes vinealis* Bright, 1972, Canadian Ent. 104:1667 (Holotype, female; Ejipantla, 8 km or 5

miles S San Andrés Tuxtla, Veracruz, Mexico; Canadian Nat. Coll., 12625); Wood, 1973, Great Basin Nat. 33:174. *Synonymy*

DIAGNOSIS.— This species is distinguished from *politus* (Blandford) by the smaller size, by the obscurely reticulate to shining pronotal disc, by the larger pronotal and elytral punctures, and by the different frons.

MALE.— Length 1.5–1.8 mm, 2.7 times as long as wide; color dark reddish brown.

Frons convex, rather finely granulate-punctate, with an acute median carina from epistoma to vertex. Antennal club as in *politus*.

Pronotum 1.1 times as long as wide; outline and sculpture about as in *politus* except disc obscurely subreticulate, punctures rather small, deep, their lateral margins form an obscure granule, granules become obsolete laterally. Subglabrous.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae 1 feebly impressed, surface shining, with a few impressed points and irregular lines, punctures moderately large, deep, moderately confused, smaller toward declivity; declivity rather steep, convex; strial punctures in rows, rather small, striae 1 moderately impressed, interstriae 1 distinctly elevated, 2 feebly impressed; interstrial punctures small. Vestiture largely confined to declivity, of rather sparse rows of short interstrial bristles, all shorter than distance between rows.

FEMALE.— Similar to male except frons flat, shining, very finely, closely, deeply punctured over broad area from epistoma to well above eyes, vestiture of abundant, fine, long yellow hair uniformly distributed, longer at margins, carina absent.

DISTRIBUTION.— Veracruz to Panama.

MEXICO: **Veracruz**: Ejipantla, 8 km or 5 miles S San Andrés Tuxtla, 5-V-69, vine, D. E. Bright. HONDURAS: Olanchito, 30-VII and 8-IX-49, at light, E. C. Becker. COSTA RICA: Cañas, Guanacaste, 13-VII-66, 50 m, No. 29, vine, S. L. Wood. PANAMA: Taboga Island, H. F. Dietz.

BIOLOGY.— Specimens were taken from axial pith tunnels of a cut vine.

NOTES.— The above treatment was based on the holotypes of *tabogae* and *vinealis*, and on eight other specimens.

### 10. *Araptus incommodus* (Blandford)

*Pityophthorus incommodus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):245 (Holotype, female; Cerro Zunil, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *tabogae* (Blackman) by the larger size, by the slightly reticulate pronotal disc and elytral declivity, by the much finer punctures on declivital striae 1 and 2, and by the very different elytral vestiture.

FEMALE.— Length 2.2 mm, 2.6 times as long as wide; color reddish brown.

Frons apparently as in *tabogae* (obscured by card).

Pronotum as in *tabogae* except serrations on anterior margin smaller, irregular, disc somewhat reticulate with granules slightly larger.

Elytra as in *tabogae* except punctures on disc closer and apparently smaller punctures on declivital striae 1 and 2 much smaller to obsolete, vestiture on interstriae from middle of disc to apex.

DISTRIBUTION.— Guatemala.

GUATEMALA: Cerro Zunil, 4000 ft (1300 mm). Champion.

NOTES.— The above treatment was based on the holotype.

### 11. *Araptus carinifrons* (Blandford)

*Pityophthorus carinifrons* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):244 (Holotype, male; Motzorongo, Veracruz, Mexico; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *tabogae* (Blackman) by the strongly reticulate pronotal disc, by the impunctate discal interstriae, with the strial punctures in rows, and by the slightly impressed female frons.

MALE.— Length 1.7–1.9 mm, 2.6 times as long as wide; color dark reddish brown.

Frons as in *tabogae* except punctures larger, deeper, granules obscure. Pronotum as in *tabogae* except disc more strongly reticulate, granules slightly larger. Elytra as in *tabogae* except strial punctures on disc smaller, in rows, interstriae three to four times as wide as striae, impunctate.

FEMALE.— Similar to male except frons as in female *tabogae* except very feebly concave.

DISTRIBUTION.— Veracruz and Panama.

MEXICO: **Veracruz**: Motzorongo. PANAMA: Ft. Clayton, Canal Zone, 22-XII-63, 30 m, No. 318, vine, S. L. Wood.

BIOLOGY.— Specimens were taken from axial pith tunnels in the stems of a recently cut vine.

NOTES.— The above treatment was based on the holotype and on 26 other specimens.

### 12. *Araptus confinis* (Blandford)

*Pityophthorus confinis* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):241 (Lectotype, male; Jalapa, Veracruz, Mexico; British Mus. Nat. Hist., designated by Wood, 1975, Great Basin Nat. 35:39)

*Neopityophthorus glabricollis* Schedl, 1938, Archiv Naturgesch. 7(2):181 (Holotype, male; Teopisca, Chiapas, Mexico; Schedl Coll.); Wood, 1975, Great Basin Nat. 35:391. *Synonymy*

DIAGNOSIS.— This species is distinguished from *dentifrons* Wood by the smaller pronotal and elytral punctures and by the very different frons in both sexes.

MALE.— Length 1.8–2.0 mm, 3.0 times as long as wide; color dark reddish brown.

Frons almost flat on median two-thirds from epistoma to well above eyes, surface subaciculate, punctured in marginal areas, with central half bearing a sharply elevated, dentate, longitudinal carina, its highest point at its middle, a small callus on median line at vertex, vestiture of moderately abundant, fine hair. Antennal club as in *politus* (Blandford).

Pronotum 1.3 times as long as wide; widest just behind middle, sides weakly arcuate on posterior half, distinctly constricted on anterior half, rather narrowly rounded in front; anterior margin armed by about 10–14 low serrations; indefinite summit slightly in front of middle; asperities small, confused; posterior area obscurely subreticulate, rather coarsely, deeply, closely punctured. Discal area glabrous.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures in rows, small, spaced by diameter of a puncture; interstriae about three times as wide as striae, subreticulate, impunctate. Declivity steep, convex; sutural interstriae weakly elevated, 2 feebly impressed, interstriae except 2 with fine punctures; remaining sculpture as on disc. Vestiture largely confined to declivity, consisting of rows of minute strial hair and longer interstrial bristles, bristles equal in length to distance between rows.

FEMALE.— Similar to male except frons more broadly flattened, carina absent, vestiture abundant, uniformly distributed, longer at margins.

DISTRIBUTION.— Veracruz to Panama.

MEXICO: Veracruz: Jalapa. GUATEMALA: Guatemala City, 30-V-64, 1300 m, No. 640, vine, S. L. Wood. HONDURAS: Olanchito, 19-V to 21-VI-49, at light, E. C. Becker. PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, No. 395, vine, S. L. Wood.

BIOLOGY.— Specimens were taken from stems of a cut vine 1 cm in diameter.

NOTES.— The above treatment was based on the lectotype of *confinis*, on the holotype of *glabricollis*, and on 17 other specimens.

### 13. *Araptus gracilens* Wood

*Araptus gracilens* Wood, 1976, Great Basin Nat. 36:364 (Holotype, male; 4 miles or 6 km N Mazatlán, Sinaloa, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *dentifrons* Wood by the smaller size, by the less strongly impressed frons in both sexes, and by the slightly smaller punctures on the pronotum and elytra.

MALE.— Length 1.1–1.3 mm, 3.2 times as long as wide; color brown.

Frons as in *dentifrons* except almost flat, carina and marginal tubercles very slightly smaller.

Pronotum 1.3 times as long as wide, as in *dentifrons* except anterior margin more broadly rounded, punctures slightly smaller.

Elytra 1.8 times as long as wide, 1.5 times as long as pronotum; as in *dentifrons* except strial punctures smaller, more widely spaced.

FEMALE.— Similar to male except frons; frons as in female *dentifrons* except weakly convex, vestiture finer, slightly shorter.

DISTRIBUTION.— Sinaloa.

MEXICO: Sinaloa: 6 km N Mazatlán, 31-VII-64, from active oriole nest, E. E. Lindquist.

NOTES.— The above treatment was based on the type series of four specimens.

### 14. *Araptus dentifrons* Wood

*Breviophthorus mexicanus* Schedl, 1963 (nec Eggers, 1936), Ent. Arb. Mus. Frey 14:161 (Holotype, male; Mexico; Schedl Coll.). *Probable synonym*

*Araptus dentifrons* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):45 (Holotype, male; 3 km SE Acatlán, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *confinis* (Blandford) by the impressed male frons, with the carina much stronger, and with a series of small tubercles arming the lateral and dorsal margins of the impressed area, by the different female frons, and by the coarser elytral punctures.

MALE.— Length 1.6–1.9 mm, 3.0 times as long as wide; color very dark reddish brown.

Frons subconcavely impressed to upper level of eyes, with median area on lower half very strongly produced into a short, dentate, median carina, upper and lateral margins of impressed area armed by a row of about nine tubercles; surface shining, subaciculate near epistoma; vestiture sparse, inconspicuous except on epistoma.

Pronotum as in *confinis* except posterior areas with numerous impressed points (obscurely reticulate in some specimens), punctures coarse, deep. Elytra as in *confinis* except discal surface smooth, shining, with impressed points, strial punctures larger, interstriae less than twice as wide as striae, declivital punctures strongly reduced in size, almost obsolete.

FEMALE.— Similar to male except frons flattened, very shallowly concave on median third, with an obscure median impressed line below, a weak carina above, marginal areas subgranulate, not tuberculate, vestiture rather uniformly distributed but more abundant and longer on margins.

DISTRIBUTION.— Colima and Puebla to Honduras.

MEXICO: **Jalisco**: Volcán Colima, 23-VI-65, 2500 m, No. 104, vine, S. L. Wood. **Puebla**: 3 km SE Acatlán, 15-VI-67, 1500 m, No. 38, vine, S. L. Wood. HONDURAS: Olanchito, 21-VI-49, at light, E. C. Becker.

BIOLOGY.— Specimens were taken from axial pith tunnels in a cut vine.

NOTES.— The above treatment was based on the type series of 32 specimens.

The male holotype of *Breviophthorus mexicanus* Schedl (1.8 mm, 3.1 times as long as wide) is very similar to *dentifrons* and may be the same species. Schedl's specimen is more slender, the spaces between the punctures on the pronotal disc are smooth, and the strial punctures on the elytral declivity are more strongly impressed. A female paratype of *dentifrons* in the Volcan Colima series almost matches these characters; that specimen intergrades within its series with normal specimens of *dentifrons*. A specimen from Texas (Hidalgo Co., 22-III-60, J. N. Knull) in the Canadian National Collection probably is of this species.

### 15. *Araptus speciosus* Wood

*Araptus speciosus* 1980, Great Basin Nat. 40:357 (Holotype, female; 8 km S La Huerta, Jalisco, Mexico; Wood Coll.)

This species is distinguished from *facetus* Wood by the larger size, by the longer elytral vestiture, and by the different ornamentation of the female frons. *Pityophthorus exquisitus* (Blackman) has the female frons less broadly flattened, the frontal setae shorter, the pronotum more reticulate and more coarsely punctured, and the elytral setae slightly longer.

FEMALE.— Length 1.4–1.7 mm, 2.7 times as long as wide; color dark reddish brown.

Frons broadly flattened from epistoma to vertex, shining, finely, closely punctured, sparsely pubescent at center, densely ornamented by long, yellow hair at sides and above, longest setae on vertex extend two-thirds distance to epistoma.

Pronotum 1.1 times as long as wide; widest slightly behind middle; sides on posterior half weakly arcuate, feebly constricted on anterior half, then rather narrowly rounded in front; anterior margin armed by 4 to 10 serrations; summit poorly developed, slightly in front of middle; asperities on anterior slope moderately large, arranged into discontinuous, irregular, subconcentric rows, posterior areas mostly smooth, shining, some specimens with very obscure indications of reticulation, punctures moderately coarse, deep, rather close. Glabrous.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures rather small, moderately deep; interstriae about twice as wide as striae, almost smooth, shining, impunctate, impressed points not clearly visible. Declivity steep, rather broadly convex; sutural interstriae feebly elevated; strial punctures smaller than on disc, a few very small interstrial punctures also present. Vestiture confined to declivity,

consisting of a few interstrial bristles, each almost as long as distance between rows.

DISTRIBUTION.— Jalisco.

MEXICO: Jalisco: 8 km S La Huerta, 1-VII-65, 500 m, No. 168, *Ficus*, S. L. Wood.

HOSTS.— *Ficus* sp.

BIOLOGY.— Specimens were taken from axial pith tunnels in twigs 2 cm in diameter.

NOTES.— The above treatment was based on the type series of nine specimens.

### 16. *Araptus facetus* Wood

*Araptus facetus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):46 (Holotype, female; Río Tempisque, Guanacaste, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *exquisitus* (Blackman) by the smaller size, by the shorter or obsolete elytral vestiture, and by the ornamentation of the female frons.

MALE.— Length 1.2–1.4 mm, 2.5 times as long as wide; color reddish brown.

Frons, pronotum, and elytra as in *exquisitus* except elytra glabrous or setae very minute.

FEMALE.— Similar to male except frons shallowly concave from eye to eye from epistoma to vertex, surface smooth, impunctate on lower fourth, finely punctured above, vestiture confined to area above eyes, consisting of a dense brush of long, yellow hair.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Río Tempisque, Guanacaste, 25-III-64, 15 m, No. 501, *Ficus*, S. L. Wood.

BIOLOGY.— Specimens were taken from small broken branches of a native fig tree.

NOTES.— The above treatment was based on the type series of four specimens.

### 17. *Araptus laevigatus* (Eggers)

*Pityophthorus laevigatus* Eggers, 1933, Mém. Trav. Lab. d'Ent. Mus. Nat. d'Hist. Nat., Paris 1(1):6 (Holotype, female; St. Laurent du Maroni, French Guiana; Paris Mus.)

*Neopityophthorus insularis* Eggers, 1940, Arb. Morph. Taxon. Ent. Berlin-Dahlem 7:130 (Holotype, female; Trois Rivières, Guadeloupe; deposited in but not now in Eggers Coll.); Wood, 1973, Great Basin Nat. 33:173. *Synonymy*

*Neodryocoetes guadeloupensis* Schedl, 1951, Dusenia 2:73 (*Replacement name*); Wood, 1973, Great Basin Nat. 33:173. *Synonymy*

DIAGNOSIS.— This species and the next present a radical biological departure from the remainder of the genus (see below). It is distinguished from *costaricensis* (Schedl) by the larger size, by the stouter body form, and by the very slightly larger, deeper punctures on the frons. The males are dwarfed, flightless, and rare.

FEMALE.— Length 1.5–1.7 mm, 2.7 times as long as wide; color very dark brown.

Frons broadly convex, with an obtuse, subcarinate median crest form epistoma to upper level of eyes; surface smooth, shining, punctures varying from small to rather large, moderately deep; vestiture of sparse, inconspicuous hair. Antennal club small, sutures weakly arcuate, 1 septate.

Pronotum 1.17 times as long as wide; widest at base, sides feebly arcuate on more than basal half, rather broadly rounded in front; anterior margin armed by about 12 serrations, indefinite summit about one-third pronotum length from anterior margin; asperities on anterior slope small, confused; posterior area smooth, brightly shining, with low, longitudinal asperities continued as sparse discontinuous ridges almost to base, punctures and points almost totally absent.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures small, spaced within a row by two to four diameters of a puncture; interstriae smooth, brightly shining, obsolescent points obscurely indicated, impunctate, two to four times as wide as striae. Declivity rather steep, convex; one or more striae sometimes narrowly impressed; interstriae with a few minute punctures. Vestiture of sparse interstrial bristles on odd-numbered interstriae, almost as long as distance between rows, more widely spaced within a row.

MALE.— Length 1.2–1.3 mm, similar to female except metathoracic wings shorter than elytra; rare.

DISTRIBUTION.— Costa Rica and Panama to French Guiana.

COSTA RICA: San Isidro del General, San José, 13-XII-63, 1000 m, No. 309, *Daphnopsis seibertii* seeds, S. L. Wood; Pandora, Limon, 23-VIII-63, 50 m, No. 139, *Cynometra hemitomophylla* seeds, S. L. Wood; Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, S. L. Wood; Dominical, Puntarenas, 9-XII-63, 3 m, No. 294, legume seed pod, S. L. Wood. PANAMA: Barro Colorado Island, Canal Zone, 27-XII-63, 70 m, No. 346, *Entada gigas*

seeds, S. L. Wood. OTHER COUNTRIES: Guadeloupe, French Guiana, Surinam.

HOSTS.— *Cynometra hemitomophylla*, *Daphnopsis seibertii* and *Entada gigas*.

BIOLOGY.— Specimens were taken from the fallen fruits and seeds of the hosts.

The males are dwarfed and, because the flight wings are of reduced size, they are incapable of flight. Consequently, mating occurs in the brood chambers and only the female enters new host material.

NOTES.— The above treatment was based on a cotype of *laevigatus* and one of *insularis*, and on 61 other specimens.

### 18. *Araptus costaricensis* (Schedl)

*Neopityophthorus insularis* var. *costaricensis* Schedl, 1938, Archiv Naturgesch. 7:180 (Syntypes, females; Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished, with difficulty, from *laevigatus* Eggers by the smaller size, by the more slender form, by the smaller, shallow frontal punctures, and by the phloeophagous habit.

FEMALE.— Length 1.2–1.4 mm, 2.9 times as long as wide; color light brown.

Exactly as in *laevigatus* except as noted in the diagnosis.

MALE.— Length 1.0 mm; similar to female except flight wings shorter than elytra.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Río Damitas, Dota Mts., San José, 22-VIII-63, 250 m, No. 122, *Cecropia* petiole, S. L. Wood; Turrialba, Cartago, 1970, I. R. Gara. PANAMA: Barro Colorado Island, Canal Zone, 27-XII-63, 70 m, No. 338, tree limb, S. L. Wood.

BIOLOGY.— Specimens were taken from the phloem tissues of a limb 10 cm in diameter and from the petiole of a fallen *Cecropia* leaf.

NOTES.— The above treatment was based on one male and 22 females, one of which was compared directly to Schedl's syntypes. An occasional specimen in this series has the same exact form and structure as *laevigatus* except for the much smaller size. Although it probably represents a valid species, its status should be verified through field studies.

### 19. *Araptus tenellus* (Schedl)

*Neodryocoetes tenellus* Schedl, 1951, Dusenia 2:109 (Holotype, male; Chiapas, Mexico; Schedl Coll.)

*Ctenyophthorus mexicanus* Schedl, 1963, Ent. Arb. Mus. Frey 14:162 (Holotype, female; Trampaluz, Escárcega, Campeche, Mexico; Schedl Coll.); Wood, 1975, Great Basin Nat. 35:392. *Synonymy*

*Neodryocoetes granulatus* Schedl, 1964, Reichenbachia 3:311 (Replacement name for *Ctenyophthorus mexicanus* Schedl)

*Araptus cuspidis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):46 (Holotype, female; 8 km E San Blas, Nayarit, Mexico; Wood Coll.); Wood, 1975, Great Basin Nat. 35:392. *Synonymy*

DIAGNOSIS.— This species and *eruditus* (Schedl) have a conspicuous median process at the posterior margin of abdominal sternum 5 that distinguishes them from all other species in the genus. This species is distinguished from *cuspidatus* by the convex, unarmed elytral declivity and by the different female frons.

MALE.— Length 1.2–1.4 mm, 2.6 times as long as wide; color yellowish brown.

Frons convex, shining, surface obscurely, rather coarsely punctured. Antennal club rather small, subcircular, sutures rather strongly procurved, 1 extending one-third, 2 two-thirds club length from base, 1 finely septate.

Pronotum 1.0 times as long as wide; widest on basal third, sides moderately arcuate, converging toward rather narrowly rounded anterior margin; anterior margin armed by about 12 low serrations; summit definite, very slightly in front of middle; asperities moderately coarse, confused; posterior areas strongly reticulate, punctures small, obscure. Glabrous.

Elytra 1.5 times as long as wide; 1.6 times as long as pronotum; sides straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures small, distinct; interstriae three times as wide as striae, almost smooth, impressed points rather obscure, impunctate. Declivity steep, convex; sutural interstriae feebly elevated, 2 indistinctly impressed; strial and interstrial punctures minute, almost obsolete. Vestiture largely confined to declivity, of interstrial rows of slender bristles, each slightly longer than distance between rows, similarly spaced within a row. Sternum 5 with a conspicuous median elevation on posterior margin.

FEMALE.— Similar to male except frons shining, convex, slightly flattened on median half below upper level of eyes, this area punctured on its lateral and upper margins,

smooth and shining in central area, punctured area with moderately abundant, short, inconspicuous hair.

DISTRIBUTION.— Nayarit to Chiapas.

MEXICO: **Campeche**: Trampaluz. **Chiapas**: Lazardo Cárdenas. **Nayarit**: 8 km E San Blas, 12-VII-65, 70 m, No. 233, tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from a broken branch of an unidentified tree.

NOTES.— The above treatment was based on the holotypes of *tenellus*, *mexicanus*, and *cuspidus* and on 15 other specimens.

*Araptus pallidus* (Blackman) (? = *pororicensis* Schedl) is a distinct species having abdominal sternum 5 as in *tenellus*.

### 20. *Araptus schedli* (Blackman)

Fig. 198

*Neodryocoetes schedli* Blackman, 1942, Proc. U.S. Nat. Mus. 92:195 (Holotype, male; Tampico, Mexico; U.S. Nat. Mus., 55976)

*Neodryocoetes lenis* Blackman, 1942, Proc. U.S. Nat. Mus. 92:198 (Holotype, male; Cordoba, Veracruz, Mexico; U.S. Nat. Mus., 55979); Wood, 1975, Great Basin Nat. 35:392. *Synonymy*

DIAGNOSIS.— This species is distinguished from *micaceus* Wood by the very different male frons and by the much smaller punctures on the elytral declivity.

MALE.— Length 1.2–1.4 mm, 2.7 times as long as wide; color dark brown.

Frons rather abruptly, strongly, transversely impressed from epistoma to upper level of eyes; upper area convex, coarsely punctured except median line impunctate and transversely etched; surface of impressed area smooth, shining, punctures almost obsolete, lateral areas with a short, conspicuously subcarinate, diagonal callus extending from near epistomal margin toward dorsomedian part of eye; epistomal margin broadly, rather deeply emarginate; vestiture confined to epistomal margin. Antennal club 1.2 times as long as wide, 1.5 times as long as scape; sutures 1 and 2 strongly procurved, dividing club into about equal thirds.

Pronotum 1.1 times as long as wide; widest on basal third, sides feebly arcuate, gradually converging toward rather narrowly rounded anterior margin; anterior margin finely, broadly serrate; summit at middle; posterior areas smooth, shining, surface with numerous impressed points, punctures moderately coarse, deep, spaced by one to two diameters of a puncture. Glabrous except at lateral margins.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures slightly larger and very slightly confused on basal half of disc; interstriae shining, almost smooth, weak lines and obscure impressed points evident, about three to four times as wide as striae. Declivity rather steep, convex; striae not impressed, punctures minute, a few similar interstrial punctures on lower third confused with those of striae. Strial and interstrial setae minute to obsolete, never longer than distance equal to diameter of a puncture.

FEMALE.— Similar to male except frons flattened and pubescent (concealed in specimens at hand).

DISTRIBUTION.— Tamaulipas to Veracruz.

MEXICO: **Tamaulipas**: Tampico, 26-XII-09, E. A. Schwarz. **Veracruz**: Cordoba, 23-IV-08, A. Fenyes. Mexican seeds intercepted at New York, 20-XI-45, 46-2193.

NOTES.— The above treatment was based on the holotypes of *schedli* and *lenis* and on eight other specimens.

### 21. *Araptus obsoletus* (Blandford)

*Pityophthorus obsoletus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):242 (Holotype, female; Las Mercedes, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *placatus* Wood by the smaller size, by the more coarsely punctured male frons, by the longer, more abundant female frontal hair, and by the more simple elytral declivity.

MALE.— Length 1.3–1.5 mm, 2.6 times as long as wide; color dark brown.

Frons convex, a shallow, broad transverse impression from upper level of eyes to epistoma; surface shining, coarsely, closely, deeply punctured; vestiture fine, sparse, inconspicuous. Antennal club comparatively small, suture 1 rather weakly procurved, septate, 2 almost obsolete.

Pronotum 1.17 times as long as wide; as in *tenellus* (Schedl) except posterior area weakly reticulate, punctures coarse, deep, rather close. Glabrous.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; as in *tenellus* except declivity uniformly convex, densely covered by impressed points, strial punctures sometimes more distinct. Elytra either glabrous or with minute setae shorter than diameter of punctures from which they arise.

FEMALE.— Similar to male except frons broadly flattened from epistoma to vertex, rather coarsely, closely punctured, with abundant, long, yellow hair.

DISTRIBUTION.— Jalisco to Guatemala.

MEXICO: Jalisco: 33 km N Juchitlán, 3-VII-65, 1300 m, No. 177, *Ficus*, S. L. Wood. GUATEMALA: Las Mercedes, G. C. Champion; Lago Amatitlan, 10-VI-64, 700 m, No. 703, vine, S. L. Wood.

BIOLOGY.— Specimens were taken from transverse tunnels in the phloem.

NOTES.— The above treatment was based on the female holotype and on 38 other specimens.

### 22. *Araptus micaceus* Wood

*Araptus micaceus* Wood, 1975, Great Basin Nat. 35:29 (Holotype, male; Los Corchos, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *obsoletus* (Blandford) by the strongly impressed frons, with a pair of epistomal calluses at the anterior articulations of the mandibles, by the smooth surface between punctures on the area above the eyes, and by the coarser strial punctures on the declivity.

MALE.— Length 1.3–1.4 mm, 2.6 times as long as wide; color light brown.

Frons as in *obsoletus* except much more strongly impressed, punctures in impressed area smaller, surface on area above eyes reticulate; epistomal calluses at anterior articulation of mandibles much larger.

Pronotum as in *obsoletus* except serrations on anterior margin much smaller (margin subcostate) and reticulation on posterior areas more strongly impressed.

Elytra as in *obsoletus* except strial punctures much larger, interstriae one and one-half times as wide as striae on disc, about twice as wide on declivity; impressed points obsolete on declivity.

FEMALE.— Similar to male except frons planoconvex on median two-thirds from level of antennal insertion to slightly above eyes, finely, closely punctured except impunctate on median line to upper level of eyes, punctured area bearing fine, rather long, moderately abundant hair; hair shorter, less abundant and covering a smaller area than in female *obsoletus*.

DISTRIBUTION.— Nayarit.

MEXICO: Nayarit: Los Corchos, 10-VII-65, 7 m, No. 222, vine, S. L. Wood.

NOTES.— The above treatment was based on the type series of nine specimens.

### 23. *Araptus crassus* Wood

*Araptus crassus* Wood, 1977, Great Basin Nat. 37:211 (Holotype, female?; 8 km NE Cerro Jefe, Panama Prov., Panama; Canadian Nat. Coll.)

DIAGNOSIS.— This species represents a unique group in the genus that is characterized by the very stout body form that has the general habitus of *Coccotrypes*, by the similar frons in both sexes, by the shallow, equally large strial and interstrial punctures, by the unique antennal club, and by the broad tibiae.

FEMALE(?).— Length 2.0–2.2 mm, 1.9 times as long as wide; color dark brown.

Frons evenly convex, surface smooth, shining, a few very minute, isolated granules; epistomal margin with a weak, narrow, median suggestion of a premandibular lobe. Antennal club obovate, about as long as scape, about 1.15 times as long as wide, about equally divided by rather strongly procurved sutures 1 and 2, these weakly grooved and marked by rows of setae, suture 1 septate on lateral half.

Pronotum 0.94 times as long as wide; widest near base, sides strongly arcuate on basal half, rather strongly constricted, then narrowly rounded in front; anterior margin armed by about four, small, indefinite granules; summit indefinite, on basal third; anterior slope rather gradual, armed by low, isolated, abundant asperities, extending to base in lateral areas, surface between asperities shining, almost smooth; posterior areas shining, not smooth, punctures very fine, indefinite, sparse. Vestiture of short, fine, recumbent hair.

Elytra about 1.01 times as long as wide; 1.2 times as long as pronotum; sides straight and parallel on basal half, very broadly rounded behind; striae not impressed, punctures moderately large, distinctly impressed,

spaced by diameter of a puncture; interstriae smooth, shining, almost three times as wide as striae, punctures as large as those of striae, a bit more widely spaced. Declivity broadly convex, very steep; sculpture as on disc. Vestiture of minute strial hair, length of each less than diameter of its puncture, and erect, flattened, narrowly spatulate, closely set interstrial setae, each equal in length to about two-thirds distance between rows.

Sexual differences not apparent, although both sexes apparently represented.

DISTRIBUTION.— Panama.

PANAMA: 8 km NE Cerro Jefe, Panama, 27-III-76, 700 m, H. P. Stockwell.

NOTES.— The above treatment was based on the type series of five specimens.

### 24. *Araptus nanulus* Wood

*Araptus nanulus* Wood, 1973, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):54 (Holotype, female; Tampico, Tamaulipas, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from others in the genus by the small size, by the simple, unadorned frons in both sexes, by the greatly reduced, almost obsolete strial punctures, by the regular, almost scalelike interstrial bristles, and by other characters.

FEMALE.— Length 1.1–1.3 mm, 2.6 times as long as wide; color dark reddish brown.

Frons convex, feebly impressed just above epistoma in lateral areas; surface shining, rather coarsely, sparsely punctured and with more numerous minute points; vestiture fine, sparse, inconspicuous. Antennal club oval, as long as scape, sutures almost straight, suture 1 finely septate.

Pronotum 1.06 times as long as wide; widest near base, sides weakly arcuate on basal half, feebly constricted on anterior half, rather narrowly rounded in front; anterior margin serrate, about 12 indistinct serrations; summit indistinct; crenulations on anterior slope rather coarse, continued as low, irregular transverse costae to well behind summit; posterior areas shining, with numerous impressed points, appearing almost subgranulate in lateral areas. Vestiture erect, moderately abundant, somewhat similar to elytral setae.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; striae not impressed, minute punctures almost obsolete; interstriae shining, setiferous punctures confused, with numerous impressed points of almost equal size. Declivity rather narrowly convex; interstriae 1 shallowly impressed; surface sculpture as on disc. Vestiture of interstrial rows of suberect apically flattened bristles; each bristle about as long as distance between rows, somewhat more closely spaced within a row.

MALE.— Similar to female in all respects.

DISTRIBUTION.— Tamaulipas.

MEXICO: Tamaulipas: Tampico, 14-VIII-72, *Disholcapsis* gall on *Quercus virginiana*, G. F. Frankie.

NOTES.— The above treatment was based on the type series of 14 specimens.

### 25. *Araptus decorulus* Wood

*Araptus decorus* Wood, 1974 (nec Bright, 1972), Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):47 (Holotype, female; Rincón de Osa, Puntarenas, Costa Rica; Wood Coll.)

*Araptus decorulus* Wood, 1974, Great Basin Nat. 34:278 (*Replacement name*)

DIAGNOSIS.— This unique species is distinguished by the shallow declivital impression, confused elytral punctures, slender form and fine sculpture, and by the very different female frons.

MALE.— Length 1.8–1.9 mm, 2.8 times as long as wide; color yellowish brown.

Frons convex, except weakly flattened on central half below upper level of eyes, a small callus near upper margin of flattened area, a pair of calluses in ventrolateral parts of this area; surface shining, rather finely punctured except impunctate in median area on lower half; vestiture fine, sparse, inconspicuous. Antennal club oval, sutures moderately procurved, suture 1 weakly septate.

Pronotum 1.25 times as long as wide; about as in *placatus* Wood except median serrations on anterior margin distinctly larger, and posterior area reticulate, dull, punctures moderately fine, deep, rather widely spaced. Glabrous.

Elytra 1.6 times as long as wide, 1.3 times as long as pronotum; outline as in *placatus*; surface shining, with minute points, punctures confused, rather small, moderately close. Declivity moderately steep, shallowly impressed, almost flat on median half; strial punctures in rows; interstriae 1 weakly elevated, 2 distinctly impressed; interstrial

punctures fine. Vestiture confined to declivity, consisting of rows of sparse, stout bristles except absent on 2, bristles spaced in all directions by distances slightly greater than length of a bristle.

FEMALE.— Similar to male except frons flattened almost from eye to eye from epistoma to vertex, with an elevated, transverse, obtuse summit just below upper level of eyes, area from summit to epistoma on median third smooth, shining, impunctate, remaining area punctured and ornamented by rather abundant, long, yellow hair.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 64, unidentified log, S. L. Wood.

BIOLOGY.— Specimens were taken from phloem tissues of a cut log 20 cm in diameter.

NOTES.— The above treatment was based on the type series of nine specimens.

### 26. *Araptus teres* (Blackman)

Fig. 198

*Neodryocoetes teres* Blackman, 1942, Proc. U.S. Nat. Mus. 92:190 (Holotype, female; Paraíso, Canal Zone, Panama; U.S. Nat. Mus., 56007)

DIAGNOSIS.— This species is distinguished from *placatus* Wood by the smaller size, by the very minute elytral punctures, and by the different female frons.

FEMALE.— Length 1.3–1.4 mm, 2.7 times as long as wide; color dark brown.

Frons flat, perhaps very feebly concave (not visible above eyes); shining, densely, very finely punctured, small median area on lower third impunctate; vestiture of fine, uniformly, moderately abundant, rather short hair (about as in *placatus*), apparently little if any longer on margins.

Pronotum 1.03 times as long as wide; about as in *placatus* except punctures slightly smaller.

Elytra 1.65 times as long as wide; as in *placatus* except strial punctures very minute, shallow; interstriae six or more times as wide as striae; surface with many fine irregular lines; declivital sculpture as on disc, some punctures apparently obsolete. Vestiture largely abraded, apparently confined to declivity, slightly longer and finer than in *placatus.*

MALE.— Similar to female except frons weakly concave, with a weak, median carina indicated.

DISTRIBUTION.— Panama.

PANAMA: Paraíso, Canal Zone, 19 and 26-I-11, E. A. Schwarz.

NOTES.— The above treatment was based on the holotype and allotype.

### 27. *Araptus tenuis* (Blackman)

Fig. 198

*Neodryocoetes tenuis* Blackman, 1942, Proc. U.S. Nat. Mus. 92:197 (Holotype, female; Tampico, Mexico; U.S. Nat. Mus.)

*Araptus placatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):46 (Holotype, male; 5 km W Jáltipan, Veracruz, Mexico; Wood Coll.). *New synonymy*

DIAGNOSIS.— This species is distinguished from *obsoletus* (Blandford) by the larger size, by the more strongly impressed, more finely punctured male frons, by the short, sparse female frontal vestiture, by the elytral vestiture, and by other characters.

MALE.— Length 1.5–1.8 mm, 2.8 times as long as wide; color dark brown.

Frons broadly impressed from epistoma to upper level of eyes, upper limits attaining a distinct summit on median half; surface shining, rather finely, deeply, closely punctured; an obscure, median carina sometimes present; vestiture fine, sparse, inconspicuous. Antennal club as in *obsoletus.*

Pronotum 1.13 times as long as wide; widest just behind middle, sides weakly arcuate, rather broadly rounded in front; anterior margin armed by about 10–12 low serrations; indefinite summit one-third pronotum length from anterior margin; asperities small, confused; posterior areas smooth to obscurely reticulate, punctures rather fine, moderately close. Glabrous.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides straight and parallel on more than basal two-thirds, rather broadly rounded behind; striae not impressed except 1 near declivity, punctures small, spaced within row by twice diameter of a puncture; interstriae almost smooth, subshining, about four times as wide as striae, impunctate. Declivity steep, rather broadly convex; striae 1 distinctly impressed, interstriae 1 distinctly elevated, 2 weakly

impressed, interstrial punctures minute. Vestiture confined to declivity, of rows of stout, blunt interstrial bristles, each slightly shorter than distance between rows, similarly spaced within a row.

FEMALE.— Similar to male except planoconvex, a median callus on lower half, area at upper level of eyes not elevated, surface shining, rather finely, closely punctured, vestiture very fine, moderately abundant, rather short.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: 5 km W Jáltipan, 25-VI-67, 50 m, No. 117, vine, S. L. Wood. HONDURAS: La Ceiba, VI-49, at light, E. C. Becker.

BIOLOGY.— Specimens were taken from the hollow central axis of a recently cut vine.

NOTES.— The above treatment was based on the type series of 43 specimens.

### 28. *Araptus leptus* (Bright)

*Neodryocoetes leptus* Bright, 1972, Canadian Ent. 104:1666 (Holotype, female; Ejipantla, 8 km or 5 miles S San Andrés Tuxtla, Veracruz, Mexico; Canadian Nat. Coll., 12624)

DIAGNOSIS.— This species is distinguished from *micaceus* Wood by the convex male frons, without epistomal calluses, by the much finer pronotal and elytral punctures, and by the more strongly impressed declivital interstriae 2.

MALE.— Length 1.2–1.3 mm, 2.8 times as long as wide; color light brown.

Frons almost uniformly convex, with epistomal margin slightly elevated; surface reticulate, punctures small, shallow, rather close; vestiture sparse, short, inconspicuous.

Pronotum 1.15 times as long as wide; basic outline and anterior margin as in *micaceus*; posterior areas subreticulate, impressed points moderately abundant, punctures small, shallow, rather numerous, spaced by about two to four diameters of a puncture.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; outline as in *micaceus*; striae 1 near declivity weakly, others not impressed, punctures very small, spaced by one to two diameters; interstriae smooth, shining, with rather numerous minute lines and impressed points, punctures obsolete, about four times as wide as striae. Declivity steep, convex; strial punctures reduced, obscure; surface shining, minutely irregular, impressed points abundant; interstriae 1 weakly elevated, 2 shallowly impressed, lateral convexities about as high as 1. Vestiture of minute strial setae and an occasional short interstrial hair; none of these longer than distance equal to two or three diameters of a strial puncture.

FEMALE.— Similar to male except frons broadly, shallowly concave from epistoma to well above eyes, very densely, minutely punctured over entire impressed area, vestiture minute pile in impressed area, margins with a dense fringe of long hair.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: Ejipantla, 8 km S San Andrés Tuxtla, 5-V-69, D. E. Bright.

NOTES.— The above treatment was based on a male and a female paratype. The holotype was also examined.

### 29. *Araptus consobrinus* Wood

*Araptus consobrinus* Wood, 1975, Great Basin Nat. 35:394 (Holotype, male; 6 km or 4 miles W Tepic, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *attenuatus* Wood by the evenly convex elytral declivity (*attenuatus* has striae 1 impressed and interstriae 1 weakly elevated), and, on the female frons, by the coarser, more abundant, longer, yellowish vestiture.

MALE.— Length 1.4–1.7 mm, 2.7 times as long as wide; color very dark brown.

Frons similar to *attenuatus* except more nearly convex, punctures not as coarse, no indications of aciculation, median callus at upper level of eyes smaller, less strongly elevated.

Pronotum as in *attenuatus* except anterior margin armed by about eight serrations.

Elytra as in *attenuatus* except surface less brightly shining, strial punctures slightly larger. Declivity more evenly convex, punctures much smaller; striae 1 not impressed, interstriae 1 not elevated.

FEMALE.— Similar to male, though frons much as in female *attenuatus* except frontal hair much more abundant, coarser, slightly longer, yellowish in color.

DISTRIBUTION.— Jalisco to Nayarit.

MEXICO: Jalisco: 33 km N Juchitlán, 3-VII-65, 1300 m, No. 177, *Ficus*, S. L. Wood. Nayarit: 6 km W Tepic, 13-VII-65, 1000 m, No. 241, shrub, S. L. Wood.

NOTES.— The above treatment was based on the type series of 29 specimens.

### 30. *Araptus attenuatus* Wood

*Araptus attenuatus* Wood, 1975, Great Basin Nat. 35:30 (Holotype, female; 48 km W Bajía de los Angeles, Baja California, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *placatus* Wood by the much coarser strial punctures, by the much longer female frontal vestiture, and by other characters cited below.

FEMALE.— Length 1.4–1.6 mm, 3.0 times as long as wide; color dark brown.

Frons feebly convex, flattened on median half in some specimens; subshining, rather finely, closely punctured in peripheral areas, central area minutely irregular, often with a few punctures; a weak median carina on lower half; vestiture of fine, long, white, subplumose setae in punctured area at sides and above, longest setae equal in length to two-thirds diameter of frons, shorter toward epistoma.

Pronotum 1.2 times as long as wide; as in *placatus* except anterior margin more narrowly rounded, posterior areas more distinctly reticulate, with punctures almost twice as large; minute setae present on disc.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; similar to *placatus* except strial punctures almost twice as large, declivity more narrowly convex, interstriae 2 not impressed, 1 more feebly elevated. Minute strial setae visible on posterior half of disc and declivity except 1 and 2, interstrial setae confined to declivity, absent on 2, similar to *placatus* except usually finer.

MALE.— Similar to female except frons more distinctly convex, punctures subrugose, obscurely aciculate, a distinct, subtuberculate, median prominence at upper level of eyes and continuing toward vertex, its summit transversely etched.

DISTRIBUTION.— Baja California.

MEXICO: **Baja California Norte**: 48 km W Bajía de los Angeles, 31-III-74, Hopk. 58650, M. M. Furniss; 32 km N Punta Prieta, 29-III-73, *Pedialanthus macrocarpus*, J. Doyen.

NOTES.— The above treatment was based on the type series of 28 specimens.

### 31. *Araptus blanditus* Wood

*Araptus blanditus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):47 (Holotype, female; Fortin de las Flores, Veracruz, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *schwarzi* (Blackman) by the smaller size, by the impunctate interstriae, and by the more deeply concave, more finely punctured female frons, with longer, more abundant frontal vestiture.

FEMALE.— Length 1.8 mm, 2.6 times as long as wide; color very dark reddish brown.

Frons moderately concave on central two-thirds from distinctly elevated epistoma to slightly above eyes; surface smooth, shining, very finely, closely, uniformly granulate-punctate; vestiture of uniformly distributed, rather abundant, fine, long hair, marginal setae distinctly larger. Antennal club oval, external sutures obsolete, internal septum of anterior half of suture 1 conspicuous.

Pronotum 1.1 times as long as wide; widest on basal third, sides on basal half moderately arcuate, distinctly constricted on anterior half, rather broadly rounded in front; anterior margin armed by about 12 low serrations; broad summit near middle; asperities rather small, confused; posterior areas smooth, shining, impressed points very small, moderately abundant, punctures rather coarse, deep, moderately close. Glabrous.

Elytra 1.55 times as long as wide, 1.65 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae 1 moderately, others not impressed, punctures moderately large, deep, very close, rows slightly irregular; interstriae smooth, shining, points obscure to absent, impunctate. Declivity moderately steep, convex, shallowly sulcate; sutural striae narrowly impressed, interstriae 2 moderately impressed, ascending laterally, 3 higher than suture; strial punctures slightly smaller than on disc; interstrial punctures small, obsolete on 2. Vestiture largely confined to declivity, in interstrial rows except obsolete on 2, of moderately stout bristles, each as long as distance between rows, similarly spaced within a row.

DISTRIBUTION.— Veracruz.

MEXICO: **Veracruz**: Fortin de las Flores, 22-V-65, at light, D. Rabago. PANAMA: Volcan Chiriquí, 11-I-64, tree branch, S. L. Wood.

NOTES.— The above treatment was based on the holotype and on 35 other specimens.

### 32. *Araptus schwarzi* (Blackman)
Fig. 197

*Thamnophthorus schwarzi* Blackman, 1942, Proc. U.S. Nat. Mus. 92:178 (Holotype, female; Boquete, Panama; U.S. Nat. Mus., 55998)

DIAGNOSIS.— This species is distinguished from *blanditus* Wood as indicated in the above key and in the diagnosis of that species.

FEMALE.— Length 2.0–2.3 mm, 2.3 times as long as wide; color dark reddish brown.

Frons broadly, subconcavely impressed from conspicuously elevated, broad epistomal process to well above eyes; surface shining, closely, finely, uniformly subgranulately punctured; vestiture of moderately abundant, very fine, short hair. Antennal club as in *blanditus* Wood.

Pronotum 1.0 times as long as wide; widest on basal third, sides on posterior half moderately arcuate, distinctly constricted on anterior half, rather narrowly rounded in front; anterior margin subserrate; indefinite summit well behind middle; asperities moderately coarse, confused; posterior area almost smooth, punctures rather coarse, deep, close. Vestiture of moderately abundant, fine, short hair.

Elytra 1.5 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed except 1 toward declivity, punctures confused toward base, in almost regular rows posteriorly; interstriae smooth, about twice as wide as striae, with few to regularly placed punctures. Declivity rather steep, convex, shallowly sulcate; interstriae 1 distinctly elevated, 2 distinctly impressed, 3 broadly rounded, as high as 1; striae 1 and 2 distinctly impressed, punctures in rows, smaller than on disc; interstrial punctures fine. Vestiture of rows of fine, short, strial hair, and distinctly longer, fine, interstrial hair, longest setae averaging about two-thirds distance between rows.

MALE.— Similar to female except frons weakly convex, almost smooth, punctures slightly larger, less abundant, vestiture much less abundant; anterior margin of pronotum more coarsely serrate, armed by 10–12 serrations.

DISTRIBUTION.— Hidalgo to Ecuador.

MEXICO: **Hidalgo**: 17 km NE Jacala, 22-VI-53, 1700 m, in flight, S. L. Wood. **Quintana Roo**:' "Quintana Roo," Aguacate. COSTA RICA: San José, San José, 6-V-14, intercepted at New York. Also intercepted at Laredo, Texas, in *Annona cherimola* from Mexico. OTHER COUNTRIES: Ecuador.

HOSTS.— *Annona cherimola, Persea americana.*

BIOLOGY.— Specimens were taken in flight in a pine-oak forest and in the seeds of the above host plants.

NOTES.— The above treatment was based on the holotype and on 73 other specimens.

### 33. *Araptus sobrinus* Wood

*Araptus sobrinus* Wood, 1974, Great Basin Nat. 34:287 (Holotype, female; Siquatepec, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *schwarzi* (Blackman) by the weakly convex, more sparsely punctured female frons, by the different elytral vestiture, and by the more deeply, more broadly sulcate declivity.

FEMALE.— Length 1.9–2.3 mm, 2.5 times as long as wide; color reddish brown.

Frons weakly convex; surface almost smooth, punctures fine, moderately abundant; vestiture of fine, short, moderately abundant hair; frons about as in male *schwarzi* except for epistomal area.

Pronotum about as in *schwarzi*, except disc with more numerous impressed points and punctures slightly larger and more nearly circular (punctures in *schwarzi* oval to crescent shaped).

Elytra as in *schwarzi* except with abundant impressed points (usually absent in *schwarzi*), declivity more deeply, more broadly impressed, and vestiture greatly reduced. Strial setae entirely absent, interstrial setae rare on disc, sparse on declivity except at sides. (In *schwarzi* interstrial rows of erect setae usually extend to elytral base and small strial hairs occur on disc and declivity.)

MALE.— Similar to female, except frons more strongly convex above, slightly impressed on lower half; epistoma broadly, shallowly emarginate about as in male *schwarzi*.

DISTRIBUTION.— Honduras.

HONDURAS: Siguatepec, 25-V-72, *Pinus oocarpa* rust cones, R. Billings.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 34. *Araptus mendicus* Wood

*Araptus mendicus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):54 (Holotype, female; Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *medialis* Wood by the smooth, polished male frons, with much finer, less abundant punctures, by the finely reticulate, much more distinctly punctured female frons, with the pubescence slightly less abundant, finer, and shorter, and by the larger size.

FEMALE.— Length 1.7–1.9 mm, 2.8 times as long as wide; color rather dark reddish brown.

Frons broadly, evenly convex, reticulate and finely, distinctly, closely punctured on lower two-thirds, almost smooth and shining in small area above eyes; vestiture fine, moderately long, rather abundant, distinctly longer on margins, particularly above, shining area above eyes subglabrous. Antennal club about as in *medialis* except slightly wider.

Pronotum and elytra as in *medialis*.

MALE.— Similar to male *medialis* except frons glabrous, smooth, polished, shagreened, punctures much smaller, less abundant.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Cartago, Cartago, XI-65, *Persea americana*, N. L. H. Krauss.

NOTES.— The above treatment was based on the type series of 24 specimens.

### 35. *Araptus medialis* Wood

*Araptus medialis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):48 (Holotype, female; San Isidro del General, San José, Costa Rica, Wood Coll.)

DIAGNOSIS.— This species is distinguished by the impressed elytral declivity, by the confused punctures on the elytral disc, and by the very different female frons.

MALE.— Length 1.4–1.6 mm, 2.5 times as long as wide; color yellowish brown.

Frons convex, a weak median callus at upper level of eyes; surface subshining, punctures small, shallow, rather close; vestiture fine, sparse, inconspicuous. Antennal club small, oval, suture 1 weakly procurved, septate throughout, 2 very obscure.

Pronotum 1.1 times as long as wide; widest on posterior half, sides feebly arcuate on posterior half, then distinctly constricted, rather narrowly rounded in front; anterior margin armed by 10 coarse serrations; summit rather broad, at middle; asperities rather coarse, confusd; posterior areas shining, almost smooth to subreticulate, impressed points rather obscure, punctures fine, not sharply impressed, rather sparse. Glabrous.

Elytra 1.5 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on slightly less than basal two-thirds, rather broadly rounded behind; striae not impressed, punctures rather small, confused on more than basal half of disc, in rows posteriorly; surface shining, with numerous impressed points. Declivity rather steep, strongly sulcate; strial punctures in rows, small, rather obscure; interstriae 1 weakly elevated, 2 impressed, rather abruptly, moderately elevated laterally, lateral margins rounded, distinctly higher than suture, interstriae 1 and 3 each bearing a row of small granules. Vestiture confined to declivity, consisting of rows of stout, blunt, interstrial bristles (except absent on 2), each bristle distinctly longer than distance between rows, similarly spaced within a row.

FEMALE.— Similar to male except 2.7 times as long as wide, frons flattened almost from eye to eye from epistoma to vertex, area below eyes dull, densely, finely punctured, central area above eyes smooth, shining, impunctate, entire lower area and marginal areas above bearing abundant, long, yellow hair, longest on upper margin; hair on elytral declivity finer and longer.

DISTRIBUTION.— Costa Rica.

COSTA RICA: San Isidro del General, San José, 5-XII-63, 1000 m, No. 288, tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from radiate tunnels in the cambium region of a broken branch.

NOTES.— The above treatment was based on the type series of 23 specimens.

### 36. *Araptus conditus* Wood

*Araptus conditus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):48 (Holotype, female; Puerto Viejo, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *medialis* Wood by the larger size, by the absence of the lateral half of the septum of suture 1 on the antennal club, by the coarser punctures on the pronotum and elytra, and by the very different frons in both sexes.

MALE.— Length 1.9–2.2 mm, 2.4 times as long as wide; color yellowish brown.

Frons broadly, transversely impressed from epistoma to upper level of eyes, a rounded median summit at its upper limits; surface smooth, finely, very closely, uniformly punctured; vestiture of rather abundant, fine, short, semirecumbent hair. Antennal club moderately large, subcircular, suture 1 strongly subangulate, its median half septate, suture 2 almost obsolete.

Pronotum 1.12 times as long as wide; sides feebly arcuate and almost parallel on basal half, slightly constricted anteriorly, rather narrowly rounded in front; anterior margin acute, subserrate; summit indefinite, at middle; asperities fine, confused, covering anterior two-thirds; posterior areas shining, obscurely reticulate, punctures moderately coarse, close, deep. Glabrous.

Elytra 1.4 times as long as wide, 1.26 times as long as pronotum; outline and disc as in *medialis* except striae 1 impressed, punctures rather coarse, deep. Declivity steep, bisulcate; interstriae 1 moderately elevated, 2 rather strongly impressed, narrowly above, broadly below, lateral areas rather strongly elevated, rounded, higher than suture, 1 and 3 each with a sparse row of granules; punctures in rows, rather small, shallow. Vestiture largely confined to declivity, of interstrial rows (absent on 2) of short, coarse bristles, each almost as long as distance between rows, similarly spaced within a row.

FEMALE.— Similar to male except frons shallowly, evenly concave from eye to eye from epistoma to vertex, densely, finely, uniformly punctured, covered by abundant erect, short, yellow hair of uniform length except slightly longer at margins.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Puerto Viejo, Heredia, 12-III-64, 70 m, No. 478, vine, S. L. Wood; Turrialba, Cartago, 1970, R. I. Gara.

BIOLOGY.— Specimens were taken from radiate galleries in the cambium of a woody vine.

NOTES.— The above treatment was based on the type series of 17 specimens.

### 37. *Araptus incompositus* (Blandford)

*Pityophthorus incompositus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):243 (Holotype, female; Coatepeque, Guatemala)

*Araptus incompositus*: Bright, 1976, Great Basin Nat. 36:426

DIAGNOSIS.— This species is distinguished from *frugalis* Wood and *laudatus* Wood by the smaller size, by the more slender body form, by the less strongly impressed declivity, and by the smaller punctures on the elytral disc.

FEMALE.— Length 1.5 mm, 2.9 times as long as wide; color reddish brown.

Frons weakly convex, smooth, punctures fine, rather abundant, margin not elevated; vestiture fine, short, inconspicuous.

Pronotum 1.2 times as long as wide; widest near base, sides on basal half very feebly arcuate, rather narrowly rounded in front; anterior margin armed by about 12 low serrations; summit anterior to middle; asperities on anterior slope confused; posterior areas obscurely subreticulate, punctures rather small, moderately abundant.

Elytra 1.6 times as long as wide, 1.3 times as long as pronotum; outline about as in *laudatus*; striae not impressed, punctures very fine; interstriae at least four times as wide as striae; smooth, shining, punctures, if present, indistinguishable from numerous, confused, impressed points. Declivity steep, shallowly bisulcate; striae 1 and 2 of fine tubercles, 2 moderately impressed, slightly wider than 1, almost flat, with numerous impressed points, shining, 3 as high as 1, rather broadly convex, armed as on 1. Vestiture confined to declivity and basal area, consisting of moderately long, rather stout setae in closely set interstrial rows except absent on 2.

DISTRIBUTION.— Guatemala.

GUATEMALA: Coatepeque, 1300 ft. Champion.

NOTES.— The above treatment was based on the holotype.

### 38. *Araptus frugalis* Wood

*Araptus frugalis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):49 (Holotype, female; Rincón de Osa, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *conditus* Wood by the minute pronotal and elytral punctures, by the much more abundant elytral vestiture, by the glabrous female frons, and by the antennal club.

FEMALE.— Length 1.9–2.2 mm, 2.7 times as long as wide; color yellowish brown.

Frons essentially as in male *conditus* except more brightly polished, less closely punctured, subglabrous, with a definite median tubercle at upper level of eyes. Antennal club elongate-oval, mesal half of suture 1 represented by a longitudinal septum, extending one-third of club length from base, 2 indicated externally, profoundly procurved, extending three-fourths of club length from base.

Pronotum 1.2 times as long as wide; about as in *conditus* except summit distinctly anterior to middle, anterior margin armed by 18 rather coarse serrations, posterior areas with punctures much smaller. Vestiture of moderately abundant fine, short hair.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; outline as in *conditus*; striae not impressed, punctures very fine, mostly in rows; interstriae four or more times as wide as striae, shining, with impressed points and very fine, irregular lines, punctures as small or smaller than those of striae, in rows. Declivity steep, sulcate; essentially as in *conditus* except punctures on striae 1 and 2 obsolete, others minute. Vestiture of rows of minute strial hair, and longer, rather fine, interstrial bristles on disc and declivity, bristles about as long as distance between rows, similarly spaced within a row, absent on declivital interstriae 2.

MALE.— Similar to female except frons convex, rather coarsely, closely punctured, median area weakly elevated and impunctate; elytral bristles slightly longer, stouter.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 80, vine, S. L. Wood. PANAMA: Canal Zone, VIII, Busck.

BIOLOGY.— Specimens were taken from a cut vine 2 cm in diameter.

NOTES.— The above treatment was based on the type series of 38 specimens.

### 39. *Araptus laudatus* Wood

*Araptus laudatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):49 (Holotype, female; San Isidro del General, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *frugalis* Wood by the narrow, convex frons in both sexes, with a distinct impression just above the epistoma in the female, by the more narrowly, deeply sulcate elytral declivity, and by the subtriangular antennal club.

FEMALE.— Length 1.7–2.1 mm, 2.8 times as long as wide; color reddish brown.

Frons convex except lower third rather strongly, transversely impressed; epistoma with median area distinctly elevated; surface dull, reticulate, rather coarsely, somewhat obscurely punctured; glabrous. Antennal club subtriangular, apex somewhat pointed; mesal half of suture 1 septate, sutures not indicated externally.

Pronotum 1.2 times as long as wide; sides almost straight and parallel on basal half, rather narrowly rounded in front; anterior margin armed by 10–12 low serrations; summit rather indefinite, one-third pronotum length from anterior margin; asperities rather fine, confused; posterior areas smooth, shining, with numerous impressed points, punctures rather small, moderately close. Glabrous.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel, then slightly tapered, bisinuately truncate on median half behind; striae not impressed; all punctures rather small, confused; surface smooth, shining, with minute impressed points. Declivity narrow, steep, broadly, rather deeply sulcate; interstriae distinctly elevated, 2 impressed, lateral areas abruptly, strongly elevated, rounded, armed on inner margin by a series of two to six small denticles, 1 usually with one or more small granules on basal half; punctures on striae 1 and 2 obscure to obsolete. Vestiture largely confined to declivity, consisting of a few short, interstrial bristles.

MALE.— Similar to female except frons more evenly convex, transverse impression almost obsolete, punctures coarser, deeper; serrations on anterior margin of pronotum larger; declivital sulcus deeper, more abrupt, sutural interstriae more regularly granulate.

DISTRIBUTION.— Costa Rica.

COSTA RICA: San Isidro del General, San José, 13-XII-63, 1000 m, No. 313, tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from radiate galleries in the cambium region of a tree branch. From two to nine females were associated with each male.

NOTES.— The above treatment was based on the type series of 50 specimens.

### 40. *Araptus eruditus* (Schedl)
Fig. 198

*Neopityophthorus eruditus* Schedl, 1938, Archiv Naturgesch., n.f., 7(2):182 (Holotype, female; El Cora, Tepic, Mexico; Schedl Coll.)

*Neodryocoetes buscki* Blackman, 1942, Proc. U.S. Nat. Mus. 92:192 (Holotype, female; Cabima, Panama; U.S. Nat. Mus., 56008); Wood, 1975, Great Basin Nat. 35:392. *Synonymy*

DIAGNOSIS.— The elevation on abdominal sternum 5 suggests a much closer relationship to *tenellus* Schedl than to other similar species having an impressed and granulate elytral declivity. The abdominal elevation and impressed declivity distinguish it from all other members of the genus.

FEMALE.— Length 1.5–1.8 mm, 2.7 times as long as wide; color yellowish brown.

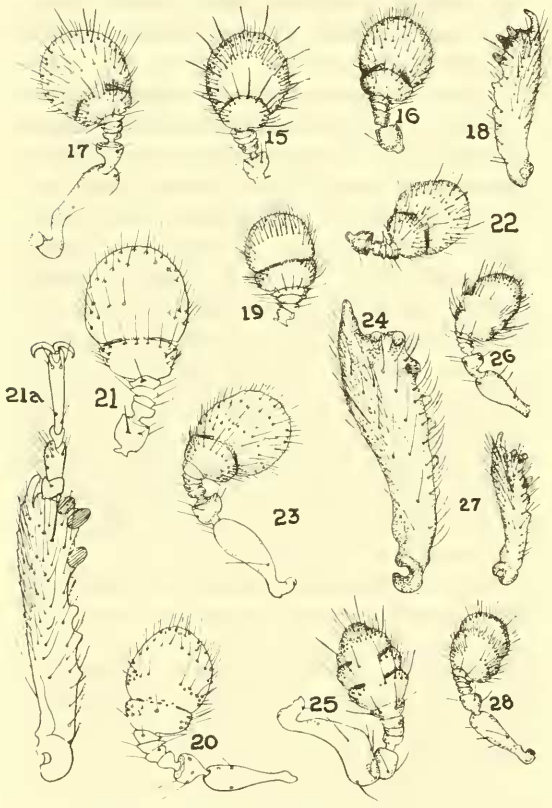



Fig. 198. *Araptus*, *Spermophthorus*, *Pityophthorus* spp., antennae and protibiae: 15, *A. eruditus*; 16, *A. teres*; 17, *A. pallidus*; 18, 20, 22, *A. schedli*; 19, *A. hymenaeae*; 21, 21a, *A. exquisitus*; 23, *A. tenuis*; 24–25, *S. caesalpiniae*; 26–27, *P. pudens*; 28, *P. robai*. (After Blackman 1942:pl. 21.)

Frons weakly convex, epistoma very slightly elevated; surface shining, punctures fine, close, rather shallow; vestiture inconspicuous, of fine, very short, moderately abundant hair. Antennal club rather small, subcircular, sutures strongly arcuate, suture 1 party septate, 2 obscure, not attaining middle of club.

Pronotum 1.15 times as long as wide; sides almost straight and parallel on basal half, broadly rounded in front; anterior margin costate, feebly serrate; summit rather indefinite, in front of middle; asperities small, confused, confined to anterior half; posterior areas smooth, shining, a few impressed points, punctures rather fine, moderately sparse, deep. Glabrous.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed except 1 near declivity, punctures moderately coarse, spaced by diameter of a puncture; interstriae smooth, shining, impunctate, about one and one-half times as wide as striae. Declivity moderately steep, sulcate; strial punctures small, almost obsolete; interstriae 1 moderately elevated, 2 impressed, 3 as high as 1, rounded, 1 and 3 each armed by a row of about four to six granules. Vestiture mostly confined to declivity, of sparse rows of fine interstrial setae except 2 glabrous, each about as long as distance between rows.

MALE.— Similar to female except frons more convex above, a feeble impression below, punctures larger, rather sparse, subglabrous.

DISTRIBUTION.— Oaxaca to Panama.

MEXICO: Chiapas: 32 km N Huixtla. Nayarit: Tepic. Oaxaca: Tuxtepec, 14-XI-37. HONDURAS: La Ceiba, Atlántida, 15-V to 28-VI-49, at light, E. C. Becker; Olanchito, Yoro, 19-V, 30-VII-49, at light, E. C. Becker. GUATEMALA: Intercepted at San Pedro, California, in logs imported from Guatemala. COSTA RICA: Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 87, tree limb, S. L. Wood; Moravia, Cartago, 11-III-64, 500 m, No. 474, log, S. L. Wood. PANAMA: Barro Colorado Island, Canal Zone, 16-IV-67, at light.

BIOLOGY.— Specimens were taken from radiate tunnels in the phloem of cut limbs and logs 15–25 cm in diameter.

NOTES.— The above treatment was based on the holotypes of *eruditus* and *buscki*, and on 56 other specimens. The holotype of

*eruditus* is a female, not a male as originally stated.

### 41. *Araptus vesculus* Wood

*Araptus vesculus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):50 (Holotype, female; Guápiles, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *exigialis* Wood by the smoother elytral surface and by the very different frons, particularly in the female.

FEMALE.— Length 1.1–1.3 mm, 2.5 times as long as wide; color very dark reddish brown.

Frons almost flat, median line above eyes weakly elevated, epistomal margin rather weakly elevated medially; surface reticulate, punctures rather coarse, close, sparsely punctured toward center; vestiture of rather sparse, very long hair. Antennal club subcircular, suture 1 moderately procurved, weakly septate, 2 obscure.

Pronotum 1.1 times as long as wide; as in *eruditus* (Schedl) except posterior areas shining, weakly reticulate, punctures fine, shallow, rather widely spaced. Almost glabrous.

Elytra 1.5 times as long as wide, 1.4 times as long as pronotum; outline as in *eruditus*; striae not impressed, punctures fine, deep, interstriae almost smooth, shining, twice as wide as striae, impressed points almost obsolete, impunctate. Declivity steep, sulcate; essentially as in *eruditus*. Vestiture as in *eruditus* except less abundant.

MALE.— Similar to female except frons more distinctly, more evenly convex, punctures coarser, more evenly distributed, almost glabrous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Guápiles, Limón, 22-VIII-66, 100 m, No. 121, vine, S. L. Wood.

BIOLOGY.— Specimens were taken from a cut vine.

NOTES.— The above treatment was based on the type series of four specimens.

### 42. *Araptus exigialis* Wood

*Araptus exigialis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):50 (Holotype, female; Ft. Clayton, Canal Zone, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *vesculus* Wood by the more abundant, more conspicuously impressed lines on the elytral disc, by the more slender form, and by the different frons in both sexes.

FEMALE.— Length 1.3–1.4 mm, 2.7 times as long as wide; color reddish brown.

Frons shallowly, broadly concave from epistoma to above upper level of eyes; surface shining, minutely, densely, uniformly punctured; vestiture of fine, very short, abundant hair, very slightly longer on margins. Antennal club as in *vesculus*.

Pronotum 1.2 times as long as wide; as in *vesculus* except posterior areas very finely, rather strongly reticulate, punctures very fine, shallow, rather sparse. Glabrous.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; as in *vesculus* except discal surface with points and fine, irregular lines.

MALE.— Similar to female except frons strongly convex, weakly impressed along upper margin of epistoma; surface reticulate, punctures rather coarse, close, shallow, vestiture fine, short, sparse, inconspicuous.

DISTRIBUTION.— Panama.

PANAMA: Ft. Clayton, Canal Zone, 22-XII-63, 30 m, No. 318, cut vine, S. L. Wood.

BIOLOGY.— Specimens were taken from radiate tunnels just below the surface of woody tissues in a cut vine.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 43. *Araptus refertus* Wood

*Araptus refertus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):51 (Holotype, female; Volcán Zunil, Guatemala, Wood Coll.)

DIAGNOSIS.— This species is distinguished from the preceding members of this genus by the much coarser strial punctures, with impunctate discal interstriae, by the rather strongly bisulcate elytral declivity, and by the frons in both sexes.

FEMALE.— Length 1.9–2.3 mm, 2.8 times as long as wide; color light brown (mature color probably dark brown).

Frons broadly, weakly convex; surface shining, smooth and impunctate on triangular area on lower, median half, finely, closely, rather deeply punctured on lateral and upper areas; vestiture of rather abundant, moderately long, fine hair. Antennal club oval, suture 1 moderately procurved, septate, not

reaching middle of club, suture 2 virtually obsolete, near apical margin.

Pronotum 1.13 times as long as wide; as in *vesculus* Wood except posterior area smooth, shining, with numerous impressed points, punctures moderately coarse, deep, close. Glabrous.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures coarse, deep, close; interstriae as wide as striae, smooth, shining, with moderately numerous impressed points, impunctate. Declivity steep, broadly, rather strongly bisulcate; strial punctures impressed, slightly smaller than on disc; interstriae 1 moderately, gradually elevated, 2 rather strongly impressed, flat, narrow at base, rather broadly expanded on middle half, 3 rather abruptly, moderately elevated, 1 and 3 each armed on basal half by about three very small, pointed, semirecumbent denticles; a few punctures on lower half. Vestiture sparse, hairlike, mostly on or near declivity.

MALE.— Similar to female except frons strongly, evenly convex; surface shining, rather coarsely, deeply, closely punctured, subglabrous except on and near epistoma; elytral declivity more strongly impressed, denticles slightly larger.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán Zunil, Quezaltenango, 27-V-64, 1000 m, No. 625, shrub, S. L. Wood.

BIOLOGY.— Specimens were taken from radiate tunnels in a Compositae shrub.

NOTES.— The above treatment was based on the type series of 18 specimens.

### 44. *Araptus trepidus* Wood

*Araptus trepidus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):51 (Holotype, female; Volcán de Agua, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the closely allied *poricollis* (Blandford) by the absence of declivital denticles and by the almost continuous transverse epistomal elevation in the male.

FEMALE.— Length 1.6–1.8 mm, 2.7 times as long as wide; color dark reddish brown.

Frons broadly flattened from epistoma to vertex, median third of lower half smooth, shining, distinctly elevated, remaining area densely, finely, deeply punctured; vestiture on punctured area abundant, fine, rather long, uniformly distributed.

Pronotum 1.15 times as long as wide; as in *refertus* Wood except median line of posterior area impunctate.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; outline and disc as in *refertus* except impressed points obscure to obsolete. Declivity steep, bisulcate; interstriae 1 abruptly, distinctly elevated, 2 rather strongly impressed, flat, wider than 1 or 3, 3 abruptly, moderately elevated, 1 and 3 finely punctured, not granulate; strial punctures small, rather obscure. Vestiture of rows of very minute strial hair, and longer, slender interstrial bristles on disc and declivity, each slightly longer than distance betwen rows, similarly spaced within a row.

MALE.— Similar to female except frons strongly convex on upper half, strongly, transversely impressed just below middle, lower margins of impressed area elevated laterally, elevations continue to a weak median subcarinate elevation dividing impression; upper area of frons coarsely, deeply punctured, vestiture sparse except for epistomal brush.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán de Agua, Esquintla, 19-V-64, 1000 m, No. 608, *Menisperma* sp., S. L. Wood.

BIOLOGY.— Specimens were taken from stems of *Menisperma* sp. less than 1 cm in diameter.

NOTES.— The above treatment was based on the type series of 58 specimens.

### 45. *Araptus poricollis* (Blandford)

*Pityophthorus poricollis* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):238. (Holotype, male; Cerro Zunil, Quezaltenango, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *frontalis* Wood by the smaller size, by the unarmed anterior margin of the pronotum, and by the presence of tubercles on the lateral margins of the declivity.

MALE.— Length 1.6 mm, 2.7 times as long as wide; color reddish brown.

Frons of type above carina largely concealed by pronotum; carina as in *frontalis*. Pronotum and elytra as in *frontalis* except lateral margin of declivity armed by three tubercles.

DISTRIBUTION.— Guatemala.

GUATEMALA: Cerro Zunil, Quezaltenango, 1300 m, G. C. Champion.

NOTES.— The above treatment was based on the holotype.

### 46. *Araptus frontalis* Wood

*Araptus frontalis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):52 (Holotype, female; Volcán Zunil, Quezaltenango, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *trepidus* Wood by the larger size, by the punctured declivital interstriae 2, and by the different frons in both sexes.

FEMALE.— Length 2.4–2.7 mm, 2.8 times as long as wide; color dark reddish brown.

Frons broadly flattened from epistoma to vertex, weakly concave on small median area above eyes, weakly convex on small, median impunctate area on lower half; surface shining, finely, closely, deeply punctured; vestiture of moderately abundant, fine, long hair. Antenna as in *trepidus*.

Pronotum 1.1 times as long as wide; essentially as in *trepidus*.

Elytral outline and disc as in *trepidus* except interstriae near declivity with punctures. Declivity about as in *trepidus* and *refertus* except interstriae 2 with a row of punctures as coarse as those of striae; lateral margins without granules. Vestiture confined to declivity, of fine, sparse hair.

MALE.— Similar to female except frons deeply, transversely concave on upper half of area below eyes on median three-fourths, lateral and lower margins of concavity strongly, acutely carinate except carina interrupted at median line, vestiture inconspicuous except on epistoma; anterior margin of pronotum rather coarsely serrate; declivity more strongly impressed.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán Zunil, Quezeltenango, 27-V-64, 1000 m, No. 626, shrub, S. L. Wood.

BIOLOGY.— Specimens were taken from radiate tunnels in the same Compositae shrub as *refertus*.

NOTES.— The above treatment was based on the type series of seven specimens.

### 47. *Araptus concentralis* (Schedl)

*Neodryocoetes concentralis* Schedl, 1951, Dusenia 2:107 (Holotype, male; Mexico; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *macer* (Bright) by the larger size, by the smaller antennal club, with sutures less strongly arcuate, and by the less abundant, shorter vestiture on the female frons.

FEMALE.— Length 1.3–1.7 mm, 2.7 times as long as wide; color very dark brown.

Frons rather broadly flattened from epistoma to well above eyes, ascending toward epistomal margin, very weakly convex above eyes; surface shining, closely, deeply, rather finely punctured, much closer on upper half; vestiture of moderately abundant, very fine, moderately short hair in central area, longer at margins. Antennal club small, circular, sutures rather weakly arcuate, 1 septate, 2 and 3 marked by weak aseptate grooves.

Pronotum 1.15 times as long as wide; sides almost straight and parallel on basal half, rather broadly rounded in front; anterior margin a finely serrate costa; summit at middle; anterior slope (excluding anterior margin) armed by four concentric rows of basally fused asperities, a partial fifth row at summit; posterior areas smooth, shining, with numerous impressed points, rather fine, deep, moderately coarse. Posterior half glabrous.

Elytra 1.6 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; striae not impressed except 1 weakly, punctures small, deep, close; interstriae twice as wide as striae, almost smooth, a few impressed lines and obscure points, impunctate. Declivity steep, weakly bisulcate; striae as on disc, 1 narrowly impressed; interstriae 1 weakly elevated, 2 weakly impressed, gradually ascending to rounded 3; 1 and 3 each with a row of fine, rounded granules. Vestiture confined to declivity and sides, of sparse, fine, short, strial hair.

MALE.— Similar to female except frons moderately, transversely impressed on lower half, punctures coarse, deep, not as close, vestiture sparse, short, inconspicuous.

DISTRIBUTION.— Jalisco to Oaxaca.

MEXICO: **Jalisco**: 16 km W Tizapán, 18-VII-53, shrub. **Oaxaca**: 6 km N Totolapan, 20-VI-67, 1100 m, No. 69, small tree. **Puebla**: 16 km S Matamoros, 14-VI-67, 1600 m, No. 37, shrub. All were taken by me.

BIOLOGY.— Specimens were taken from radiate tunnels in twigs and branches of a small shrubby tree, possibly a Compositae.

NOTES.— The above treatment was based on the holotype and on 58 other specimens.

### 48. *Araptus macer* (Bright)

*Neodryocoetes macer* Bright, 1972, Canadian Ent. 104:1666 (Holotype, female; 8 km or 5 miles S San Andrés Tuxtla, Veracruz, Mexico; Canadian Nat. Coll., 12623)

*Neodryocoetes tuberculatus* Bright, 1972, Canadian Ent. 104:1665 (Holotype, female; Lake Catemaco, Veracruz, Mexico; Canadian Nat. Coll., 12622); Wood, 1973, Great Basin Nat. 33:173. *Synonymy*

DIAGNOSIS.— This species is distinguished from *concentralis* (Schedl) by the smaller size, by the larger antennal club, with suture 1 strongly, angulately procurved, and by the longer, dense frontal vestiture of the female.

FEMALE.— Length 1.2–1.4 mm, 2.5 times as long as wide; color light brown.

Frons flat from epistoma to vertex, partly impunctate (concealed by hair), marginal areas densely, very finely punctate except median line above; vestiture at margins dense, very long, incurved. Antennal club rather large, oval, suture 1 strongly procurved, others not indicated.

Pronotum as in *concentralis* except punctures on posterior areas much finer.

Elytra as in *concentralis* except punctures of discal striae not as close, in slightly irregular rows; granules on elytral declivity less numerous, larger, pointed; interstrial setae short, spatulate.

MALE.— Similar to female except frons rather strongly convex except lower third rather strongly, transversely impressed, surface smooth, shining, punctures fine, close, vestiture sparse, inconspicuous.

DISTRIBUTION.— Veracruz to Honduras.

MEXICO: **Veracruz**: Bright (1972:1665–1666) lists Ejipantla, Lago Catemaco, and San Andrés Tuxtla. HONDURAS: La Ceiba, Atlántida, 20-V and 1-VI-49, at light, E. C. Becker.

NOTES.— The above treatment was based on 2 paratypes of *macer*, 2 paratypes of *tuberculatus*, and on 10 other specimens. The holotypes of both were also examined.

### 49. *Araptus nigrellus* Wood

*Araptus nigrellus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):52 (Holotype, female; 10 km SE Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This and the following three species form a distinctive transitional group between *Araptus* and species previously placed in *Sphenoceros* Schedl. They have a large antennal club, with finely marked, strongly procurved sutures, the costal apex of the elytra ascends slightly, the declivity is convex, and the elytral vestiture tends to be confined to the declivity, closely spaced, and more or less scalelike. This species is distinguished from others in the group by the more slender body, by the slender interstrial bristles, and by the subglabrous female frons.

FEMALE.— Length 1.7–2.0 mm, 2.7 times as long as wide; color black.

Frons convex, a weak, transverse impression above epistoma; surface strongly reticulate-subgranulate above eyes, almost smooth and with a few small punctures below. Antennal club rather large, oval, sutures strongly arcuate, 1 septate.

Pronotum 1.1 times as long as wide; widest on basal third, sides moderately arcuate, converging toward narrowly rounded serrate anterior margin; summit at middle; asperities moderately coarse, confused; posterior areas shining, partly subreticulate, with low, longitudinal subasperate crenulations continuing almost to base, punctures obscure, associated with crenulations. Glabrous.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; sides straight and parallel on slightly less than basal two-thirds, tapered then rather broadly rounded behind; striae not impressed except 1 weakly, punctures small, deep, spaced within row by diameter of a puncture; interstriae four times as wide as striae, almost smooth, with obscure, minute points, impunctate. Declivity moderately steep, convex; striae obscurely impressed, punctures smaller and less distinct than on disc; interstriae each with a row of very fine granules. Vestiture confined to declivity, of rows of narrowly spatulate interstrial bristles, each bristle as long as distance between rows, more closely spaced within a row.

MALE.— Similar to female in all respects.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 10 km SE Cartago, Cartago, 3-VII-63, Nos. 13, 15, 24-IX-63, No. 205, 1800 m, *Myrica pubescens*, S. L. Wood.

BIOLOGY.— This locally common species was taken from radiate tunnels in the cambium region of limbs and boles of recently cut trees.

NOTES.— The above treatment was based on the type series of 69 specimens.

### 50. *Araptus vinnulus* Wood

*Araptus vinnulus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):53 (Holotype, female; San Ignacio de Acosta, San José, Costa Rica, Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nigrellus* Wood by the smaller size, by the stouter form, by the more widely spaced, stouter interstrial bristles, by the almost obsolete strial punctures, and by the frons.

FEMALE.— Length 1.2–1.5 mm, 2.4 times as long as wide; color very dark brown, almost black.

Frons broadly convex, lower third with broad, smooth, shining, median line; surface densely, coarsely, deeply punctured; upper two-thirds on median two-thirds with moderately abundant, fine, long hair. Antenna essentially as in *nigrellus*.

Pronotum 1.03 times as long as wide; as in *nigrellus* except less strongly tapered anteriorly, moderately rounded in front, posterior areas dull. Glabrous.

Elytra 1.44 times as long as wide, 1.44 times as long as pronotum; sides straight and parallel on basal half, tapered then rather narrowly rounded behind; striae not impressed, punctures minute, shallow, many almost obsolete; interstriae shining, with many very minute impressed points and shallow, irregular lines, impunctate. Declivity rather steep, convex; as on disc except interstriae each with a row of small, rounded granules. Vestiture confined to declivity, of rather stout, spatulate bristles, each slightly shorter than distance between rows, similarly spaced within a row.

MALE.— Similar to female except frons rather strongly convex, surface strongly reticulate, subglabrous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: San Ignacio de Acosta, San José, 5-VII-63, 1500 m, No. 31, *Roupala complicata*, S. L. Wood.

BIOLOGY.— Specimens were taken from radiate tunnels in the cambium region of branches 2 cm in diameter.

NOTES.— The above treatment was based on the type series of 20 specimens.

### 51. *Araptus furvus* Wood

*Araptus furvus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):53 (Holotype, female; Cerro Punta, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *vinnulus* Wood by the larger size, by the more closely spaced interstrial setae, by the presence of strial hair, and by the longer, more abundant setae on the female frons.

FEMALE.— Length 1.7–2.2 mm, 2.4 times as long as wide; color almost black.

Frons convex, strongly reticulate, punctures rather small, sparse; upper two-thirds with rather dense marginal fringe of long hair, longest setae on vertex extend about two-thirds distance to epistomal margin; distance from upper level of eyes to vertex equal to 1.2 times distance from epistoma to upper level of eyes. Antenna as in *vinnulus*.

Pronotum 1.03 times as long as wide; as in *vinnulus* except more distinctly constricted on anterior half.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; as in *vinnulus* except strial punctures on basal half of disc more distinct; declivital strial punctures obsolete. Vestiture confined to declivity, of rows of minute, fine, strial hair, and rows of longer, spatulate, interstrial bristles, each bristle slightly shorter than distance between rows, more closely spaced within a row, each bristle very slender on its basal half, flattened on its apical half.

MALE.— Similar to female except frons broadly convex, glabrous.

DISTRIBUTION.— Panama.

PANAMA: Cerro Punta (Volcán Chiriquí), Chiriquí, 11-I-64, 1800 m, No. 422, *Roupala* limbs, S. L. Wood.

BIOLOGY.— Specimens were taken from longitudinal galleries in the phloem of broken tree limbs. One or rarely two females were associated with each male. Larval mines were entirely within the phloem and did not show on the surface of peeled bark.

NOTES.— The above treatment was based on the type series of 47 specimens.

### 52. *Araptus furvescens* Wood

*Araptus furvescens* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):53 (Holotype, female; Volcán Pacaya, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *furvus* Wood by the smaller average size, by the feebly impressed declivital striae, with minute strial punctures indicated, and by the longer female frontal pubescence, with pubescent area extending higher on the vertex.

FEMALE.— Length 1.5–1.9 mm; as in *furvus* Wood except female frontal pubescent area extending higher on vertex, distance from upper level of eyes to upper limits of pubescent area 1.5 times distance from epistoma to upper level of eyes, longest setae on vertex almost reaching epistomal margin, pubescent area extending ventrad in lateral areas almost to epistoma; declivital striae weakly impressed, punctures very small but usually visible; declivital interstrial bristles more nearly scalelike, each flattened on two-thirds or more of its length.

MALE.— Similar to female except frons more broadly convex, glabrous.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán Pacaya, Esquintla, 1-VI-64, 1300 m, No. 652, *Roupala*, S. L. Wood.

BIOLOGY.— As in *furvus*.

NOTES.— The above treatment was based on the type series of 42 specimens.

## 53. *Araptus lepidus* Wood

*Araptus lepidus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):54 (Holotype, female; Volcán Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the above three species in this group by the presence of discal interstrial punctures and by the stouter body form. It is distinguished from *aztecus* Wood by the narrowly rounded, serrate anterior margin of the female pronotum and by the very different female frons.

FEMALE.— Length 1.7–2.0 mm, 2.26 times as long as wide; color dark brown.

Frons convex, median area strongly impressed from slightly above upper level of eyes to just above epistoma, lower lateral margins of impressed area moderately elevated; surface shining, smooth, punctures rather fine, deep, sparse; glabrous except near epistoma. Antennal club very large, about as in *nigrellus* Wood, only median half of suture 1 septate.

Pronotum 1.05 times as long as wide; essentially as in *vinnulus* Wood, except crenulations on ridges on posterior half almost obsolete, posterior areas smooth, shining, punctures very small, shallow, rather sparse. Glabrous.

Elytra 1.3 times as long as wide, 1.2 times as long as pronotum; sides almost straight and parallel on basal half, rather broadly rounded behind; striae not impressed, punctures small, shallow, rows irregular on anterior two-thirds; interstriae smooth, shining, about four times as wide as striae, punctures uniseriate, similar to those of straie. Declivity steep, convex; sculpture essentially as on disc except punctures slightly smaller, deeper. Vestiture largely confined to posterior half, consisting of interstrial rows of slender scalelike bristles, each slightly shorter than distance between rows, similarly spaced within a row.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcan, Puntarenas, 11-XII-63, 1000 m, No. 304, tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from the phloem of a broken branch.

NOTES.— The above treatment was based on the type series of four female specimens.

## 54. *Araptus aztecus* (Wood)

*Sphenoceros aztecus* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):54 (Holotype, female; 6 km W Tepic, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *lepidus* Wood by the larger average size, by the acutely angulate anterior margin of the female pronotum, by the very different female frons, and by the confused punctures on the elytral disc.

FEMALE.— Length 1.8–2.2 mm, about 2.1 times as long as wide; color very dark reddish brown.

Frons broadly flattened from vertex to slightly below upper level of eyes, a thick, low, transverse elevation between flattened area and emarginate epistoma, its ends elevated to form a pair of rather strong tubercles; flattened area almost smooth, subshining, very minutely, densely punctured; margin of upper half of flattened area ornamented by a row of very long hair (except on median line), longest setae reaching epistoma. Antenna as in *lepidus*.

Pronotum 1.1 times as long as wide; triangular, anterior angle acutely acuminate; widest near base, basal half of sides rather weakly arcuate; asperities rather coarse, confused; posterior areas as in *lepidus*. Glabrous.

Elytra as in *lepidus* except discal punctures slightly more confused, declivital striae 1 impressed, punctures in rows. Vestiture as in *lepidus*.

MALE.— Similar to female except frons convex, rather coarsely punctured, median line slightly raised; pronotum as in female *lepidus*.

DISTRIBUTION.— Nayarit and San Luis Potosí.

MEXICO: Nayarit: San Blas, 12-VII-65, 70 m, No. 235, sapling, S. L. Wood; 6 km W Tepic, 13-VII-65, 1000 m, No. 240, limbs, S. L. Wood. San Luis Potosí: El Salto, 19-VI-53, *Ficus* (accidental?), S. L. Wood.

BIOLOGY.— This monogamous species constructs transverse, biramous tunnels in the cambium region of cut or unthrifty host material. Larval mines are longitudinal and entirely in the phloem. One dead female specimen was taken from an abandoned *Corthylus* gallery, in *Ficus*, where it had apparently found temporary refuge.

NOTES.— The above treatment was based on the type series of 11 specimens and on 18 other specimens.

## GENUS *CONOPHTHOCRANULUS* SCHEDL

*Conophthocranulus* Schedl, 1935, Rev. de Ent. 5:343 (Type-species: *Conophthocranulus blackmani* Schedl, monobasic)

The status of this genus is uncertain. Of the seven species subsequently assigned to it by Schedl, none are related in even a remote sense to the type-species. An examination of the type suggested that *blackmani* Schedl is nothing more than a very large *Pityophthorus* allied to *crotonis* Wood.

### *Conophthocranulus blackmani* Schedl

*Conophthocranulus blackmani* Schedl, 1935, Rev. de Ent. 5:344 (Holotype, female; Turrialba, Cartago, Costa Rica; Schedl Coll.)

DIAGNOSIS.— The large size and the shape of the pronotum distinguish this species from all other *Pityophthorus*-like species.

FEMALE.— Length 3.3 mm, 2.2 times as long as wide; color dark reddish brown.

Frons concealed on holotype, lower area flattened and with rather short, moderately abundant pubescence at least to level of antennal insertion. Antennae missing except for left scape.

Pronotum 0.98 times as long as wide; widest one-fourth of length from base; sides rather strongly arcuate on basal two-fifths, strongly converging on anterior three-fifths to rather narrowly rounded anterior margin; anterior margin costate, weakly serrate; summit broad, one-third pronotum length from base; anterior slope closely, rather finely asperate to summit, low asperities continued to base laterally almost to summit; posterior surfaces somewhat reticulate, with a few impressed points; pronotum rather similar to *Conophthorus*. Short, stout setae in asperate area sparse, inconspicuous.

Elytra 1.3 times as long as wide, 1.35 times as long as pronotum; sides feebly arcuate and subparallel on basal three-fourths, rather abruptly rounded behind, then rather shallowly emarginate on median fourth; disc occupying slightly more than basal half; discal punctures moderately fine, rather deep, surface shining, irregular, weakly subcrenulate; moderately abundant impressed points present. Declivity broadly sulcate much as in *Ips*, but lateral margins abruptly rounded, unarmed; posterolateral margins strongly, acutely elevated from striae 2 to about interstriae 7; face of impressed area with strial punctures indicated, interstriae 2 distinctly impressed; interstrial punctures less clearly impressed, minute granules on 3. Glabrous.

Tibiae typical of *Pityophthorus*.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Turrialba, 800 m, SLG. Schild.

NOTES.— The above treatment was based on the holotype. It appears to be allied to *Pityophthorus crotonis* Wood from Venezuela.

## GENUS *SPERMOPHTHORUS* DA COSTA LIMA

Fig. 198

*Spermophthorus* da Costa Lima, 1929, Suppl. Mem. Inst. Oswaldo Cruz 8:111 (Type-species: *Spermophthorus apuleiae* da Costa Lima, monobasic)

DIAGNOSIS.— This genus closely resembles certain seed infesting *Araptus* except that the small antennal club has sutures 1 and 2 partly septate as in many neotropical *Pityophthorus*.

The tibiae are broader and bear more denticles than in *Pityophthorus*, the pronotum also lacks a definite summit, and the transition from the asperate to the punctured areas is gradual.

DESCRIPTION.— Length 1.4–1.8 mm, 2.4 times as long as wide; color reddish brown to dark brown.

Frons dimorphic, male variously excavated, female convex, vestiture inconspicuous. Antennal scape elongate; funicle 5-segmented; club small, largely glabrous, sutures 1 and 2 almost straight, both partly septate at sides. Pronotum without a definite summit, finely asperate anteriorly, transition from asperate to punctured areas gradual. Elytra striate, conservatively sculptured. Tibiae moderately stout, lateral margin armed by denticles on more than apical half.

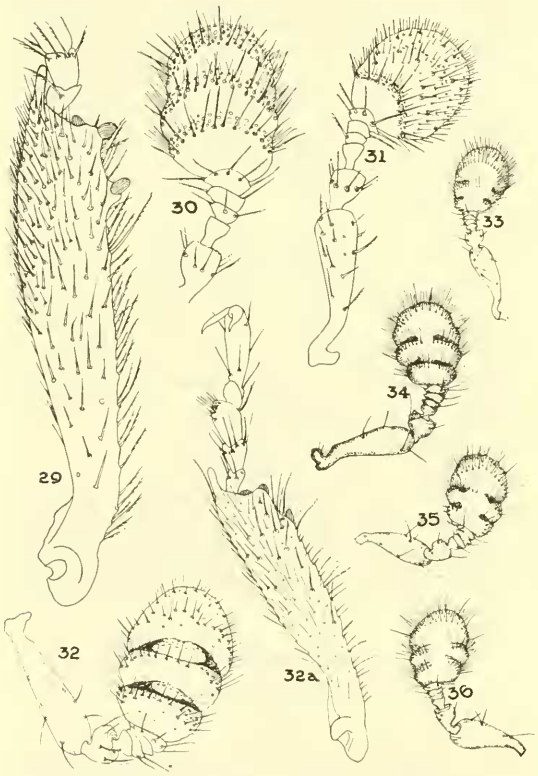



Fig. 199. *Pityophthorus*, *Pityoborus*, *Gnatholeptus* spp., antennae and protibiae: 29–30, *Pityophthorus deleoni*, male, 31, same, female; 32, 32a, *Pityoborus secundus*; 33, *Pityophthorus regularis*; 34, *Pityophthorus costalimai*; 35, *Gnatholeptus subcribratus*; 36, *Gnatholeptus shannoni*. (After Blackman 1942:pl. 22.)

DISTRIBUTION.— Costa Rica and S South America; three species are known, one from Costa Rica.

BIOLOGY.— Two species breed in seeds, one evidently in a gall.

### *Spermophthorus aberrans* Wood

*Spermophthorus aberrans* Wood, 1968, Great Basin Nat. 28:11 (Holotype, male; 6 km S San Vito, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from both South American species by the reduced size of the head, by the general contour and sculpture of the pronotum and elytra, and by the very different frons in both sexes.

MALE.— Length 1.4–1.7 mm, 2.4 times as long as wide; color dark brown.

Frons above upper level of eyes convex, with a low median elevation; rather abruptly, strongly, broadly impressed at upper level of eyes, subconcave area extending from eye to eye to epistomal margin; center of impressed area bearing a pointed tubercle; central part of each ventrolateral fourth of impressed area armed by a large, rounded, strongly developed process about twice as high as its basal width, directed cephalad and very slightly mesad; entire surface dull, above upper level of eyes also clearly reticulate and finely punctured; vestiture inconspicuous.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on basal half, then rather abruptly rounded and continued straight to very narrow, narrowly rounded anterior margin; anterior margin a continuous, unbroken elevated costa, one pair of low teeth at its ends; dorsal profile a continuous, gradual arch from anterior to posterior margins; isolated, small, crenulate asperities extend to basal margin, surface between asperities irregular, apparently with obscure, coarse reticulation. Vestiture consisting of moderately abundant, erect, slender scales.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal half, then converging gradually to narrowly rounded posterior margin; striae 1 feebly, others not impressed, punctures small, shallow, not close or clearly evident; interstriae perhaps three times as wide as striae, very irregular, minutely rather densely punctured, with median row of small,

subvulcanate, squamiferous punctures. Declivity convex, rather steep; striae weakly impressed, punctures more distinct; interstriae 2 strongly narrowed, abruptly, strongly impressed, obsolete before apex; interstrial tubercles slightly larger. Vestiture consisting of interstrial rows of rather slender, erect scales.

FEMALE.— Similar to male except frons weakly, uniformly convex to epistoma, median elevation continued to epistomal margin, with central tubercle minute, lateral tubercles minute but evident.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 6 km S San Vito, Puntarenas, 19–21-III-67, C. Valencio.

BIOLOGY.— Specimens were taken from a pear-shaped gall (3.5 by 4.5 cm) that was picked up on the forest floor.

NOTES.— The above treatment was based on the type series of 32 specimens.

## GENUS *PSEUDOPITYOPHTHORUS* SWAINE

*Pseudopityophthorus* Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):93 (Type-species: *Crypturgus minutissimus* Zimmermann, original designation)

DIAGNOSIS.— This genus is distinguished from *Pityophthorus* Eichhoff by the strongly reduced or absent striae, by the more abundant elytral vestiture, by the tuberculate posterior face of the protibiae, by the pubescent frons forming a male character, and by the distinctive biological characters.

DESCRIPTION.— Length 1.2–2.6 mm, 2.6–3.1 times as long as wide; color medium brown to almost black; vestiture hairlike to scalelike; rather abundant.

Frons usually dimorphic, convex to shallowly concave in either sex, abundant frontal vestiture a male character, in a few species females similarly pubescent, most females subglabrous. Antennal scape elongate; funicle 5-segmented; club moderately large, sutures 1 and 2 partly septate, rather weakly to strongly arcuate. Elytral striae weak to obsolete, surface punctures on disc usually small, confused, abundant; declivity simple, steep, usually convex, very conservatively sculptured. Anterior tibiae tuberculate on posterior face.

DISTRIBUTION.— Oregon and Quebec to Colombia; 22 species are known; 21 occur in North and Central America, and one is from Colombia.

BIOLOGY.— All species except *fagi* occur in *Quercus*, although several are capable of breeding in other hosts. Cut, broken, or unthrifty branches, limbs, or boles are selected for attack. In all species an entrance tunnel and a short longitudinal tunnel are formed in the cambium region by the male; he may also begin two transverse egg tunnels near the middle of the longitudinal gallery. He is normally joined by two females that extend the straight, transverse egg galleries. The larval mines are longitudinal and are entirely in the phloem, although they usually show on the inner surface of peeled bark. In an area where several species occur on the same host tree, each beetle species usually confines its attacks to a particular part of the host, such as small branches, large limbs, or bole. Where only one species occurs on a host, it usually infests all areas of the tree.

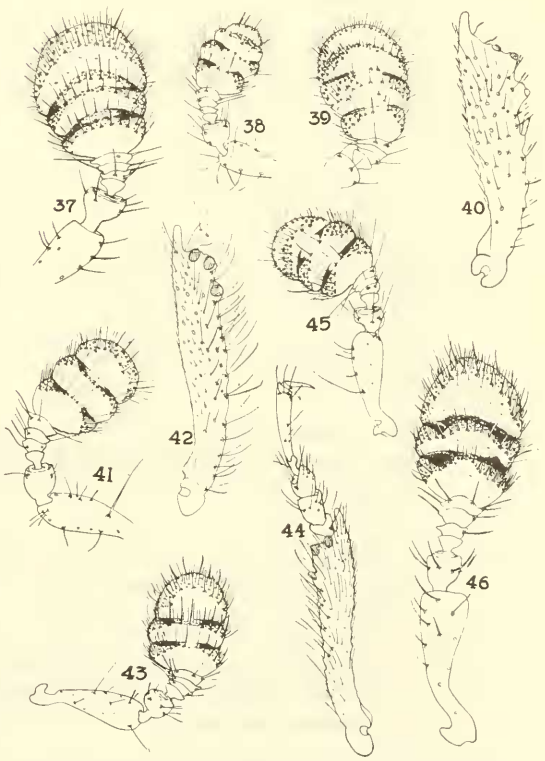



Fig. 200. *Pityophthorus* spp., antennae and protibiae: 37, *leiophyllae*; 38, *sambuci*; 39–40, *alni*; 41–42, *subopacus*; 43–44, *ciliatus*; 45, *nocturnus*; 46, *rudis*. (After Blackman 1942:pl. 23.)

Key to the Species of *Pseudopityophthorus*

1. Body more slender, more than 2.8 times as long as wide (except 2.7 in *hispidus*, *virilis*, *declivis*); strial punctures usually reduced in size, in definite rows, if rows obscure then elytral pubescence in definite rows of shorter strial and longer interstrial setae, setae hairlike or nearly so; elytral declivity sometimes with granules; sutures of antennal club weakly to moderately arcuate; mostly smaller species ..... 2

– Body stouter, less than 2.8 times as long as wide; elytral punctures confused on disc, vestiture of uniform length, not in rows, usually almost scalelike; elytral declivity never with granules; sutures of antennal club moderately to strongly arcuate; mostly larger species ..... 14

2(1). Elytral declivity with either definite rows of strial punctures or with rows of conspicuous granules on interstriae 1–3 ..... 3

– Elytral declivity entirely devoid of granules (feeble granules on 1 and 3 in *hondurensis*), punctures either obsolete or strongly confused ..... 8

3(2). Elytral declivity moderately to strongly flattened (except *hispidus*), interstriae 1 moderately elevated, punctures on striae 1 and 2 distinctly impressed, frontal hair a male character ..... 4

– Elytral declivity convex to feebly impressed, punctures obsolete, interstriae 1–3 armed by rows of small granules; both sexes similarly ornamented by frontal hair ..... 6

4(3). Pronotal disc longitudinally rugose from summit to basal margin; elytral declivity narrowly convex, discal and declivital punctures very coarse for this genus; elytral vestiture unusually long for this genus, coarse; Valle de Mexico; 2.0 mm ..... 1. ***hispidus*** **Eggers**

– Pronotal disc smooth, finely punctured; elytral declivity rather strongly impressed; elytral vestiture hairlike ..... 5

5(4). Elytral declivity more gradual, with punctures on striae 1 and 2 and with rows of granules on interstriae 1 and 3, 2 weakly impressed and unarmed; Colombia; 1.3–1.5 mm ..... ***colombianus*** **Wood**

– Elytral declivity subvertical, striae 1 and 2 punctured, interstriae unarmed; Nayarit to Chiapas; 1.8 mm ..... 2. ***declivis*** **Wood**

6(3). Interstrial bristles slender, shorter, spaced by one to two times length of a bristle; pronotal punctures averaging twice as large as those on elytral disc; frontal vestiture slightly less abundant in both sexes; Arizona; 1.3–1.7 mm ..... 3. ***granulatus*** **Blackman**

– Interstrial bristles stout, longer, spaced within a row by distances less than length of a bristle; pronotal punctures fine, not larger than those on elytral disc; frontal vestiture slightly more abundant in both sexes ..... 7

7(6). Stout, longer interstrial and fine, short, hairlike strial setae on declivity in definite rows; declivital granules larger, equally developed on interstriae 1–3; Chiapas to Honduras (see also 5. ***denticulus*** **Wood**); 1.6–2.0 mm ..... 4. ***granulifer*** **Wood**

– Strial and interstrial setae on declivity stout, almost scalelike, largely confused; declivital granules smaller, of reduced size or entirely obsolete on interstriae 2; Hidalgo to Veracruz; 1.3–1.6 mm ..... 6. ***virilis*** **Wood**

8(2). Pronotum at least 1.25 times as long as wide; antennal club at least 1.5 times as long as scape; elytral disc subglabrous on basal half, posteriorly strial setae less than one-fourth as long as fine interstrial bristles ..... 9

— Pronotum less than 1.2 times as long as wide; antennal club less than 1.2 times as long as scape; elytral disc pubescent, strial setae at least two-thirds as long as coarser interstrial bristles ..... 12

9(8). Male and female frons subglabrous, female frons with no indication of a median carina; Maine and New York to E Texas and Florida; 1.2–1.4 mm ..... 7. ***asperulus*** **(LeConte)**

— Male frons bearing a rather sparse tuft of long yellow hair, female frons glabrous or pubescent ..... 10

10(9). Female frons pubescent as in male; declivital interstriae 1 and 3 each with two or three minute granules, 2 feebly impressed; Chiapas to Honduras; 1.2–1.6 mm (see also 9. ***cincinnatus*** **Blandford)** ..... 8. ***hondurensis*** **Wood**

— Female frons glabrous; declivity convex, with no indication of granules ..... 11

11(9). Female frons transversely impressed, coarsely, rather closely punctured; interstrial bristles longer than distance between rows; Veracruz to Chiapas; 1.3–1.6 mm ..... 10. ***singularis*** **Wood**

— Female frons flattened, a short median carina just below upper level of eyes; interstrial bristles half as long as distance between rows; Hidalgo and Veracruz to Chiapas; 1.2–1.4 mm ..... 11. ***tenuis*** **Wood**

12(8). Interstrial setae two to four times as long as distance between rows; all discal setae hairlike, ground vestiture on declivity scalelike; male frons shallowly concave; Virginia and North Carolina; 1.8–2.0 mm ..... 12. ***pubescens*** **Blackman**

— Interstrial setae shorter than distance between rows; all elytral setae hairlike; male frons flat ..... 13

13(12). Punctures on pronotal disc moderately fine; elytral declivity narrowly, strongly convex; Pennsylvania to West Virginia; *Fagus*; 1.4–1.5 mm ..... 13. ***fagi*** **Blackman**

— Punctures on pronotal disc very fine; elytral declivity more broadly convex, less strongly arched; California to Arizona; 1.5–1.9 mm ..... 14. ***agrifoliae*** **Blackman**

14(1). Elytral vestiture fine, short, hairlike; elytral declivity convex, smooth, shining, devoid of punctures and vestiture (recently emerged specimens sometimes with declivital scales); Durango and Hidalgo to Oaxaca; 2.0–2.5 mm ..... 15. ***limbatus*** **Eggers**

— Elytral vestiture rather coarse, not reduced on declivity; confused declivital punctures evident ..... 15

15(14). Smaller; pronotal disc finely reticulate; elytral punctures minute; elytral vestiture rather fine, short, of uniform proportions on disc and declivity; frons strongly reticulate, planoconcave to upper level of eyes; Maine and Minnesota to Louisiana and Florida; 1.5–1.8 mm ..... 16. ***minutissimus*** **(Zimmermann)**

— Larger; pronotal disc never reticulate, smooth (except coarsely reticulate in *squamosus*); elytral punctures moderately fine to rather coarse; elytral vestiture rather coarse, ground vestiture more nearly scalelike on declivity (except *comosus*) ..... 16

16(15). Pronotum strongly reticulate; elytral vestiture on disc of minute, fine hair, usually abraded, on declivity of abundant small scales, if scales abraded surface densely, finely punctured; antennal club small for this genus, sutures almost straight; Durango to Sinaloa; 2.1–2.4 mm ..... 18. ***squamosus*** **Bright**

– Pronotum smooth, shining; antennal club larger, sutures moderately to strongly arcuate ..... 17

17(16). Elytral ground vestiture hairlike on disc and declivity; posterior half of elytra with rows of erect slender bristles, each bristle only slightly longer than ground vestiture; male frons glabrous on central half, with a rather dense row of long, dark hair on margins; female frons with rather abundant, moderately short hair except glabrous on median fourth, longest on lower half; Oaxaca; 2.2–2.4 mm .. ..... 17. ***comosus*** **Bright**

– Elytral setae stout, subplumose to scalelike ..... 18

18(17). Declivital ground vestiture subplumose, stout, scalelike; elongate setae, if present, stout, blunt, rarely more than twice as long as ground cover ..... 19

– Declivital ground vestiture rather strongly plumose, elongate setae slender, almost hairlike, pointed, some at least four times as long as ground cover ..... 21

19(18). Discal vestiture uniformly short, declivital vestiture either similar or setae in position of interstriae 1 and 3 sometimes erect, slightly longer; New York and Michigan to Florida and Honduras; 1.5–2.4 mm ..... 19. ***pruinosus*** **(Eichhoff)**

– Setae on some discal and declivital interstriae conspicuously longer and stouter than setae in ground cover ..... 20

20(19). Erect scales on all interstriae of disc and all except 2 on declivity, each scale about six to eight times as long as wide; male frons broadly flattened, with no indication of a callus; Sinaloa; 1.6–1.8 mm ..... 20. ***festivus*** **Wood**

– Erect scales on alternate odd-numbered interstriae of disc and declivity, each scale more than ten times as long as wide, some pointed on sides and near base of disc; male frons transversely impressed, a distinct median callus well above upper level of eyes; Arizona to Chiapas; 1.8–2.2 mm ..... 21. ***opacicollis*** **Blackman**

21(18). Elongate elytral setae stout, less abundant, absent on declivital interstriae 2; pronotal disc usually with minute, sparse hair over entire surface (often abraded); Washington to California; 1.7–2.5 mm ..... 22. ***pubipennis*** **(LeConte)**

– Elongate elytral setae hairlike, more abundant, on all declivital interstriae; pronotal disc glabrous except at margins; Arizona to Chihuahua; 1.7–2.6 mm ... ..... 23. ***yavapaii*** **Blackman**

### 1. *Pseudopityophthorus hispidus* Eggers

*Pseudopityophthorus hispidus* Eggers, 1931, Ent. Blätt. 26:170 (Holotype, female; Valle de Mexico, Mexico; Berlin Mus.)

DIAGNOSIS.— This unique species is distinguished from all others in the genus by the more rugose pronotal disc, by the coarser elytral punctures, and by the stout, very long elytral vestiture.

FEMALE.— Length 2.0 mm, 2.7 times as long as wide; color brown, pubescence pale.

Frons broadly convex, surface shining, feebly subaciculate; vestiture fine, short, sparse. Antennal club apparently typical of genus.

Pronotum 1.1 times as long as wide; widest near middle, sides weakly arcuate on slightly more than basal half, rather narrowly rounded in front; anterior margin armed by 16 coarse serrations, median ones distinctly larger; summit at middle; anterior slope armed by closely set, small asperities; posterior area subgranulate, with fine, irregular, longitudinal rugosities from summit to basal margin. Vestiture moderately abundant, of delicate, coarse, moderately long hair.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal two-thirds, rather narrowly rounded behind; discal surface shining, with moderately abundant impressed points, punctures confused, moderately coarse (very coarse for this genus). Declivity rather steep, narrowly convex; declivital punctures in strial rows, interstriae twice as wide as striae, with very sparse interstrial punctures. Vestiture of rather abundant, long, stout but delicate setae, and slightly longer, coarser rows of interstrial setae on posterior half of elytra on interstriae 1, 3, 5, and 7, these setae about two-thirds as long as distance between alternate rows.

DISTRIBUTION.— Presumably Mexico or the Distrito Federal.

Only the type specimen is known; it is labeled "R.d.M. Mexico" but was published by Eggers as "Valle de Mexico, Mex."

NOTES.— The above treatment was based on the holotype.

### 2. *Pseudopityophthorus declivis* Wood

*Pseudopityophthorus declivis* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):50 (Holotype, female; Laguna Santa María, Nayarit, Mexico, Wood Coll.)

*Pseudopityophthorus truncatus* Bright, 1972, Canadian Ent. 104:1673 (Holotype, male; 184 km S Oaxaca, Oaxaca, Mexico; Canadian Nat. Coll.); Wood, 1973, Great Basin Nat. 33:184. *Synonymy*

*Pseudopityophthorus curtus* Bright, 1972, Canadian Ent. 104:1674 (Holotype, female; 13 km or 8 miles N Ocosingo, Chiapas, Mexico, 2-VI-69, *Quercus*, D. E. Bright; Canadian Nat. Coll., 12634); Wood, 1973, Great Basin Nat. 33:184. *Synonymy*

DIAGNOSIS.— This species is distinguished by the rather strongly impressed subvertical declivity, on which the rather coarse punctures of striae 1 and 2 are clearly impressed, and by the hairlike vestiture.

FEMALE.— Length 1.8 mm, 2.6 times as long as wide; color very dark brown.

Frons broadly convex above eyes, almost flat below, with epistomal area weakly elevated; surface very coarsely, deeply punctured above and at sides, almost impunctate in median area below; vestiture rather sparse except on epistoma, of fine, long hair. Antennal club moderately large, widest through segment 3.

Pronotum 1.1 times as long as wide; widest near base, sides feebly arcuate and converging very slightly on basal two-thirds, rather broadly rounded in front; anterior margin armed by a continuous, elevated, serrate costa, summit at middle; anterior area rather finely asperate; posterior area rather coarsely, deeply, closely punctured, general surface subreticulate. Subglabrous.

Elytra 1.6 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly bisinuate behind; striae not impressed, punctures rather fine (coarse for this genus), deep; interstriae three times as wide as striae, with very fine, irregular lines, numerous impressed points, impunctate. Declivity subvertical, flattened, confined to less than posterior fifth; striae 1–3 clearly indicated, punctures shallow; surface almost flat except for strongly elevated interstriae 1; very fine punctures on all interstriae except 2. Vestiture confined to posterior third, of very minute strial hair, and rows of erect, moderately long, interstrial bristles of uniform length.

DISTRIBUTION.— Nayarit.

MEXICO: **Chiapas**: 13 km or 8 miles N Ocosingo, 2-VI-69, *Quercus*, D. E. Bright. **Jalisco**: 60 km E Guadalajara, 22-IV-77, *Quercus*, M. M. Furniss. **Nayarit**: Laguna Santa María, 6-VII-65, 1000 m, No. 203 *Quercus*, S. L. Wood. **Oaxaca**: 184 km S Oaxaca, 12-VI-71, 2000 m, D. E. Bright.

HOST.— *Quercus* sp.

BIOLOGY.— One specimen was taken from an oak limb 30 cm in diameter.

NOTES.— The above treatment was based on the holotypes of *declivis* and *curtus*, on two paratypes of *truncatus*, and on eight other specimens. The declivital punctures of *curtus* are slightly larger than in *declivis*; there are also minor differences on the pronotum, but the head and prothorax of the type of *curtus* are detached from the remainder of the body, and their slightly larger size suggests they may not belong to the remainder of the body. The paratypes of itruncatus have the declivital punctures slightly smaller than in *declivis* and the declivital setae are slightly longer and more slender. With only 12 specimens available, from four different localities, it is not possible to determine whether these differences are due to normal intrapopulational variation, geographical variation, or to specific differences. In view of the exceedingly close similarity of the

unique declivity, I consider all to represent the same species.

### 3. *Pseudopityophthorus granulatus* Blackman
Fig. 202

*Pseudopityophthorus granulatus* Blackman, 1931, J. Washington Acad. Sci. 21:230 (Holotype, male; Prescott N.F., Arizona; U.S. Nat. Mus., 43425)

DIAGNOSIS.— This species is distinguished from *granulifer* Wood by the smaller size, by the shorter, more widely spaced interstrial bristles, by the larger pronotal punctures, and by the smaller average size of declivital granules.

MALE.— Length 1.3–1.7 mm, 3.0 times as long as wide; color very dark reddish brown.

Frons as in *granulifer* except setae very slightly shorter and evidently less abundant.

Pronotum 1.2 times as long as wide; as in *granulifer* except punctures on disc slightly larger, deeper, impressed points less conspicuous and less numerous.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; as in *granulifer* except declivital granules usually smaller, less numerous; vestiture finer, shorter, more widely spaced, length of interstrial bristles shorter than distance between rows, spaced within a row by one to two lengths of a bristle.

FEMALE.— Similar to male.

DISTRIBUTION.— Arizona.

USA: Arizona: Prescott N.F., 10-VI-30, *Quercus*, M. W. Blackman; Arivaca Road, 23-VIII-58, *Quercus*, S. L. Wood; Madera Canyon, 24-VIII-58, *Quercus*, S. L. Wood; Mt. Bigelow, Santa Catalina Mts., 11-VI-69, *Quercus hypoleucoides*, S. L. Wood; Santa Rita Mts., 13-VI, Hubbard and Schwarz.

HOSTS.— *Quercus hypoleucoides*, *Q.* spp.

BIOLOGY.— Specimens were taken from cut and broken branches less than 5 cm in diameter. The habits are as described for the genus.

NOTES.— The above treatment was based on the holotype, on 53 paratypes, and on 21 other specimens.

### 4. *Pseudopityophthorus granulifer* Wood

*Pseudopityophthorus granulifer* Wood, 1967, Great Basin Nat. 27:42 (Holotype, female; Zamorano, Morazan, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *granulatus* Blackman by the larger size, by the stouter, longer, closer interstrial bristles, by the smaller discal punctures on the pronotum, and by the slightly different elytral declivity.

MALE.— Length 1.6–2.0 mm, 2.8 times as long as wide; color almost black.

Frons plano-convex over a broad area, with a dense marginal fringe of long, yellow hair as in male of most species. Segments 2 and 3 of antennal club equal in width.

Pronotum 1.2 times as long as wide; sides gradually, arcuately narrowed toward rather broadly rounded anterior margin; anterior margin armed by about 14 serrations; summit indefinite, at middle; posterior area smooth and shining, with fine, rather sparse, deep punctures and more abundant minute points; vestiture limited to sides and asperate area.

Elytra 1.5 times as long as wide; sides almost straight and subparallel on basal two-thirds, rather narrowly rounded behind; striae 1 weakly impressed, others not at all impressed, punctures very small, shallow, in rather indefinite rows; interstriae obscure, with a few punctures, points, and surface lines. Decliviy convex, rather steep, with interstriae 2 impressed; strial punctures obsolete; interstriae 1, 2, and 3 each armed by a row of rounded granules that decrease in size and number toward apex; declivital surface smooth, dull. Vestiture consisting of rather sparse, erect bristles arranged in fine strial and coarse interstrial rows; some interstrial bristles on declivity strongly flattened.

FEMALE.— Similar to male in all respects.

DISTRIBUTION.— Chiapas to Honduras.

MEXICO: Chiapas: 8 km SE San Cristóbal de las Casas, 5-VII-56, D. D. Linsdale; Yerba Buena, 32 km N Bochil, 10-VI-69, *Quercus*, D. E. Bright. GUATEMALA: Guatemala City, 30-V-64, flight, S. L. Wood. HONDURAS: Zamorano, Morazán, 18-IV-64, *Quercus hondurensis* and *Q. sapotaefolia*, S. L. Wood.

HOSTS.— *Quercus hondurensis*, *Q. sapotaefolia*.

BIOLOGY.— Specimens were taken from broken branches 3–5 cm in diameter. Habits were as described for the genus.

NOTES.— The above treatment was based on the type series of 18 specimens, and on 2 other specimens.

A male fron Hochixtlan, Oaxaca, is tentatively assigned to this species. The elytral disc near the declivity is more rugosely punctured and the interstrial bristles on the declivity are slightly stouter and longer.

### 5. *Pseudopityophthorus denticulus* Wood

*Pseudopityophthorus denticulus* Wood, 1977, Great Basin Nat. 37:216 (Holotype, female; Boot Springs, Big Bend National Park, Brewster Co., Texas; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *granulifer* Wood by the different frons, by the less definite discal striae, by the more widely spaced, more slender interstrial bristles, and by the near absence of granules and bristles on declivital interstriae 2.

FEMALE.— Length 1.9 mm (paratypes 1.6–2.0 mm), 2.9 times as long as wide; color dark brown.

Frons as in *granulifer* except more shallowly, more broadly concave, punctures smaller, more widely spaced.

Pronotum and elytra as in *granulifer* except strial punctures on disc in less definite rows, erect interstrial setae more slender, more widely spaced, spaced by distances equal to length of a seta, setae and granules absent from declivital interstriae 2, one or two granules sometimes present near base or apex.

MALE.— Similar to female in all respects except antennal club sometimes more slender.

DISTRIBUTION.— Texas.

USA: **Texas**: Boot Springs, Big Bend N.P., Brewster Co., 20-VII-74, *Quercus*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 19 specimens.

### 6. *Pseudopityophthorus virilis* Wood

*Pseudopityophthorus virilis* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):50 (Holotype, male; 1 km W Las Vigas, Veracruz, Mexico; Wood Coll.)

DIAGNOSIS.— This species has the frons ornamented by setae in both sexes; it remotely resembles *granulifer* Wood, but it is distinguished by the smaller size, by the distinctly punctured elytral declivity, and by the presence of granules only on interstriae 1 and 3.

MALE.— Length 1.3–1.6 mm, 2.7 times as long as wide; color black.

Frons transversely impressed, flattened from above eyes to epistoma; surface somewhat coarsely punctured above and at sides; evidently impunctate below in median area; vertex ornamented by a rather dense brush, its longest setae exceeding epistomal margin, a few additional setae at sides and on epistomal area. Antenna about as in *granulifer*.

Pronotum as in *granulifer* except teeth on anterior margin of pronotum larger, punctures on disc very slightly larger, impressed points much smaller.

Elytra 1.6 times as long as wide; outline as in *granulifer*; punctures on disc confused, not in rows except near declivity, small; surface subshining, with a few irregular lines and impressed points. Declivity steep, convex; interstriae 1 and 3 each bearing a row of fine, rounded granules, three indistinct rows of minute, setiferous punctures between rows of granules, lateral areas similarly punctured. Vestiture almost hairlike at base, becoming scalelike toward declivity, those setae apparently derived from interstriae distinctly longer than those derived from striae; longest scales on declivity rather short, about six times as long as wide.

FEMALE.— Similar to male.

DISTRIBUTION.— Hidalgo to Veracruz.

MEXICO: **Hidalgo**: Tlahuelumpa, Zacualtipan, 16-X-80, *Quercus*, T. H. Atkinson. **Veracruz**: 1 km W Las Vigas, 5-VII-67, No. 159, *Quercus*, S. L. Wood.

BIOLOGY.— Specimens were taken from a broken branch 3 cm in diameter. The habits were as described for the genus.

NOTES.— The above treatment was based on the type series of 21 specimens.

### 7. *Pseudopityophthorus asperulus* (LeConte)

Fig. 202

*Cryphalus asperulus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:155 (Holotype, male; Virginia; Mus. Comp. Zool., 1008)

*Pseudopityophthorus asperulus*: Blackman, 1931, J. Washington Acad. Sci. 21:244

*Pseudopityophthorus gracilis* Blackman, 1921, Mississippi Agric. Expt. Sta. Tech. Bull. 10:6 (Lectotype, male; Natchez, Mississippi; U.S. Nat. Mus., present designation); Blackman, 1931, J. Washington Acad. Sci. 21:228. *Synonymy*

DIAGNOSIS.— This species is distinguished from *tenuis* Wood by the flattened, unarmed, subglabrous frons in both sexes and by the finer pronotal and elytral punctures.

MALE.— Length 1.2–1.4 mm, 3.1 times as long as wide; color very dark brown.

Frons rather broadly flattened from epistoma to well above upper level of eyes; surface shining, obscurely, shallowly, coarsely punctured; vestiture very sparse, short, inconspicuous. Antennal club moderately large,

widest through segment 3, segment 1 short, sutures 1 and 2 moderately procurved.

Pronotum 1.3 times as long as wide; essentially as in *granulatus* Blackman except punctures on discal area very fine, rather shallow. Posterior half glabrous.

Elytra 1.8 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures small at base, becoming minute to obsolete at base of declivity; interstriae subshining, with some points and many fine, irregular lines, punctures evidently obsolete. Declivity steep, convex; strial punctures obsolete on surface, interstriae smoother than on disc, very minute impressed points usually indicated. Vestiture rather short, of rows of minute, fine strial hair, and rows of distinctly longer, fine, erect, interstrial bristles; each bristle slightly shorter than distance between rows, spaced within a row by one to three lengths of a bristle.

FEMALE.— Similar to male.

DISTRIBUTION.— Maine to Florida and E Texas.

USA: **Connecticut**: Lyme. **District of Columbia**: Washington. **Florida**: Apalachicola, Oleno St. Pk. **Louisiana**: Covington, Zwolle. **Maine**: Kittery. **Massachusetts**: Middlesex Falls. **Mississippi**: Natchez, Nicholson. **New Jersey**: Westville. **New York**: Jamaica. **North Carolina**: Asheville, Pink Beds, Tryon. **Pennsylvania**: Chambersburg, Clark's Valley, Dauphin. **Tennessee**: Gatlinburg. **West Virginia**: Monongalia, Morgantown.

HOSTS.— *Ostrya virginiana*, *Quercus* spp.

BIOLOGY.— Specimens were taken from small branches in tunnels similar to those described for the genus.

NOTES.— The above treatment was based on the holotype of *asperulus*, on the type series of *gracilis*, and on 183 other specimens. Blackman named *gracilis* from a syntypic series but labeled a male as the type; I here designate that male as the lectotype of his species.

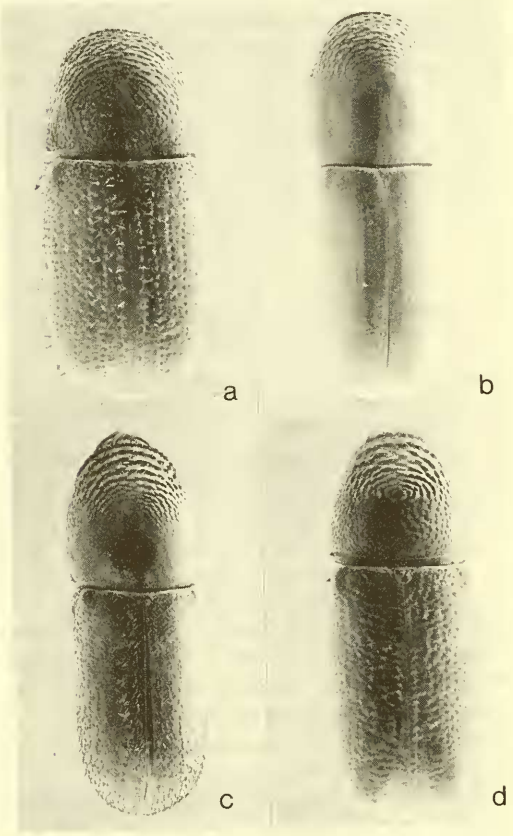



Fig. 201. Corthylini spp., dorsal aspect of adult: a, *Conophthorus resinosae*; b, *Gnathotrichus materiarius*; c, *Pseudopityophthorus minutissimus*; d, *Pityophthorus confinis*. (After Bright 1976:213.)

### 8. *Pseudopityophthorus hondurensis* Wood

*Pseudopityophthorus hondurensis* Wood, 1967, Great Basin Nat. 27:42 (Holotype, male; Buenos Aires, Cortes, Honduras; Wood Coll.)

*Pseudopityophthorus montanus* Bright, 1972, Canadian Ent. 104:1667 (Holotype, male; Mt. Tzontehuitz, Chiapas, Mexico; Canadian Nat. Coll.); Wood, 1973, Great Basin Nat. 33:184. *Synonymy*

DIAGNOSIS.— This species is distinguished from *singularis* Wood and *tenuis* Wood by the presence of minute granules on declivital interstriae 1 and 3 and by the female frons being pubescent as in the male.

MALE.— Length 1.2–1.6 mm, 2.8 times as long as wide; body color very dark brown, summit of pronotum somewhat lighter.

Frons plano-convex over a broad area, with a marginal fringe of long, yellow hair, median area punctured. Antennal club widest through segment 3.

Pronotum 1.05 times as long as wide; sides straight and subparallel on basal half, then moderately constricted before broadly rounded anterior margin; anterior margin armed by about 14 low serrations; summit poorly developed, at middle; posterior area smooth and shining, with rather sparse, coarse, deep punctures and more numerous minute points. Subglabrous.

Elytra 1.5 times as long as wide; sides approximately straight and parallel on basal two-thirds, almost semicircularly rounded behind; striae not impressed, punctures fine, distinct but not deep, in definite rows; interstriae almost flat, smooth and shining, with a few fine lines and impressed points. Declivity convex, moderately steep; strial punctures obsolete; interstriae except 2 with a few minute setiferous granules. Vestiture mostly confined to declivity, consisting of slender, erect, hairlike, interstrial setae.

FEMALE.— Almost indistinguishable from male, but evidently with frontal vestiture less abundant and shorter.

DISTRIBUTION.— Mexico to Honduras.

MEXICO: Chiapas: Mt. Tzontehuitz, 12-VI-69, D. E. Bright. HONDURAS: Buenos Aires, Cortez, 7-V-64, 2300 m, *Quercus*, S. L. Wood.

BIOLOGY.— Specimens were taken from a broken branch 3 cm in diameter. The habits were as described for the genus.

NOTES.— The above treatment was based on the type series of 30 specimens.

### 9. *Pseudopityophthorus cincinnatus* (Blandford)

*Pityophthorus cincinnatus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):242 (Holotype, female; Quiché Mts., Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *hondurensis* Wood by the larger size, by the longer, more closely spaced declivital setae, and by the smoother, slightly wider discal interstriae.

FEMALE.— Length 2.2 mm, about 2.8 times as long as wide; color very dark brown.

Head and pronotum missing from type.

Elytra as in *hondurensis* except declivity more broadly convex, interstriae 2 very feebly impressed, punctures obsolete, granules almost obsolete on lower half, vestiture distinctly longer, closer (particularly near base of declivity) and extending to base, slightly coarser.

DISTRIBUTION.— Guatemala.

GUATEMALA: Quiché Mts. 7-9000 ft Champion.

NOTES.— The above treatment was based on the type.

### 10. *Pseudopityophthorus singularis* Wood

*Pseudopityophthorus singularis* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):50 (Holotype, male; 1 km W Las Vigas, Veracruz, Mexico; Wood Coll.)

*Pseudopityophthorus acuminatus* Bright, 1972, canadian Ent. 104:1671 (Holotype, male; 13 km or 8 miles NE San Cristobal de las Casas, Chiapas, Mexico; Canadian Nat. Coll.); Wood, 1973, Great Basin Nat. 33:185. *Synonymy*

DIAGNOSIS.— This species is distinguished from *tenuis* Wood by the coarser pronotal punctures, by the longer elytral setae, by the weakly impressed male frons with slightly longer and more abundant setae, and by the subconcave female frons that lacks a median carina.

MALE.— Length 1.3–1.6 mm, 3.0 times as long as wide; color very dark brown.

Frons flattened, epistoma weakly elevated, surface indistinctly punctured; vertex bearing a sparse brush of about two dozen very long setae with tips reaching to epistoma, a few additional setae in epistomal area. Antenna as in *tenuis*.

Pronotum much as in *tenuis*, with anterior margin more broadly rounded; punctures on disc much larger, impressed points moderately abundant.

Elytra 1.8 times as long as wide; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures small, distinct, in rows; interstriae almost smooth, at least three times as wide as striae, a few minute, impressed points, a few punctures toward declivity. Declivity steep, rather broadly convex; punctures of striae 1 minute, in a row, others obsolete; sutural interstriae feebly elevated, 1, 3, and some of lateral interstriae with sparse, minute, setiferous punctures. Vestiture of very minute strial hair and rows of widely spaced, moderately long, fine, interstrial hair on sides and declivity, almost obsolete on disc.

FEMALE.— Similar to male except frons convex above eyes, transversely impressed above epistoma, impression extending slightly dorsad at center, surface very coarsely punctured, vestiture sparse, inconspicuous.

DISTRIBUTION.— Veracruz to Chiapas.

MEXICO: Chiapas: 13 km or 8 miles NE San Cristóbal de las Casas, 15-V-69, *Quercus*, D. E. Bright. Veracruz: 1 km W Las Vigas 5-VII-67, No. 159, *Quercus*, S. L. Wood.

BIOLOGY.— Specimens were taken from the same branch as the type series of *virilis* Wood; the habits were similar.

NOTES.— The above treatment was based on the type series of seven specimens of *singularis* and on the holotype and two paratypes of *acuminatus*.

### 11. *Pseudopityophthorus tenuis* Wood

*Pseudopityophthorus tenuis* Wood, 1959, Great Basin Nat. 19:1 (Holotype, male, 18 km or 11 miles NE Jacala, Hidalgo, Mexico; Snow Ent. Mus., Univ. Kansas)

*Pseudopityophthorus hirsutus* Bright, 1972, Canadian Ent. 104:1668 (Holotype, male; 8 km or 5 miles SE Teopisca, Chiapas, Mexico; Canadian Nat. Coll.); Wood, 1973, Great Basin Nat. 33:185. *Synonymy*

DIAGNOSIS.— This species is distinguished from *asperulus* (LeConte) by the pubescent male frons, the presence of a small, median carina on the female frons, and by the smoother surface and finer punctures on the pronotum and elytra.

MALE.— Length 1.2–1.4 mm, 3.0 times as long as wide; color very dark brown.

Frons as in *asperulus* except with a conspicuous tuft of long, yellow hair. Pronotum as in *asperulus* except surface smoother, punctures smaller. Elytra as in *asperulus* except more brightly shining, surface evidently smoother, punctures finer.

FEMALE.— Similar to male except frons glabrous, less extensively flattened, a small median carina at upper level of eyes.

DISTRIBUTION.— Hidalgo and Veracruz to Chiapas.

MEXICO: **Chiapas**: 8 km or 5 miles SE Teopisca, 9-VII-69, *Quercus*, D. E. Bright. **Hidalgo**: 17 km NE Jacala, 22-VI-53, *Quercus*, S. L. Wood. **Veracruz**: 14 km E Huatasco, 7-VII-67, 250 m, No. 172, *Quercus*, S. L. Wood.

HOSTS.— *Quercus* sp.

BIOLOGY.— Specimens were taken from cut branches 5 cm in diameter. The habits were as described for the genus.

NOTES.— The above treatment was based on 7 paratypes of *tenuis*, on the holotype and 2 paratypes of *hirsutus*, and on 22 other specimens.

### 12. *Pseudopityophthorus pubescens* Blackman

Fig. 202

*Pseudopityophthorus pubescens* Blackman, 1931, J. Washington Acad. Sci. 21:229 (Holotype, male; Tryon, North Carolina; U.S. Nat. Mus., 43424)

DIAGNOSIS.— This species is distinguished from others in the genus by the shallowly concave male frons and by the very long, hairlike elytral vestiture that is in rows.

MALE.— Length 1.8–2.0 mm, 2.8 times as long as wide; color dark brown.

Frons broadly, rather shallowly concave from epistoma to vertex; surface shining, obscurely punctured, a few short setae in concavity; vertex above concave area bearing a dense brush of long, yellow hair, longest setae exceeding epistomal margin.

Pronotum 1.17 times as long as wide; general sculpture as in *asperulus* (LeConte) except posterior areas with moderately abundant, short, hairlike pubescence.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures small, somewhat obscure; interstriae irregular, four to six times as long as wide. Declivity steep, convex; surface smooth, with obscure points, setiferous punctures confused. Vestiture on disc hairlike, in rows, of short, semirecumbent hair, and long, erect, interstrial bristles, each bristle at least twice as long as distance between rows, similarly spaced within a row; declivital setae on central area short, almost scalelike.

FEMALE.— Similar to male except frons more shallowly, less extensively impressed.

DISTRIBUTION.— Virginia and North Carolina.

USA: **North Carolina**: Asheville, 8-VIII-55, *Quercus borealis*, E. P. Merkel; Tryon, Hopk. U.S. 3040, *Castanea dentata*, W. F. Fiske. **Virginia**: E. Woodford, 1-X-21, *Quercus rubra*, R. St. George; Carter Bridge, *Quercus alba*.

HOSTS.— *Quercus alba*, *Q. borealis*, *Q. rubra*, *Castanea dentata*.

BIOLOGY.— Unknown except for the host records.

NOTES.— The above treatment was based on the type series of 11 specimens and on 6 other specimens.

### 13. *Pseudopityophthorus fagi* Blackman
Fig. 202

*Pseudopityophthorus fagi* Blackman, 1931, J. Washington Acad. Sci. 21:228 (Holotype, male; Morgantown, West Virginia; U.S. Nat. Mus., 43423)

DIAGNOSIS.— This species is distinguished from *asperulus* (LeConte) by the conspicuously pubescent male frons, by the shorter interstrial bristles, and by the very slightly smoother elytral surface, with the impressed points more conspicuous.

MALE.— Length 1.4–1.5 mm, 3.0 times as long as wide; color dark brown.

Frons as in *asperulus* except margins of flattened area more abrupt, pubescence rather abundant, fine, very long. Pronotum 1.14 times as long as wide, as in *asperulus* except basal half with sparse pubescence, particularly on basal margin. Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; as in *asperulus* except strial punctures smaller, surface smoother, with impressed points more abundant, deeper; interstrial bristles shorter, slightly longer than strial setae, each about two-thirds as long as distance between rows, more closely spaced within a row; declivity with very obscure, minute granules.

FEMALE.— Similar to male except frons sparsely pubescent (not seen).

DISTRIBUTION.— Pennsylvania and West Virginia.

USA: **Pennsylvania**: Newton, 13-III-15, *Fagus atropunicea*, W. P. Adams. **West Virginia**: Midland Farm, Morgantown, 26-XI-96, Hopk. W. Va. 7142a, *Fagus*, A. D. Hopkins.

HOST.— *Fagus grandifolia.*

BIOLOGY.— Only the host record of this rare species is known.

NOTES.— The above treatment was based on the type series of six specimens and on three other specimens.

### 14. *Pseudopityophthorus agrifoliae* Blackman
Fig. 202

*Pseudopityophthorus agrifoliae* Blackman, 1931, J. Washington Acad. Sci. 21:230 (Holotype, male; Golden Gate Park, San Francisco, California; U.S. Nat. Mus., 43426)

DIAGNOSIS.— This species is distinguished from *fagi* Blackman by the larger size, by the more finely punctured pronotal disc, and by the larger, more definite rows of setae on declivital interstriae 1 and 3, with those on 2 entirely absent.

MALE.— Length 1.5–1.9 mm, 2.9 times as long as wide; color dark brown.

Frons broadly flattened from epistoma to vertex, surface subshining, punctures shallow, moderately coarse, rather close; vestiture of fine, very long hair, rather sparse in central area, abundant on upper and lateral margins to epistoma.

Pronotum 1.14 times as long as wide; as in *fagi* except punctures on posterior areas finer, impressed points larger, vestiture on disc less evident.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; as in *fagi* except striae evidently obsolete in some specimens, strial and interstrial setae not always distinguishable; setae on declivital interstriae 1 and 3 slightly larger, in definite rows, those on 2 obsolete, but minute strial setae present (some setae on interstriae 2 present in *fagi* and those on 1 and 3 smaller).

FEMALE.— Similar to male in all respects.

DISTRIBUTION.— California and Arizona.

USA: **Arizona**: Madera Canyon, 24-VIII-58, *Quercus*, S. L. Wood. **California**: Golden Gate Park, San Francisco, 20-IV-99, *Q. agrifolia*, A. D. Hopkins; Mill Valley, Marin Co., 4-IV-57, *Q. wislizeni*, H. B. Leech; Santa Lucia Range, 5-VII-54, 600 m, *agrifolia*, O. Bryant; Big Pine Pk., 8-IV-40, *Q. kelloggi*, C. R. Bruck.

HOSTS.— *Quercus agrifolia*, *Q. kelloggii*, *Q. wislizenii*, *Q.* sp.

BIOLOGY.— Specimens were taken from cut branches.

NOTES.— The above treatment was based on the holotype and on 92 other specimens. The Arizona specimen's declivity is more strongly convex and the elytral setae very slightly stouter, but it almost certainly belongs to this species.

### 15. *Pseudopityophthorus limbatus* Eggers

*Pseudopityophthorus limbatus* Eggers, 1931, Ent. Blätt. 26:169 (Holotype, female; "R.d.M.," Mexico; deposited in Eggers Coll. but apparently now on loan to Schedl)

*Pseudopityophthorus micans* Wood, 1967, Great Basin Nat. 27:44 (Holotype, male; 96 km or 60 miles W Durango, Durango, Mexico; Wood Coll.); Wood, 1975, Great Basin Nat. 35:394. *Synonymy*

DIAGNOSIS.— This unique species is distinguished from others in the genus by the large size, by the obsolete striae, with confused discal punctures and minute, fine, strial hair,

and by the smooth, polished elytral declivity normally devoid of punctures and setae.

MALE.— Length 2.0–2.5 mm, 2.7 times as long as wide; color dark brown.

Frons plano-convex on three-fourths of a circle, smooth and shining at center, with a marginal fringe of closely placed, long, erect, hairlike setae, marginal pubescent area closely, finely granulate-punctate. Antennal club widest through segment 3.

Pronotum 1.1 times as long as wide; sides weakly arcuate, almost parallel on basal half, then moderately constricted before rather narrowly rounded anterior margin; anterior margin armed by about 14 small teeth; summit indefinite; posterior area behind summit smooth and shining with rather abundant fine punctures and minute points. Glabrous except at margins.

Elytra 1.6 times as long as wide; sides straight and subparallel on basal two-thirds, abruptly narrowed at posterolateral angles, rather narrowly rounded behind; elytral punctures largely limited to anterior two-thirds of disc, fine, confused except for striae 1; surface smooth and shining but marked with a few fine lines. Declivity abrupt, with apical and sutural area somewhat produced posteriorly; surface smooth and shining. Glabrous except for a few setae at anterolateral angles.

FEMALE.— Similar to male, though frons finely, deeply punctured except for a narrow median line; frontal vestiture sparse, scattered; and declivital punctures minute but evident.

DISTRIBUTION.— Durango and Hidalgo to Oaxaca.

MEXICO: **Durango**: 64 km, No. 15, and 96 km, No. 22, W Durango, 5-VI-65, 2200–2500 m; 5 km W El Salto, 7-VI-65, 2500 m, No. 32. **Hidalgo**: 31 km E Tulancingo, 12-VI-67, 2200 m, No. 15. **Michoacán**: 53 km E Morelia, 14-VI-65, 3000 m, No. 51; 9 km S Carapan, 18-VI-65, 2200 m, No. 78. **Oaxaca**: Nochixtlán, 16-VI-67. **Tlaxcala**: 17 km N Tlaxco, 9-VII-67, 2900 m, No. 178. All were taken by me from *Quercus*.

HOSTS.— *Quercus* spp.

BIOLOGY.— Specimens were taken from boles and limbs of recently cut or fallen trees. The habits were as described for the genus.

NOTES.— The above treatment was based on the holotype of *limbatus*, on the type series of 57 specimens of *micans*, and on 28 other specimens.

### 16. *Pseudopityophthorus minutissimus* (Zimmermann)

Figs. 201, 202, 207

? *Tomicus* (?) *pusillus* Harris, 1837, Trans. Nat. Hist. Soc. Hartford 1:82

*Crypturgus minutissimus* Zimmermann, 1868, Trans. Amer. Ent. Soc. 2:143 (Lectotype, male; Carolina; Mus. Comp. Zool., 1007, present designation)

*Pseudopityophthorus minutissimus*: Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):93

DIAGNOSIS.— This species is distinguished from others in the genus by the reticulate frons and pronotal disc in both sexes, by the very fine, confused elytral punctures, and by the uniformly short, confused, slender elytral setae.

MALE.— Length 1.5–1.8 mm, 2.74 times as long as wide; color dark brown.

Frons very broadly planoconcave from epistoma to vertex; surface strongly, finely reticulate, small punctures confined to marginal areas; lateral and upper margins ornamented by a dense brush of long, yellow hair; epistomal margin feebly emarginate. Antennal club comparative small, sutures 1 and 2 moderately arcuate.

Pronotum 1.1 times as long as wide; sides on posterior half very weakly arcuate, subparallel, feebly constricted just before broadly rounded anterior margin; anterior margin armed by about 16 coarse serrations; summit broad, slightly in front of middle; anterior slope rather coarsely asperate; posterior areas finely reticulate (obscure in some specimens), finely, rather closely punctured, impressed points not evident. Usually glabrous.

Elytra 1.66 times as long as wide, 1.44 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; surface shining, minutely somewhat irregular, punctures fine, confused, shallow, rather close. Declivity steep, convex; surface smoother and punctures much finer than on disc. Vestiture of short, fine, confused, reclining, moderately stout hair of uniform length, setae often very slightly stouter on declivity.

FEMALE.— Similar to male except frons planoconvex on a smaller area, vestiture rather sparse, much shorter, confined to a smaller area; serration on anterior margin of pronotum usually finer.

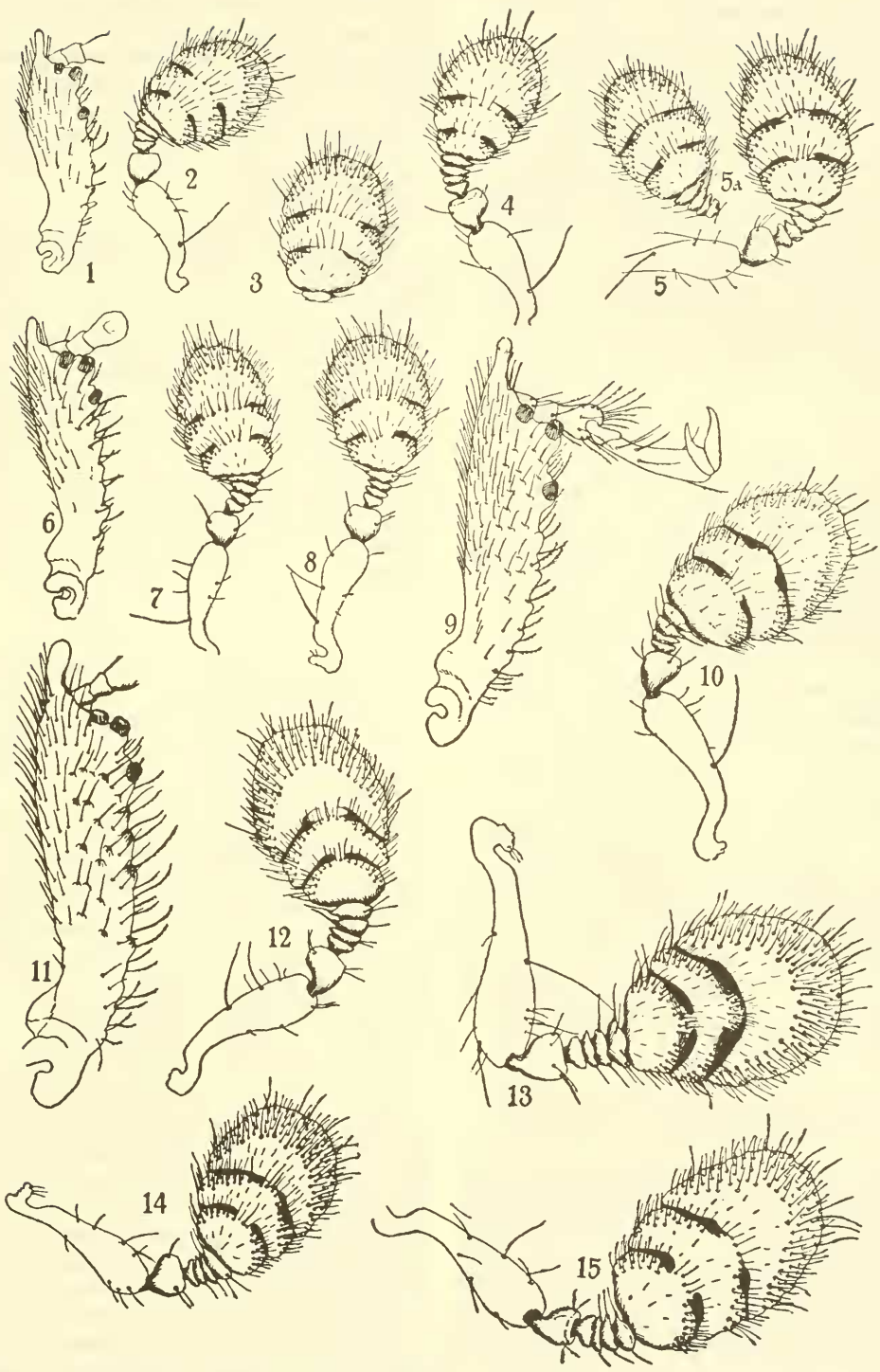



Fig. 202. *Pseudopityophthorus* spp., antennae and tibiae: 1–2, *asperulus*; 3, *fagi*; 4, *pubescens*; 5, 5a, *granulatus*; 6–7, *minutissimus*; 8, *agrifoliae*; 9–10, 13, *pruinosus*; 11–12, *yavapaii*; 14, *pubipennis*; 15, *opacicollis*. (After Blackman 1938:227.)

DISTRIBUTION.— Minnesota and Maine to Louisiana and Florida.

USA: **Arkansas**: Camden. **District of Columbia**: Washington. **Florida**: Crescent City, Indian River, Oleno St. Pk., Sanford. **Georgia**: Brunswick, Cornelia. **Iowa**: "Ia." **Kansas**: Lawrence. **Louisiana**: Greenwell Springs. **Maine**: Wales. **Maryland**: Beltsville, Berwin, Bladensburg, Chevy Chase, College Park, Harper's Ferry, Oakland. **Massachusetts**: Middlesex Falls. **Michigan**: Detroit. **Minnesota**: Houston Co., Winona Co. **Mississippi**: Agricultural College, Meridian. **Missouri**: Dent Co. **New Jersey**: Alpine, Brunswick, Clementon, Denville, Grenlock, Montclair, Newark, Orange. **New York**: Ithaca, Long Island, Syracuse, West Point. **North Carolina**: Pink Beds, Tryon. **Pennsylvania**: Chambersburg, Frankford, Lazareth, Lehigh Gap, Mt. Alto, Perry Co., Sullivan Co. **South Carolina**: Chicora, Paris Mt., Spartinsburg. **Virginia**: Falls Church, Georgetown, Mt. Vernon. **West Virginia**: Dellslow, Laurel Hill, Monongalia Co., Morgantown, Pocahontas Co., Wood Co. **Wisconsin**: Clintonville.

HOSTS.— *Quercus muehlenbergii, Q. rubra, Q. velutina, Q.* spp. Rare or probably accidental in other hosts.

BIOLOGY.— Specimens were taken from cut or broken limbs and branches. The habits are as described for the genus.

NOTES.— Of the two male syntypes of *minutissimus* in the LeConte collection I here designate the first as the lectotype of Zimmermann's species. This specimen was compared directly to several specimens in my collection that were used for the above treatment; 394 specimens were examined.

The species named *Tomicus* (?) *pusillus* Harris is unknown. It was assumed by LeConte (1868:143) to be identical to *minutissimus*; however, the original description indicated that the elytral declivity of the type was scabrous and that the hairs and bristles on the elytral declivity were in rows. Neither of these features fit *minutissimus*.

## 17. *Pseudopityophthorus comosus* Bright

*Pseudopityophthorus comosus* Bright, 1972, Canadian Ent. 104:1670 (Holotype, male; Highway 131, 178 km S Oaxaca, Oaxaca, Mexico; Canadian Nat. Coll., 12629)

DIAGNOSIS.— This species is distinguished from *limbatus* Eggers by the longer coarser vestiture, particularly on the declivity, and by the presence of minute declivital punctures.

MALE.— Length 2.2–2.5 mm, 2.7 times as long as wide; color dark brown.

All features essentially as in *limbatus* except elytral vestiture. Ground setae at least twice as long and slightly more abundant than in *limbatus*; posterior half of elytra with erect interstrial setae slightly longer and distinctly coarser than hair of ground cover. Declivity with minute setiferous punctures.

FEMALE.— Similar to male except frons as in female *limbatus*.

DISTRIBUTION.— Oaxaca.

MEXICO: **Oaxaca**: Highway 131, at 115 km, 178 km, 184 km S Oaxaca, 11-30-V-71, 2000–2500 m, *Quercus*, D. E. Bright.

NOTES.— The above treatment was based on a male and a female paratype.

Some series of *limbatus* have the elytral vestiture intermediate between these two forms. Because the known distributions are separated by a gap of more than 200 km, additional collecting will be necessary in Oaxaca to determine whether geographical races or distinct species are represented by these names.

## 18. *Pseudopityophthorus squamosus* Bright

*Pseudopityophthorus squamosus* Bright, 1972, Canadian Ent. 104:1670 (Holotype, female; 9 miles or 14 km W La Ciudad, Durango, Mexico; Canadian Nat. Coll., 12628)

DIAGNOSIS.— This species is distinguished from *limbatus* Eggers by the sculpture of the frons, by the reticulate pronotum, by the smaller antennal club with straight sutures, by the densely, minutely punctured elytral declivity, and, when not abraded, by the presence of declivital scales.

MALE.— Length 2.1–2.4 mm, 2.6 times as long as wide; color reddish brown.

Frons transversely impressed, almost flat, to upper level of eyes, a conspicuous, blunt, median, transverse elevation above eyes; surface subreticulately, finely punctate-granulate from epistoma to vertex except elevation almost smooth; vestiture of about two dozen long, yellow, hairlike setae arising on vertex, a few additional setae on lower areas.

Pronotum as in *limbatus* except surface of posterior areas strongly reticulate.

Elytra as in *limbatus* except declivity finely, rather densely punctured; recently emerged specimens with rather abundant, small scales.

FEMALE.— Similar to male except long hair on vertex absent.

DISTRIBUTION.— Durango to Sinaloa.

MEXICO: **Durango**: 29 km W El Salto, 7-VI-65, 2500 m, No. 36, S. L. Wood; 59 km W El Salto, 10-VI-64, H. F. Howden; 15 km W La Ciudad, 11-VI-64, L. A. Kelton. **Sinaloa**: 8 km N Mazatlán, 14-VIII-64, H. F. Howden.

NOTES.— The above treatment was based on two topotypic paratypes and on four other specimens. The four specimens from El Salto were inadvertently designated as paratypes of *micans* Wood and compared to the types of *squamosus* rather than to true *micans*. On the basis of this error *squamosus* was incorrectly placed in synonymy.

### 19. *Pseudopityophthorus pruinosus* (Eichhoff)

Fig. 202, 207

*Pityophthorus pruinosus* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:198 (Lectotype, male; published as Carolina, labeled "Am. bor.," no. "11"; U.S. Nat. Mus., 4562, present designation)

*Pseudopityophthorus pruinosus*: Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):94

*Pityophthorus tomentosus* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:201 (Holotype, sex?; America borealis; presumably lost with Hamburg Mus.); Blackman, 1931, J. Washington Acad. Sci. 21:225. *Synonymy?*

*Pityophthorus querciperda* Schwarz, 1888, Proc. Ent. Soc. Washington 1:56 (Syntypes; New York to Florida; U.S. Nat. Mus.); Eichhoff, 1896, Proc. U.S. Nat. Mus. 18:609. *Synonymy*

*Pseudopityophthorus pulvereus* Blackman, 1931, J. Washington Acad. Sci. 21:232 (Holotype, male; Chiricahua Reserve, Arizona; U.S. Nat. Mus., 43427); Wood, 1973, Great Basin Nat. 33:185. *Synonymy*

*Pseudopityophthorus tropicalis* Wood, 1967, Great Basin Nat. 27:43 (Holotype, male; Zamorano, Morazán, Honduras; Wood Coll.); Wood, 1973, Great Basin Nat. 33:185. *Synonymy*

*Pseudopityophthorus convexus* Bright, 1972, Canadian Ent. 104:1672 (Holotype, male; 184 km or 115 miles S Oaxaca, Oaxaca, Mexico; Canadian Nat. Coll., 12632); Wood, 1973, Great Basin Nat. 33:185. *Synonymy*

DIAGNOSIS.— This species is distinguished from *minutissimus* (Zimmermann) by the larger average size, by the larger elytral punctures, by the stouter, almost scalelike elytral setae of uniform length, a row of declivital scales on interstriae 1 and 3 sometimes being erect and very slightly longer, and by the male frons being plano-convex, with the vestiture usually slightly longer and more abundant.

MALE.— Length 1.5–1.8 mm, 2.8 times as long as wide; color dark brown.

Frons weakly convex except distinctly, transversely impressed above epistoma; finely punctured on marginal areas; margins ornamented by a dense brush of long, yellow hair, longest setae arising on vertex exceeding epistomal margin. Antennal club as in *minutissimus*.

Pronotum as in *minutissimus* except posterior areas smooth, shining, not at all reticulate, impressed points rather abundant, conspicuous, punctures small, slightly larger than in *minutissimus*.

Elytra as in *minutissimus* except declivity more broadly convex, slightly flattened, discal punctures coarser, closer, interstriae little if any wider than punctures, setae very slightly longer, much stouter, laterally compressed; punctures on declivity smaller and setae stouter than on disc, some specimens in any series with setae on interstriae 1 and 3 slightly longer, erect.

FEMALE.— Similar to male except frons more distinctly convex, transverse impression weaker, vestiture sparse, shorter, fine.

DISTRIBUTION.— Michigan and New York to Honduras and Florida.

USA: **Arizona**: Chiricahua Reserve, Prescott, Santa Catalina Mts. **Arkansas**: Camden. **District of Columbia**: Washington. **Florida**: Crescent City, Gainesville, La Belle, Mariana, Oleno St. Pk., Orlando. **Georgia**: Atlanta, Clayton, St. Catherine Island. **Louisiana**: Covington. **Maryland**: Beltsville, Bladensburg. **Michigan**: Seney. **Mississippi**: Iuka, Laurel, Meridian, Nicholson, Summerland, Trimcane Swamp. **New Jersey**: Newark. **New York**: New York, Peekskill, Watermill. **North Carolina**: Asheville, Pink Beds, Tryon. **Pennsylvania**: Chester Hill, Lazareth, Rydal. **South Carolina**: Clemson, Spartinsburg. **Tennessee**: Knoxville. **Texas**: Kirbyville, Montell. **West Virginia**: Dellslow, Kanawha Station, Morgantown, Roosevelt, Wood Co. MEXICO: **Durango**: 37 km and 64 km W Durango, 48 km SW El Salto. **Michoacán**: Morelia, Quiroga. **Oaxaca**: Nochixtlán, 184 km S Oaxaca. **Sinaloa**: Copala. **Veracruz**: Huatasco. GUATEMALA: Volcán de Agua. HONDURAS: Zamorano.

HOSTS.— *Quercus hypoleuocoides, Q. marilandica, Q. nigra, Q.* spp.

BIOLOGY.— Specimens were taken from cut and broken limbs and branches. The habits are as described for the genus.

NOTES.— The above treatment was based on the holotypes of *pulvereus, tropicalis,* and *convexus,* on syntypes of *pruinosus* and *querciperda,* and on 385 other specimens. The male syntype of *pruinosus* in the U.S. National Museum is here designated the lectotype of Eichhoff's species.

### 20. *Pseudopityophthorus festivus* Wood

*Pseudopityophthorus festivus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):55 (Holotype, male; 11 km NE Copala, Sinaloa, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *pruinosus* (Eichhoff) by the plano-concave male frons, by the more strongly impressed elytral declivity, by the more coarsely punctured elytral surface, and by the very different elytral vestiture.

MALE.— Length 1.6–1.8 mm, 2.8 times as long as wide; color dark brown.

Frons broadly plano-concave from epistoma to vertex; surface smooth, shining in central area, marginal areas finely punctured and bearing a dense tuft of long, yellow hair. Antenna as in *pruinosus.*

Pronotum 1.2 times as long as wide, as in *pruinosus.*

Elytra 1.6 times as long as wide, 1.3 times as long as pronotum; outline as in *pruinosus;* surface smooth, shining, punctures moderately coarse, shallow, confused, very close, width of interspaces about equal to diameter of punctures. Declivity steep, flattened; moderately elevated at suture, a moderately strong sulcus in area of interstriae 2, lateral convexities rounded; punctures minute. Ground vestiture of fine, short, stout, reclining setae; erect scales in interstrial rows except obsolete on lower half of 2 on declivity, each scale about as long as distance between rows, similarly spaced within a row, each about four to eight times as long as wide.

FEMALE.— Similar to male except frons plano-convex, pubescence sparse, fine, much shorter.

DISTRIBUTION.— Sinaloa.

MEXICO: Sinaloa: 11 km or 7 miles NE Copala, 22-VII-53, *Quercus,* S. L. Wood.

BIOLOGY.— Specimens were taken from a broken branch.

NOTES.— The above treatment was based on the type series of four specimens.

### 21. *Pseudopityophthorus opacicollis* Blackman

Fig. 202

*Pseudopityophthorus opacicollis* Blackman, 1931, J. Washington Acad. Sci. 21:235 (Holotype, male; Santa Catalina Mts., Arizona; U.S. Nat. Mus., 43429)

*Pseudopityophthorus aesculinus* Bright, 1972, Canadian Ent. 104:1672 (Holotype, female; 112 km or 70 miles N Oaxaca, Oaxaca, Mexico; Canadian Nat. Coll.); Wood, 1973, Great Basin Nat. 33:185. *Synonymy*

DIAGNOSIS.— This species is distinguished from *festivus* Wood by the larger size, by the more feebly impressed elytral declivity, and by the absence of longer, erect, interstrial setae on even-numbered interstriae.

MALE.— Length 1.8–2.2 mm, 2.7 times as long as wide; color dark brown.

Frons moderately convex above, transversely impressed on lower third, a slight callus at upper margin of impression; surface smooth and shining on lower median area, punctured in marginal areas; margins ornamented by a dense brush of long, yellow hair. Antennal club as in *pruinosus* (Eichhoff).

Pronotum 1.14 times as long as wide; about as in *pruinosus* except more distinctly constricted on anterior third, posterior areas more closely punctured.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal two-thirds, rather narrowly rounded behind; disc as in *festivus* except punctures smaller. Declivity steep, slightly flattened; sulcus on interstriae 2 feeble; punctures smaller than on disc. Vestiture of moderately abundant, recumbent, rather stout,

short ground cover, and rows of longer, erect setae on even-numbered interstriae beginning about middle of disc; longest setae about two to three times as long as ground vestiture, almost hairlike on disc, becoming scalelike on declivity, those on 9 hairlike throughout.

FEMALE.— Similar to male except frons less strongly convex above, less strongly impressed below, vestiture sparse, shorter.

DISTRIBUTION.— Arizona to Chiapas.

USA: **Arizona**: Madera Canyon, 24-VIII-58, *Quercus*, S. L. Wood; Miller Canyon, 22-VIII-58, *Quercus*, S. L. Wood; Santa Catalina Mts., 28-VII-13, Blackjack oak, Hopk. U.S. 10519a, M. Chrisman. MEXICO: **Chiapas**: Mt. Tzontahuitz, 13-VI-69, *Quercus*, D. E. Bright. **Durango**: 56 km SW El Salto, 23-VII-53, *Quercus*, S. L. Wood. **Hidalgo**: 16 km E Pachuca, 10-VI-67, 2700 m, No. 5, *Quercus*, S. L. Wood; 8 km W Tulacingo, 11-VI-67, 2400 m, No. 11, *Quercus*, S. L. Wood. **Oaxaca**: Oaxaca, 18-V-71, 2800 m, *Quercus*, D. E. Bright. **Tlaxcala**: 17 km N Tlaxco, 9-VII-67, 2900 m, No. 179, *Quercus*, S. L. Wood.

HOSTS.— *Quercus* spp.

BIOLOGY.— Specimens were taken from boles, limbs, and branches of cut and broken trees. The habits are essentially as described for the genus.

NOTES.— The above treatment was based on the type series of both *aesculinus* and *opacicollis*, and on 44 other specimens.

## 22. *Pseudopityophthorus pubipennis* (LeConte)

Fig. 191, 202, 208–209

*Bostrichus pubipennis* LeConte, 1860, Rept. Expl. Surv. Railroad Mississippi River-Pacific Ocean 9(1):59 (Lectotype, female; San Jose, California; Mus. Comp. Zool., 2022, present designation)

*Pseudopityophthorus pubipennis*: Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):93.

DIAGNOSIS.— This species is distinguished from *yavapaii* Blackman by the less numerous, much stouter elytral bristles, which are absent on declivital interstriae 2, and, usually, by the presence of minute setae on the pronotal disc.

MALE.— Length 1.7–2.5 mm, 2.7 times as long as wide; color dark brown.

Frons broadly flattened from epistoma to vertex, a narrow, abrupt, transverse impression above epistoma, upper margin of impression with a moderately strong median callus; surface shining, punctures mostly in marginal areas; vestiture mostly on margins, of abundant, long, yellow hair, tips of longest setae on vertex exceeding epistoma. Antennal club moderately large, oval, segment 1 very small, sutures 1 and 2 strongly arcuate, 2 reaching middle.

Pronotum 1.14 times as long as wide; essentially as in *opacicollis* Blackman.

Elytra 1.6 times as long as wide, 1.45 times as long as pronotum; sides straight and parallel on basal two-thirds, rather broadly rounded behind; punctures on disc abundant, small, confused, surface shining, subrugulose. Declivity steep, rather broadly convex; sculpture about as on disc, with punctures smaller, surface smoother, numerous impressed points evident. Vestiture consisting of ground cover of abundant, rather short, subplumose setae, and of long, slender, interstrial bristles, bristles sparse on disc, absent on declivital interstriae 2.

FEMALE.— Similar to male except frons without transverse impression or callus, vestiture fine, sparse, short.

DISTRIBUTION.— Oregon to California.

USA: **California**: Alameda Co., Bass Lake, Berkeley, Calaveras Co., Contra Costa Co., Del Monte, Del Norte Co., El Dorado Co., Grass Valley, Halsey, Humboldt Co., Kaweah, Kern Co., Lafayette, Lake Co., Los Angeles, Los Gatos, Madera Co., Mendocino Co., Montecito, Monterey Co., North Fork, Oakland, Palo Alto, Pasadena, Placer Co., Riverside Co., Sacramento, Salyer, San Bernardino Co., San Diego, San Rafael, San Francisco, Santa Barbara Co., Santa Clara Co., Santa Cruz, Shasta Co., Sylvania, Tapia Pk., Ventura Co., Yolo Co., Yosemite Valley, Yuba Co. **Oregon**: Ashland, Corvallis, Forest Grove, Hood River, Jacksonville, Portland.

HOSTS.— *Quercus agrifolia*, *Q. garrayana*, and *Q. kelloggii*.

BIOLOGY.— Specimens were taken from boles, limbs, and branches. The habits are as described for the genus.

NOTES.— The above treatment was based on 435 specimens 2 of which were compared to the 4 syntypes in the LeConte collection. The first syntype, a female, is in better condition than the others and is here designated as the lectotype of *pubipennis*.

23. *Pseudopityophthorus yavapaii* Blackman
Fig. 202

*Pseudopityophthorus yavapaii* Blackman, 1931, J. Washington Acad. Sci. 21:233 (Holotype, male; Prescott N.F., Arizona; U.S. Nat. Mus., 43428)

DIAGNOSIS.— This species is distinguished from *pubipennis* (LeConte) by the more abundant, more slender elytral bristles, which also occur on declivital interstriae 2, and by the glabrous pronotal disc.

MALE.— Length 1.7–2.6 mm, 2.7 times as long as wide; color dark brown.

Frons and pronotum essentially as in *pubipennis* except pronotal disc glabrous.

Elytra as in *pubipennis* except elongate interstrial bristles more numerous, more slender, some bristles on declivital interstriae 2.

FEMALE.— Similar to male except frons slightly convex, more coarsely punctured, impression and callus obscure or absent, vestiture fine, sparse, short.

DISTRIBUTION.— Arizona to Chihuahua.

USA: **Arizona**: Chiricahua Mts., Huachuca Mts., Paradise, Patagonia, Prescott, Santa Catalina Mts., Santa Rita Mts. MEXICO: **Chihuahua**: 24 km NW Chihuahua.

HOSTS.— *Quercus hypoleucoides*, and *Q.* spp.

BIOLOGY.— The bole, limbs, and branches of cut or brokn host material were selected for attack. The habits were as described for the genus.

NOTES.— The above treatment was based on 2 paratypes and on 215 other specimens. The holotype was also examined.

## GENUS *CONOPHTHORUS* HOPKINS

*Conophthorus* Hopkins, 1915, J. Washington Acad. Sci. 5:430 (Type-species: *Pityophthorus coniperda* Schwarz, original designation)

DIAGNOSIS.— This genus is distinguished from *Pityophthorus* Eichhoff by the larger size, by the stout body form, by the aseptate antennal club, by the pronotum that has an indefinite summit on the basal third and the asperities continuing to or near the base in the lateral areas, and by the monogamous, cone-infesting habit (one apparent exception).

DESCRIPTION.— Length 2.2–4.1 mm, 2.3–2.4 times as long as wide; color brown to black.

Frons simple, essentially convex, sparsely punctured, vestiture sparse, sexual differences inconspicuous. Eye emarginate, finely faceted. Antennal scape slender, rather long; funicle 5-segmented; club oval, with lateral constrictions at sutures, sutures 1 and 2 aseptate, conspicuously marked by grooves and setae. Pronotum longer than wide, indefinite summit on basal third, anterior slope with numerous asperities, asperities descending in height gradually posterolaterally, some extending to or near base in lateral areas. Elytra with punctures in more or less definite strial and interstrial rows, declivity sulcate, rather simple. Vestiture hairlike. Tibiae similar to *Pityophthorus*.

DISTRIBUTION.— S Canada to Mexico; 14 species are known.

BIOLOGY.— These monogamous species infest cones of the genus *Pinus*, except that *banksianae* McPherson infests twig terminals. Other species are apparently able to survive in twigs when cones are not available. Young cones are usually attacked from May to mid-July in the second year of their growth. When the beetles are under stress, first-year cones are sometimes attacked. In severe infestations more than half the seed production may be destroyed. The larvae develop in the cones and the young adults do not emerge from them until spring. Occasional specimens may not emerge until the second spring.

NOTES.— Character diversity in this genus is limited. Characters are poorly developed and variable, making the separation of some species extremely difficult. It is suspected that one or more sibling species occur in the western forms, but their recognition must await detailed biological studies.

### Key to the Species of *Conophthorus*

1. Declivital striae 1 and 2 with punctures moderately coarse, interstriae 2 not more than twice as wide as 1, less strongly impressed, surface gradually ascending to striae 3, punctures on interstriae 3 usually not granulate; in pinyon pines ..... 2

— Declivital striae 1 with punctures largely or entirely obsolete, those on 2 usually very small to obsolete, interstriae 2 three or more times as wide as 1, rather strongly impressed, lateral summit at middle of 3, usually armed by small tubercles; on other pines, not pinyon ..... 4

2(1). Discal interstriae about four times as wide as striae, strial punctures on declivity much smaller than on disc; color uniformly very dark brown to almost black; California to W Utah; *Pinus monophylla*; 2.7–3.1 mm ..... 1. ***monophyllae*** **Hopkins**

— Discal interstriae about two and one-half times as wide as striae, strial punctures on declivity only slightly smaller than on disc; elytra reddish brown ..... 3

3(2). Punctures on pronotum and elytra averaging smaller; declivital interstriae 2 less strongly impressed; frons somewhat flattened; Arizona to Hidalgo; *Pinus cembroides*; 2.2–2.5 mm ..... 2. ***cembroides*** **Wood**

— Punctures on pronotum and elytra averaging larger; declivital interstriae 2 more distinctly impressed; frons more strongly convex; Utah and Colorado to Arizona and W Texas; *Pinus edulis*; 2.3–3.0 mm ..... 3. ***edulis*** **Hopkins**

4(1). Elytral declivity with about 6–12 small tubercles more or less uniformly distributed from base to apex of interstriae 1; male declivity with suture and lateral convexities subequal in height ..... 5

— Elytral declivital interstriae 1 unarmed on at least lower two-thirds, one tubercle sometimes present just before apex; lateral convexities on declivity much higher than suture, at least in male ..... 9

5(4). Elytral declivity not as steep, without minute impressed points, interstriae 1 armed by about 6–8 small tubercles; California; *Pinus radiata*; 3.3–4.1 mm ..... 4. ***radiatae*** **Hopkins**

— Declivity much steeper, with numerous, minute, impressed points, interstriae 1 armed by about 8–12 small tubercles ..... 6

6(5). Smaller; punctures on declivital striae 2 slightly larger, more closely, more regularly spaced; punctures on discal interstriae averaging closer, more regular; elytral setae slightly shorter ..... 7

— Mostly larger; punctures on declivital striae 2 slightly smaller, not as close, spacing somewhat irregular; punctures on discal interstriae usually not as close, spacing more irregular; elytral setae slightly longer ..... 8

7(6). Smaller; declivity more strongly arched, particularly at suture on middle half, sulcus not as deep, slightly narrower; pronotal and elytral punctures distinctly larger, deeper, interstriae less than three times as wide as striae; transverse frontal impression not as strong; Missouri; *Pinus echinata*; 2.3–2.5 mm ..... 5. ***echinatae*** **Wood**

— Larger; declivity more weakly arched, particularly on middle half, sulcus deeper, wider; pronotal and elytral punctures smaller, interstriae usually four times as wide as striae; transverse frontal impression slightly deeper; Minnesota and Maine to North Carolina; *Pinus strobus*; 2.4–3.0 mm ..... 6. ***coniperda*** **(Schwarz)**

8(6). Average size smaller; elytral setae slightly longer; breed in twigs; Minnesota and Wisconsin to W Ontario and Michigan; *Pinus banksiana*; 2.4–2.9 mm ..... 7. ***banksianae*** **McPherson**

— Average size larger, 95 percent of them larger than 3.0 mm; elytral setae slightly shorter; breed in cones; Minnesota and New Hampshire to New Jersey, West Virginia, and Wisconsin; *Pinus resinosa*; 2.6–3.4 mm ..... 8. ***resinosae*** **Hopkins**

9(4). Declivity very strongly, rather narrowly impressed, denticles on lateral summit larger; punctures on discal striae small, interstriae four to six times as wide as striae; discal interstriae without impressed points; female frons with profile convex, without an epistomal tubercle; Puebla; *Pinus*; 3.3–4.1 mm ..... 9. ***mexicanus*** **Wood**

— Declivity moderately impressed, lateral denticles smaller; punctures on discal striae larger, interstriae about three times as wide as striae ..... 10

10(9). Declivity strongly, broadly impressed, tubercles on 3 larger, punctures on striae 2 rather coarse; disc smooth, punctures larger, somewhat confused; body stouter, elytra 1.4 times as long as wide; Hidalgo and Mexico to Puebla; *Pinus leiophylla*; 3.3–3.8 mm ..... 10. ***conicolens*** **Wood**

— Declivity much less strongly impressed, punctures on striae 2 smaller, less regular, tubercles on 3 small to obsolete; strial punctures on disc in distinct regular rows, interstrial punctures either smaller or widely spaced; body more slender, elytra at least 1.5 times as long as wide ..... 11

11(10). Profile of frons convex, female epistoma without a median, subtuberculate, low elevation (a feeble impression on upper half in *michoacanae*); average size larger ..... 12

— Profile of frons weakly concave from epistoma to upper level of eyes, female with a median, subtuberculate elevation (obscure or absent in male *ponderosae*); elytral disc without impressed points; average size smaller ..... 13

12(11). Interstriae on basal half of disc usually wrinkled, punctures much more abundant, confused; declivity much steeper, more strongly arched, impression narrower; frons more evenly convex; body stouter; Arizona; *Pinus engelmannii*; 3.7–3.9 mm ..... 11. ***apachecae*** **Hopkins**

— Interstriae on basal half of disc smooth, punctures sparse, confused only at base; declivity more gradual, less strongly arched, impression much broader; frons with a weak, transverse impression on upper half; body more slender; Michoacán; *Pinus michoacana*; 3.9–4.2 mm ..... 12. ***michoacanae*** **Wood**

13(11). Male frons never with a median carina, epistomal tubercle reduced to obsolete; declivital striae 2 usually with punctures to near its apex; declivital sulcus usually deeper, narrower; British Columbia and Montana to Michoacán and Mexico; *Pinus*; 2.5–4.0 mm ..... 13. ***ponderosae*** **Hopkins**

— Frons with a conspicuous, subacutely elevated carina in both sexes, its lower end forming a distinct tubercle; punctures on declivital striae 2 obsolete except minute on less than basal fourth; declivital sulcus not as deep, broader; Michoacán; *Pinus teocote*; 3.1–3.7 mm ..... 14. ***teocotum*** **Wood**

### 1. *Conophthorus monophyllae* Hopkins

*Conophthorus monophyllae* Hopkins, 1915, J. Washington Acad. Sci. 5:433 (Holotype, female; Ventura County, California; U.S. Nat. Mus., 7474)

DIAGNOSIS.— This species is distinguished from *edulis* Hopkins by the slightly larger size, by the black color, by the much smaller elytral punctures on disc and declivity, by the host, and by the distribution.

FEMALE.— Length 2.7–3.1 mm, 2.3 times as long as wide; color almost black.

Frons convex, a feeble transverse impression at level of antennal insertion; surface smooth, shining, punctures small,

rather sparse; vestiture short, sparse, inconspicuous.

Pronotum 1.06 times as long as wide; widest near base, sides on basal two-thirds weakly, arcuately converging to moderate constriction, rather broadly rounded in front; anterior margin irregularly armed by about 8–12 variable serrations; summit slightly behind middle; asperities not attaining base even in lateral areas; posterior areas smooth, shining, punctures rather coarse, deep, close. Vestiture of fine, rather short, moderately abundant hair.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on slightly more than basal half, then converging slightly and broadly rounded behind; striae not impressed except 1 moderately on posterior two-thirds, punctures rather small, deep, irregularly rather close; interstriae almost smooth, shining, three to four times as wide as striae, punctures slightly smaller than those of striae, closer and slightly confused on basal third, more sparsely uniseriate on posterior half. Declivity steep, convex, shallowly bisulcate; striae 1 impressed, punctures on 1 and 2 smaller than on disc, distinctly impressed; interstriae 1 distinctly elevated, with a few fine punctures, 2 moderately impressed, ascending slightly laterally, lateral convexities slightly higher than suture, their summits at striae 3, punctures on interstriae 3 mesad of summit, very feebly granulate. Strial setae minute, usually abraded; interstrial hair of moderate length except short on 1 on declivity.

MALE.— Apparently identical to female.

DISTRIBUTION.— California to W Utah.

USA: **California**: Whitney Portal in Inyo Co., Baldwin Lake and San Bernardino N.F. in San Bernardino Co., Ventura Co. **Nevada**: Baker, Reno. **Utah**: Iron Co., Sawtooth N.F. in Box Elder Co.

HOST.— *Pinus monophylla.*

BIOLOGY.— Because new attacks occur in the spring and fall and both larvae and adults overwinter in the cones, it is presumed that one or more overlapping generations occur.

NOTES.— The above treatment was based on the holotype and on 19 other specimens.

### 2. *Conophthorus cembroides* Wood

*Conophthorus cembroides* Wood, 1971, Great Basin Nat. 31:74 (Holotype, male; Miller Canyon, Huachuca Mts., Arizona; Wood Coll.)

DIAGNOSIS.— This species is distinguished fro m*edulis* Hopkins by the smaller average size of punctures on the pronotum and elytra, by the less strongly impressed interstriae 2 on the declivity, by the slightly impressed frons, by the host, and by the distribution.

FEMALE.— Length 2.2–2.5 mm, 2.3 times as long as wide; color very dark brown, elytra reddish brown.

As in *edulis* except frons more distinctly impressed, median epistomal tubercle averaging larger, punctures on frons, pronotum, and elytra slightly smaller, discal interstriae 2 more sparsely punctured, declivital interstriae 2 less strongly impressed.

MALE.— Similar to female except frontal impression stronger.

DISTRIBUTION.— Arizona to Hidalgo.

USA: **Arizona**: Miller Canyon, Huachuca Mts., 8-VIII-62, *Pinus cembroides*, S. L. Wood. MEXICO: **Coahuila**: 53 km SE Saltillo, 25-VII-63, A. T. Howden. **Hidalgo**: Zimapan, 12-VI-60, *P. cembroides*, F. Islas.

HOST.— *Pinus cembroides.*

NOTES.— The above treatment was based on the type series of 17 specimens and on 2 other specimens.

### 3. *Conophthorus edulis* Hopkins

*Conophthorus edulis* Hopkins, 1915, J. Washington Acad. Sci. 5:430 (Holotype, female; Las Vegas Hot Springs, New Mexico; U.S. Nat. Mus., 7472)

DIAGNOSIS.— This species is distinguished by the comparatively small size, by the coarse punctures on declivital striae 1 and 2, by the shallow, broad, declivital sulcus, by the absence of granules on declivital interstriae 3, by the host, and by the distribution.

FEMALE.— Length 2.3–3.0 mm, 2.3 times as long as wide; color dark brown, elytra reddish brown.

Frons and pronotum as in *monophyllae* except punctures on disc not as close, slightly smaller.

Elytra similar to *monophyllae* except strial punctures on disc larger, interstriae two to

two and one-half times as wide as striae, interstrial punctures almost as large as those of striae, declivital striae 1 and 2 with punctures almost as coarse as those on disc and conspicuously larger than in *monophyllae*, vestiture slightly longer.

MALE.— Similar to female except weak transverse frontal impression stronger, extending from epistoma to upper level of eyes.

DISTRIBUTION.— Utah and Colorado to Arizona and W Texas.

USA: **Arizona**: Chiricahua Mts., Kaibab N.F., Santa Catalina Mts., Tucson, Walnut Canyon. **Colorado**: Buena Vista, Colorado Springs, El Paso, Ft. Garland, Trinidad, Ute Pass. **New Mexico**: Capulin, High Rolls, Las Vegas Hot Springs. **Texas**: Big Bend N.P. **Utah**: Beaver, Iron Co., Junction, Monticello.

HOST.— *Pinus edulis.*

BIOLOGY.— Apparently there is one generation per year; only adults overwinter.

NOTES.— The above treatment was based on the holotype and on 85 other specimens.

### 4. *Conophthorus radiatae* Hopkins

*Conophthorus radiatae* Hopkins, 1915, J. Washington Acad. Sci. 5:432 (Holotype, female; Pacific Grove, California; U.S. Nat. Mus., 7481)

DIAGNOSIS.— This species is distinguished from *ponderosae* Hopkins by the presence of a row of tubercles on declivital interstriae 1, by the absence of a low, median, subtuberculate elevation on the female epistoma, by the host, and by the distribution.

FEMALE.— Length 3.1–4.1 mm, 2.4 times as long as wide; color black.

Frons as in *ponderosae* except punctures much finer, median epistomal, subtuberculate elevation usually absent.

Pronotum as in *ponderosae.*

Elytra as in *ponderosae* except declivital interstriae 1 armed by a row of regularly spaced, fine granules, 2 much narrower, about twice as wide as 1, tubercles on 3 usually slightly larger.

MALE.— Similar to female except transverse impression on frons slightly deeper, declivital interstriae 2 more strongly impressed, tubercles on declivital interstriae 3 smaller.

DISTRIBUTION.— California.

USA: **California**: Aptos, Correlitas, and Watsonville in Santa Cruz Co.; Aromas, Asilomar, Pt. Lobos S.P., Pacific Grove, and Prunedale in Monterey Co.; Strawberry Hills in Alameda Co.; Tunitas Creek in San Mateo Co.

HOST.— *Pinus radiata.*

BIOLOGY.— Overwintered adults emerge from the broad cone in late February or March and attack two-year-old cones. The female enters the cone near the pedicel on the lower side, bores about 1.5 cm, then constructs a spiral tunnel around the central axis, following which she bores parallel to the axis to near the apex of the cone then turns and bore on the opposite side of the axis toward the base. The cone turns brown and shrinks to two-thirds of normal size. Eggs (1–30) are placed in niches along the tunnel walls and mature in about 40–60 days. Parent adult females may emerge and attack a second cone. There is one generation per year (Schaeffer 1962, 1963, 1964).

NOTES.— The above treatment was based on the holotype and on 74 other specimens.

### 5. *Conophthorus echinatae* Wood

*Conophthorus echinatae* Wood, 1978, Great Basin Nat. 38:398 (Holotype, female; Winona, Missouri; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *coniperda* (Schwarz) by the smaller size, by the more slender form, by the more strongly arched elytral declivity, by the coarser pronotal and elytral punctures, and by the weaker transverse frontal impression.

FEMALE.— Length 2.3–2.5 mm, 2.5 times as long as wide; color very dark brown.

Frons as in *coniperda* except transverse impression between epistoma and upper level of eyes not as deep.

Pronotum as in *coniperda* except punctures on disc and near base larger, their lateral margins almost never bearing a granule.

Elytra as in *coniperda* except punctures larger; interstriae two and one-half to three times as wide as striae, declivital sulcus narrower and less strongly impressed, vestiture averaging slightly longer.

MALE.— Similar to female except lower half of frons with a distinct, median, subcarinate summit.

DISTRIBUTION.— Missouri.

USA: **Missouri**: Winona, VIII-1967, *Pinus echinata* cone.

NOTES.— The above treatment was based on the type series of seven specimens.

### 6. *Conophthorus coniperda* (Schwarz)

Fig. 208

*Pityophthorus coniperda* Schwarz, 1895, Proc. Ent. Soc. Washington 3:144 (Lectotype, male; Marquette, Michigan; U.S. Nat. Mus.; designated by Wood, 1978, Great Basin Nat. 38:384.)

*Conophthorus clunicus* Hopkins, 1915, J. Washington Acad. Sci. 5:432 (Holotype, female; 13, 122, Tomicus clunicus Fitch, Det. No. 12 Hopk., Collection Fitch; U.S. Nat. Mus.); Wood, 1977, Great Basin Nat. 37:384. *Synonymy*

*Conophthorus taedae* Hopkins, 1915, J. Washington Acad. Sci. 5:431 (Holotype, sex?; Ft. Monroe, Va.; U.S. Nat. Mus., 7473.); Wood, 1977, Great Basin Nat. 37:385. *Synonymy*

DIAGNOSIS.— This species is distinguished by the comparatively small size, by the steep elytral declivity, by the presence of tubercles on declivital interstriae 1, by the host, and by the distribution.

FEMALE.— Length 2.4–3.0 mm, 2.3 times as long as wide; color almost black.

Frons convex, with a very weak, transverse impression from epistoma to upper level of eyes; surface smooth, shining, punctures rather sparse, moderately coarse; vestiture rather short, sparse, inconspicuous.

Pronotum essentially as in *radiatae* Hopkins.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; essentially as in *radiatae* except punctures closer, declivity much steeper. Declivital striae 1 and 2 with fine, distinct punctures; interstriae 1 distinctly elevated, armed by a row of fine granules, 2 moderately impressed, about three times as wide as 1, with numerous impressed points, 3 weakly elevated, armed at summit by a few fine tubercles.

MALE.— Similar to female except frons more strongly impressed, punctures evidently coarser, median epistomal tubercle more strongly raised.

DISTRIBUTION.— Minnesota and Maine to North Carolina.

CANADA: **Ontario**: Algonquin Park, Angus, Haley Station, Hurkett, Ottawa, Simcoe. **Quebec**: Lanorare, Quebec. **Nova Scotia**: Hants Co. USA: **Maine**: Bangor, Orono. **Massachusetts**: Cambridge, Framingham, Marion, Martha's Vineyard, Petersham. **Maryland**: Ashton. **Michigan**: Bear Lake, Eagle Harbor, Marquette. **Minnesota**: Chippewa Falls, Filmore Co., St. Anthony. **New Hampshire**: Durham, Pike. **New Jersey**: Clemonton, Greenwood, Lakehurst, Orange Mt. **New York**: Ithaca, Olcott, Upper Jay, Westbury, West Point. **North Carolina**: Henderson. **Pennsylvania**: Cooks Forest, Mt. Alto. **Virginia**: Culpepper, Monroe, Norfolk. **Wisconsin**: Clintonville.

HOST.— *Pinus strobus*, accidental in other hosts.

BIOLOGY.— Specimens were taken from cones of the host.

NOTES.— The above treatment was based on the lectotype of *coniperda*, on the holotypes of *clunicus* and *taedae*, and on 113 other specimens.

### 7. *Conophthorus banksianae* McPherson

*Conophthorus banksianae* McPherson, 1970, *in* McPherson, Stehr, and Wilson, Canadian Ent. 102:1020 (Holotype, male; Fife Lake, Michigan; Michigan State Univ. Coll.)

DIAGNOSIS.— This species is distinguished from *resinosae* Hopkins by the habit of infesting twig terminals rather than cones and by the host.

FEMALE.— Length 2.4–2.9 mm, 2.3 times as long as wide; color almost black.

Identical to *resinosae* except elytral hair evidently slightly longer.

MALE.— Similar to female except sexes differing as in *coniperda*.

DISTRIBUTION.— Ontario to Wisconsin and Michigan.

CANADA: **Ontario**: Black Sturgeon Lake, Oba, Franz, Sault Ste. Marie. **Michigan**: Cadillac, Christensen Nursery, Fife Lake, Fish Lake, Grand Traverse Co., Kalkaska Co., Wellston, Wexford Co. **Minnesota**: Cass Lake, Itasca Co. **Wisconsin**: Three Lakes.

HOST.— *Pinus banksiana*.

BIOLOGY.— This species was originally distinguished entirely on the basis of its habits. Its bores into the pith of its host's twig terminals.

NOTES.— The above treatment was based on 14 paratypes and on 27 other specimens. This could be a valid species, but identifying anatomical characters that distinguish it from *resinosae* have not been found. Of the 41 specimens examined, the largest was 2.9 mm in length. Of 66 specimens of *resinosae* measured, all but 4 were larger than 3.0 mm. Nevertheless, it is noted that *resinosae* may

also breed in twigs. The less favorable habitat and abnormal host could account for the size difference in what is here recognized as *banksianae*. Additional studies are needed to confirm its validity.

### 8. *Conophthorus resinosae* Hopkins
Fig. 201

*Conopthorus resinosae* Hopkins, 1915, J. Washington Acad. Sci. 5:431 (Holotype, male; Conoph. resinosae Hopkins, 1 Harring., Conophthorus resinosae; U.S. Nat. Mus., 7483)

*Conophthorus virginianae* Hopkins, 1915, J. Washington Acad. Sci. 5:431 (Holotype, male, not a female as labeled; Huttonsville, West Virginia; U.S. Nat. Mus., 7482); Wood, 1977, Great Basin Nat. 37:385. *Synonymy*

DIAGNOSIS.— This species is distinguished from *coniperda* (Schwarz) by the larger average size, by the slightly longer elytral setae, by the more closely spaced interstrial punctures on the disc, and by the smaller punctures on declivital striae 2.

FEMALE.— Length 2.6–3.4 mm (95 percent are larger than 3.0 mm), 2.3 times as long as wide; color almost black.

As in *coniperda* except as noted in diagnosis and key.

MALE.— Sexual differences as in *coniperda*.

DISTRIBUTION.— Minnesota and Wisconsin to New Hampshire and New Jersey.

CANADA: **Ontario**: Burnt River, Camp Borden, Carp, Chalk River, Dorset, Luden, Midland, Parry Sound, Sault Ste. Marie, Temagami. **Quebec**: Laniel, Kazubazua, Park Reserve. **Nova Scotia**: Kentville. USA: **Michigan**: Keweeno Co., Raco. **Minnesota**: Cass Lake, Itasco Co. **New Hampshire**: Effingham. **New Jersey**: Greenwood Lake. **New York**: East Hampton, Farmingdale. **West Virginia**: Huttonsville. **Wisconsin**: Chippewa Falls.

HOST.— *Pinus resinosa*.

BIOLOGY.— This species breeds in the cones of its host, less commonly in twigs.

NOTES.— The above treatment was based on the holotypes of *resinosae* and *virginianae* and on 166 other specimens.

### 9. *Conophthorus mexicanus* Wood

*Conophthorus mexicanus* Wood, 1962, Great Basin Nat. 22:79 (Holotype, male, Necaxa, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *ponderosae* Hopkins by the larger average size, by the much more strongly impressed elytral declivity, by the smaller elytral punctures, and by the absence of a median epistomal elevation in the female.

FEMALE.— Length 3.3–4.1 mm, 2.3 times as long as wide; color very dark brown.

Frons largely concealed in only available female (allotype), apparently much more strongly convex than *ponderosae*, a weak, transverse impression near upper level of eyes; surface smooth, shining, punctures smaller and slightly closer than in *ponderosae*.

Pronotum about as in *ponderosae* except lateral crenulations extending to base, margins of punctures on disc each bearing a tubercle, vestiture more abundant.

Elytra 1.3 times as long as wide, 1.7 times as long as pronotum; striae 1 weakly, others not impressed, punctures rather fine, moderately close, in poorly defined rows; interstriae about four times as wide as striae, punctures as large and as close as those of striae, in poorly defined rows, largely confused on basal third. Declivity steep, rather strongly sulcate; striae 1 and 2 almost obsolete, fine punctures obscure; interstriae 1 moderately elevated, usually with tubercles only at extreme base and one just before apex, 2 strongly impressed, three times as wide as 1, shining, surface not smooth, almost subrugose in some specimens, 3 much higher than 1, armed at summit by about eight rather coarse tubercles. Vestiture slightly more abundant than in related species.

MALE.— Similar to female except declivital tubercles apparently slightly larger.

DISTRIBUTION.— Puebla.

MEXICO: **Puebla**: Necaxa, 17-III-60, ex cono, J. Carillo.

NOTES.— The above treatment was based on the type series of six specimens and on three other topotypic specimens.

### 10. *Conophthorus conicolens* Wood

*Conophthorus conicolens* Wood, 1977, Great Basin Nat. 37:212 (Holotype, female; 8 miles or 13 km W Texmelucan, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *ponderosae* Hopkins by the convex profile of the frons, by the absence of a median epistomal tubercle or carina in either sex, by the presence of numerous impressed points on the elytral disc, and by the slightly deeper declivital sulcus, with the lateral convexities

very slightly higher than the suture and armed by slightly larger tubercles; margins of punctures on pronotal disc usually less conspicuously subasperate. From *mexicanus* Wood it is distinguished by the larger elytral punctures and by the much less strongly sulcate declivity, with the lateral convexities only slightly higher than the suture and the tubercles much smaller.

FEMALE.— Length 3.3–3.8 mm, 2.2 times as long as wide; color very dark brown.

Frons and pronotum as in *mexicanus*, crenulations on pronotal disc distinctly smaller.

Elytra about as in *ponderosae* except numerous minute, impressed points present on disc, discal punctures slightly larger, slightly confused, declivital sulcus slightly deeper, lateral convexities very slightly higher than suture, and lateral tubercles very slightly larger. Some specimens with surface of disc undulating conspicuously, other smooth.

MALE.— Similar to female except punctures on frons evidently slightly larger.

DISTRIBUTION.— Hidalgo and Mexico to Puebla.

MEXICO: **Hidalgo**: Tulancingo, 24-VI-53, pine cones, S. L. Wood. **Mexico**: Tlalmonalco, 24-IX-49, *Pinus leiophylla*, #13A, J. P. Perry. **Puebla**: 13 km W Texmelucan, 13-VI-67, *Pinus* cones, S. L. Wood.

HOST.— *Pinus leiophylla*.

BIOLOGY.— All specimens were taken from cones of the host.

NOTES.— The above treatment was based on the type series of 18 specimens.

### 11. *Conophthorus apachecae* Hopkins

*Conophthorus apachecae* Hopkins, 1915, J. Washington Acad. Sci. 5:432 (Holotype, male; Chiricahua Mts., Arizona; U.S. Nat. Mus., 7484)

DIAGNOSIS.— This species is distinguished from *ponderosae* Hopkins by the larger size and by other characters indicated below.

MALE.— Length 3.7–3.9 mm, 2.3 times as long as wide; color dark brown.

Frons convex, a weak median summit on lower half, elevation absent.

Pronotum about as in *ponderosae* except more broadly arched, punctures on disc distinctly larger.

Elytra about as in *ponderosae* except discal surface slightly irregular (ripples occur on disc corresponding to positions of interstrial punctures; this character is variable), punctures deeper; declivity more strongly impressed, lateral convexities higher than suture, vestiture distinctly longer.

FEMALE.— Similar to male except frontal summit not evident.

DISTRIBUTION.— Arizona.

USA: **Arizona**: Chiricahua Mts., 6-VI, Hubbard and Schwarz; Madera Canyon, Santa Rita Mts., 1-VI-78, *Pinus engelmannii*, S. L. Wood.

HOST.— *Pinus engelmannii*.

NOTES.— The above treatment was based on the holotype, and on six other specimens.

### 12. *Conophthorus michoacanae* Wood

*Conophthorus michoacanae* Wood, 1980, Great Basin Nat. 40:354 (Holotype, male; Uruapan, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *apachecae* Hopkins by the more slender body, by the less densely punctured, smoother basal half of the elytral disc, by the broader, more gradual elytral declivity, and by other characters cited below.

MALE.— Length 3.9–4.2 mm, 2.4 times as long as wide; color very dark reddish brown.

Frons as in *apachecae* except never with a median crest or tubercle, a weak, transverse impression usually present on upper half of median half of area below upper level of eyes.

Pronotum essentially as in *apachecae* except slightly more slender.

Elytra resembling *apachecae* except 1.48 times as long as wide; discal striae with punctures not as close, mostly in rows, interstriae sparsely punctured, punctures only slightly confused on basal fifth, surface smooth, not wrinkled; declivity not as steep, less strongly arched, sulcus deeper and much wider, tubercles on interstriae 3 very small (less strongly arched and more broadly sulcate than in *ponderosae*); vestiture less abundant, slightly coarser.

FEMALE.— Similar to male in all respects.

DISTRIBUTION.— Michoacán.

MEXICO: **Michoacán**: Uruapan, II-80, *Pinus michoacana* cones, A. A. del Río Mora.

NOTES.— The above treatment was based on the type series of seven specimens.

### 13. *Conophthorus ponderosae* Hopkins
Figs. 203–204, 209

*Conophthorus ponderosae* Hopkins, 1915, J. Washington Acad. Sci. 5:431 (Holotype, female; Ashland, Oregon; U.S. Nat. Mus., 7479)

*Conophthorus scopulorum* Hopkins, 1915, J. Washington Acad. Sci. 5:431 (Holotype, female; Flagstaff, Arizona; U.S. Nat. Mus., 7480); Wood, 1977, Great Basin Nat. 37:385. *Synonymy*

*Conophthorus contortae* Hopkins, 1915, J. Washington Acad. Sci. 5:432 (Holotype, female; Newport, Oregon; U.S. Nat. Mus., 7476); Wood, 1977, Great Basin Nat. 37:385. *Synonymy*

*Conophthorus monticolae* Hopkins, 1915, J. Washington Acad. Sci. 5:432 (Holotype, female; Priest River, Idaho; U.S. Nat. Mus., 7477); Wood, 1977, Great Basin Nat. 37:385. *Synonymy*

*Conophthorus flexilis* Hopkins, 1915, J. Washington Acad. Sci. 5:433 (Holotype, female; Mount Manitou, Colorado U.S. Nat. Mus., 7475); Wood, 1977, Great Basin Nat. 37:385. *Synonymy*

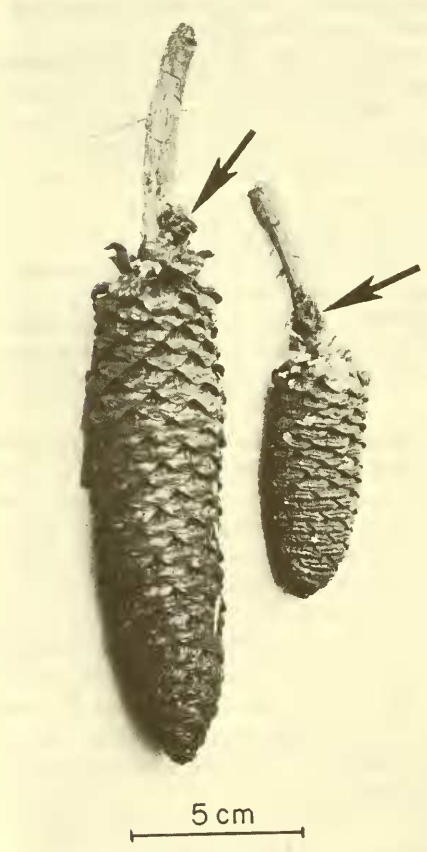



Fig. 203. Immature cones of sugar pine attacked by *Conophthorus ponderosae*. The arrows point to pitch tubes. (After Bedard 1968:3.)

*Conophthorus lambertianae* Hopkins, 1915, J. Washington Acad. Sci. 5:433 (Holotype, female; Hilt, California; U.S. Nat. Mus., 7478); Wood, 1977, Great Basin Nat. 37:385. *Synonymy*

DIAGNOSIS.— This species is distinguished by the absence of tubercles on the lower two-thirds of declivital interstriae 1, by the lateral convexities on the declivity being much higher than the suture, by the presence of a low, median, epistomal elevation in the female, by the host, and by the distribution.

FEMALE.— Length 2.5–4.0 mm, 2.4 times as long as wide; color very dark brown, elytra often brown.

Frons transversely convex, longitudinally very weakly concave from epistoma to upper level of eyes; epistoma with a median summit, usually with a conspicuous, low tubercle, often with an obscure, low carina extending dorsad; surface smooth, shining, punctures rather sparse, of moderate size; vestiture inconspicuous.

Pronotum about as long as wide; as in *radiatae* Hopkins and *resinosae* Hopkins, disc longer and less strongly arched longitudinally than in *mexicanus* Wood, discal punctures rather coarse, margins not subasperate.

Elytra 1.6 times as long as wide, 1.7 times as long as pronotum; striae not impressed except 1 near declivity, punctures rather coarse, deep, mostly in rows; interstriae two to three times as wide as striae, smooth, shining, without impressed points, punctures rather sparse, closer and confused toward base. Declivity steep, convex, broadly, shallowly bisulcate; punctures on striae 1 and 2 smaller than on disc, distinct; interstriae 1 moderately elevated, unarmed except a few fine tubercles at base and one near apex, 2 broadly, moderately impressed, three times as wide as 1, surface shining, with numerous obscure, minute impressed points, 3 distinctly elevated, as high as 1, tubercles very fine to moderately coarse. Vestiture as in allied spe cies, not abundant.

MALE.— Similar to female except frontal tubercle usually absent, transverse impression often more pronounced.

DISTRIBUTION.— British Columbia and Montana to Michoacán and Mexico.

CANADA: **British Columbia**: Castlegar, Cobble Hill, Cowichan Lake on Vancouver Island, Crawford Bay, Vancouver. USA: **Arizona**: Flagstaff, Kaibab N.F., Santa

Catalina Mts. **California**: Alameda Co., Barton Flat in San Bernardino Co., Big Meadows in Calaveras Co., Cypress Camp in Lassen Co., Dead Horse Summit in Siskiyou Co., Fallen Leaf Lake in El Dorado Co., Hilt, Lake Co., Madera Co., Mariposa Co., Mendocino Co., Modoc Co., Mono Co., Norval Flats, North Fork, Pine Crest, Placerville, Shaver Lake, Plumas Co., Riverside Co., San Diego Co., Santa Barbara Co., Shasta Co., Tehama Co., Tulare Co., Tuolumne Co., Yosemite N.P. **Colorado**: Buena Vista, Boulder, Cheyenne Mts., Crystal Springs, Colorado Springs, Estes Park, Evergreen, Larkspur, La Veta Pass, Longmont, Monument, Mountain Home, Mt. Manitou, Woodland Park. **Idaho**: Bannock Creek in Boise Co., Bonner Co., Coeur d'Alene, Emida, Idaho City, Mica, Priest Lake. **Montana**: Lodgegrass. **Nebraska**: Nenzel, Valentine. **Nevada**: Baker, Mt. Rose. **New Mexico**: Cloudcroft, Gila N.F., Lincoln N.F., Silver City. **Oregon**: Ashland, Colestein, Ferrin G.S., Frederick, Jennie Creek, Klamath, Mistletoe, Pinehurst, Talent, Tollgate, Waldo. **Utah**: Beaver, Dutch John, Huntington Canyon, Logan Canyon. **Washington**: Longmires, Pullman. **Wyoming**: Centennial, Saratoga, Shell. MEXICO: **Durango**: El Salto. **Mexico**: Zoquiapan N.P. **Michoacán**: Uruapan.

HOSTS.— *Pinus aristata, P. contorta, P. douglasiana, P. durangensis, P. flexilis, P. jeffreyi, P. lambertiana, P. leiophylla, P. montezumae, P. monticola, P. strobiformis, P. washoensis.*

BIOLOGY.— Second-year cones are attacked near their base. The parent adults make a spiral tunnel around the axis of the cone, causing its death, then form an egg tunnel along the axis. The attack apparently begins in May and continues until early July. One female evidently may attack more than one cone. The brood matures in late summer and overwinters in the brood cone.

NOTES.— The above treatment was based on the holotypes of *ponderosae, scopulorum, contortae, monicolae, flexilis,* and *lambertianae,* and on 784 other specimens. The variability in this material is difficult to interpret. It is entirely possible that two or more sibling species are represented. The material from five-needle pines could be different.

### 14. *Conophthorus teocotum* Wood

*Conophthorus teocotum* Wood, 1980, Great Basin Nat. 40:354 (Holotype, male; Uruapan, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *ponderosae* Hopkins by the subacutely elevated median carina on the lower half of the frons in both sexes, by the totally obsolete punctures on declivital striae 2 except near base, and by other characters cited below.

MALE.— Length 3.1–3.7 mm, 2.3 times as long as wide; color very dark brown.

Frons weakly, transversely impressed as in *ponderosae*; median line on more than lower half with a conspicuous, subacutely elevated carina, end of carina somewhat tuberculate near epistomal margin.

Pronotum as in *ponderosae* except asperities averaging smaller, serrations on anterior margin usually reduced, impressed points rather numerous and sharply, distinctly impressed.

Elytra as in *ponderosae* except punctures on declivital striae 2 obsolete (sometimes resent on less than basal fourth), declivity more broadly, slightly less strongly impressed, tubercles on declivital interstriae 3 slightly larger.

FEMALE.— Similar to male except transverse frontal impression more extensive, slightly more conspicuous, carina slightly shorter.

DISTRIBUTION.— Michoacán.

MEXICO: **Michoacán**: Uruapan, III-80, *Pinus teocote* cones, A. A. del Río Mora.

NOTES.— The above treatment was based on the type series of four specimens.

## GENUS *PITYOPHTHORUS* EICHHOFF

*Pityophthorus* Eichhoff, 1864, Berliner Ent. Zeitschr. 8:39 (Type-species: *Bostrichus lichtensteini* Ratzeburg, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:127)

*Trigonogenius* Hagedorn, 1912, Deutsche Ent. Zeitschr. 1912:354 (Type-species: *Trigonogenius fallax* Hagedorn, monobasic); Schedl, 1952, Dusenia 3:347. *Synonymy*

*Hagedornus* Lucas, 1920, Cat. Alphabet. Gen. Subgen. Coleopt. 1:683. Replacement name for *Trigonogenius*; Schedl, 1952, Dusenia 3:347. *Synonymy*

*Myeloburus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:16 (Type-species: *Pityophthorus ramiperda* Swaine, original designation); Bright, 1977, Canadian Ent. 109:511. *Synonymy*

*Gnathophorus* Schedl, 1935 (nec Kirby, 1837), Rev. de Ent. 5:342 (Type-species: *Gnathophorus sparsepilosus* Schedl, monobasic); Wood, 1975, Great Basin Nat. 35:391. *Synonymy*

*Pityophthoroides* Blackman, 1942, Proc. U.S. Nat. Mus. 92:199 (Type-species: *Pityophthoroides pudens* Blackman, original designation); Wood, 1977, Great Basin Nat. 37:207. *Synonymy*

*Cladoborus* Sawamoto, 1942, Insecta Matsum. 16:165 (Type-species: *Cladoborus arakii* Sawamoto); Bright, 1977, Canadian Ent. 109:511. *Synonymy*

*Ctenyophthorus* Schedl, 1955, Zeit. Angew. Ent. 38:26 (Type-species: *Ctenyophthorus glabratulus* Schedl, monobasic); Bright, 1977, Canadian Ent. 109:511. *Synonymy*

*Gnathophthorus* Wood, 1962, Great Basin Nat. 22:76 (Replacement name for *Gnathophorus*); Wood, 1975, Great Basin Nat. 35:391. *Synonymy*

DIAGNOSIS.— This large, diversified genus is distinguished from *Araptus* Eichhoff by the equally, partly or entirely septate sutures 1 and 2 on the antennal club (sutures sometimes marked only at margins; club small and sutures straight when septa almost obsolete), by the reduction or absence of denticles or rugae on the lateral margin of the basal half of the protibia, by the (usually) distinct transverse impression behind the pronotal summit, and by a different assortment of habits.

DESCRIPTION.— Length 0.8–3.2 mm, 2.0–3.4 times as long as wide; color yellowish brown to almost black.

Frons usually sexually dimorphic, male convex to variously impressed, with or without a carina, female convex to concave, commonly ornamented by a tuft of hair. Antennal

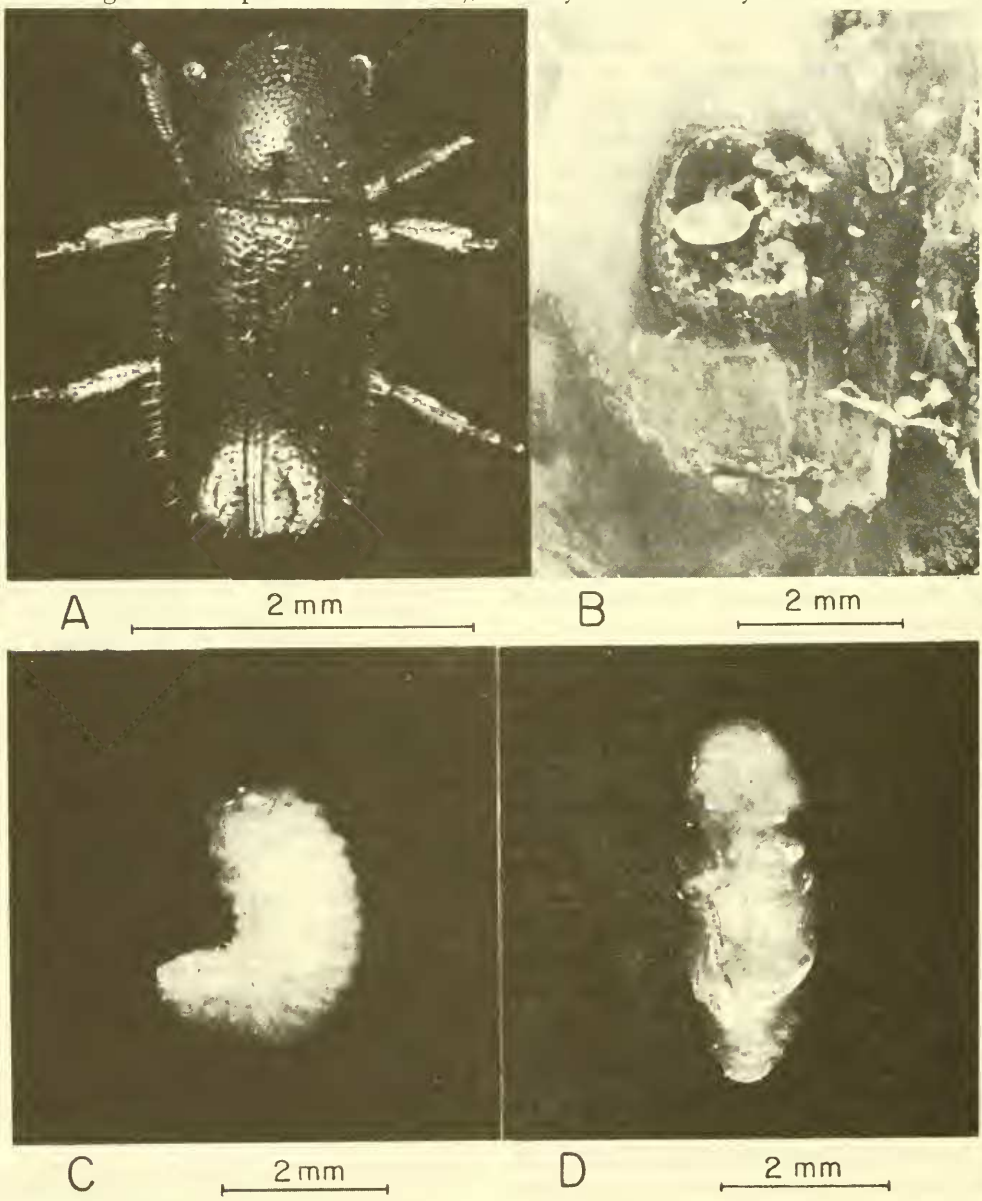



Fig. 204. *Conophthorus ponderosae*: A, adult; B, egg; C, larva; D, pupa. (After Bedard 1968:6.)

scape slender, elongate; funicle 5-segmented (except 3–5 segmented in *costatus* Wood), usually about as long as scape; club subcircular to elongate-oval, of moderate size, sutures 1 and 2 straight to rather strongly procurved, partly to entirely, equally septate (when septa strongly reduced, sutures straight and club comparatively small). Pronotum usually elongate, summit usually near middle, usually with a transverse impression behind summit; asperities usually on a definite area on anterior half; lateral margins with a fine, raised line. Scutellum rather large, flat. Elytra usually striate, punctures confused in some species groups; declivity moderately to very steep, convex to strongly bisulcate. Anterior tibiae usually armed by two denticles on apical margin and one subapical denticle on lateral margin. Supplemental rugae on lateral margin sometimes on distal half.

DISTRIBUTION.— Alaska to Argentina, temperate Europe and Asia, Africa; 213 species occur in North and Central America, about 50 in South America, and about 50 in the remainder of the world.

BIOLOGY.— Many of the more primitive species are monogamous; most of the more advanced species are polygynous. A few species breed in the bole of the host; others characteristically infest unthrifty seedlings, shaded out branches, injured tops, slash or broken branches, or the pith of green twigs. A few ubiquitous species may spread into several of these habitats; others are rigidly restricted to one of them. Most species infest the phloem, where the parental tunnels are visible on the inner surface of peeled bark; others occur only in the central axis of pith in tiny twigs. The parental tunnels of most species are of the radiate type; however, some pith-boring species construct a simple, uniramous tunnel. All species deposit their eggs in niches.

NOTES.— The exact limits of *Pityophthorus* are somewhat obscure. A certain amount of intergradation with *Araptus* occurs, but I am unable to justify synonymy of them. *Conophthocranulus* almost certainly should be made a synonym; Conophthorus, Gnatholeptus, and *Pityotrichus* all contain distinctive species groups, but there is a question as to their validity as genera. All four are tentatively given generic status here, but future collecting and study may modify the classification of them.

NOTE ADDED IN PRESS: In 1965, D. E. Bright undertook a revisional study of *Pityophthorus* in order that his study might become part of this treatise. Our schedule asked that it be completed by 1970. In the early to mid-1970s, I was informed that he had abandoned the study and it was left to me to prepare the revision of this genus. When my study was nearing completion, his study was revived. He examined the entire manuscript of this treatise prior to submission of his manuscript (Bright 1981); I examined his manuscript after my manuscript was submitted for publication. We have attempted to work closely together, but some inconsistencies, differences of opinion in interpretation, and oversights remain. Still, it is felt that both treatments are valuable contributions to our knowledge of this large and very difficult group.

## Key to the Species of *Pityophthorus*

1. Pronotal asperities confused; punctures on declivital striae 1 and 2 rather small or obsolete; male frons usually with a definite longitudinal or transverse carina; on coniferous and broadleaf hosts ..... 2

— Asperities on anterior slope of pronotum between anterior margin and summit arranged into two or more definite, concentric rows, adjacent asperities within a row usually basally contiguous (if doubtful, then declivital striae 1 and 2 with punctures rather strongly impressed); male frons either without a definite carina or with a transverse carina; sutural apex of elytra never acuminate (see also couplet 136); rarely on coniferous hosts ..... 164

2(1). Elytral apex obtusely rounded at suture (see also *accuminatus*, *sparsepilosus*, tropical); male frons either without a carina, with a longitudinal carina, or with a poorly developed transverse carina (in which case interstrial punctures absent on disc); when declivity sulcate, punctures on striae 1 and 2 usually obsolete if on coniferous hosts (except *nocturnus*) ..... 3

— Elytral apex moderately to strongly acuminate, when acumination poorly developed, punctures on elytral disc confused (except *sparsepilosus*) and male frons with a conspicuous transverse carina at upper level of eyes ..... 136

3(2). Tropical species in nonconiferous hosts; female frons unmodified, without a tuft of hair, except a small tuft in *pudicus* and *inceptis*, male frons never with a carina of any kind (a subcarinate crest in *elegans*); declivital sculpture usually conservative, with punctures on striae 2 distinct ..... 4

— Temperate and tropical species, mostly in conifers or *Quercus*; female frons modified from that of male, almost always with a tuft of long setae, male frons either with or without a carina, almost always conspicuously different from female (except *ramiperda* group, *lecontei*); declivital sculpture variable ..... 16

4(3). Elytral declivity convex, interstriae 3 never armed by granules ..... 5

— Elytral declivity rather shallowly to strongly bisulcate, interstriae 2 impressed and without punctures or granules, 3 armed by small granules in male and usually also in female ..... 10

5(4). Pronotal asperities low, costiform, length of some equal to more than one-fourth width of pronotum; pronotal disc strongly reticulate, punctures fine, sparse; elytra with numerous impressed points, strial punctures small, rather shallow; Costa Rica; woody vine; 1.1–1.2 mm ..... 1. ***costatus*** **Wood**

— Pronotal asperities normal, short, not costiform; pronotal disc rather weakly reticulate, coarsely punctured; elytra with points inconspicuous or absent, strial punctures rather coarse and deep; larger species ..... 6

6(5). Smaller; declivital striae 1 and 2 not impressed, punctures smaller; female frons ornamented by a conspicuous tuft of long hair ..... 7

— Larger; declivital striae 1 and 2 weakly to moderately impressed, punctures rather coarse; female frons with vestiture sparse, inconspicuous ..... 8

7(6). Punctures on pronotum and elytra smaller; male frons less strongly convex; Jalisco; *Sambucus*; 1.3–1.5 mm ..... 2. ***pudicus*** **Blackman**

— Punctures on pronotum and elytra coarser; male frons more strongly convex; Michoacán to Jalisco; 1.5–1.6 mm (generic placement doubtful) ..... 3. ***exquisitus*** **(Blackman)**

8(6). Pronotum rugose-reticulate, rugae on posterior half coarser; elytral surface wrinkled, punctures slightly confused; Chiapas; *Quercus*; 1.7–2.0 mm ..... 4. ***melanurus*** **Wood**

— Pronotal disc almost smooth and with etched, impressed points or reticulate, rugae smaller or absent, less numerous; elytral surface smooth or nearly so ..... 9

9(8). Pronotum smooth, shining; strial punctures coarser, deeper, interstriae on disc smooth, about twice as wide as striae; declivital interstriae 2 with setae; Hidalgo to Veracruz; *Alnus*; 2.0–2.4 mm ..... 5. ***alni*** **Blackman**

— Pronotum reticulate, dull; strial punctures very small, shallow, interstriae with numerous impressed lines, three or more times as wide as striae; Oaxaca; *Alnus*; 1.5–1.7 mm ..... 6. ***alnicolens*** **Wood**

10(4). Head and pronotum smooth, shining; frons, at least in male, weakly to very strongly, transversely impressed ..... 11

— Head and pronotum reticulate; frons convex in both sexes ..... 15

11(10). Male frons very strongly, transversely impressed just below upper level of eyes; declivity shallowly sulcate, interstriae 3 rather weakly elevated ..... 12

— Male frons shallowly impressed; declivity very strongly bisulcate, interstriae 3 strongly elevated, rather coarsely tuberculate (except without tubercles in female *degener*) ..... 14

12(11). Very slender, 3.1 times as long as wide; declivity more broadly flattened on lower two-thirds, sulcus rather wide; male frons rather strongly, evenly, transversely impressed from epistoma to upper level of eyes; color light brown; Guatemala; 1.3 mm ..... 7. ***elegans*** **Schedl**

— Slender, 2.6–2.8 times as long as wide; declivity more convex, sulcus narrow; male frons more irregularly impressed; color dark brown ..... 13

13(12). Larger; pronotal punctures averaging larger; punctures on female declivital interstriae 3 at least weakly granulate; declivital setae slightly longer, more slender; Panama; 1.8–2.0 mm ..... 8. ***timidulus*** **Wood**

— Smaller; pronotal punctures averaging smaller; punctures on female declivital interstriae 3 not granulate; declivital setae shorter, stouter; Costa Rica; 1.5–1.7 mm ..... 9. ***mendosus*** **Wood**

14(11). Median line reticulate to transversely etched from upper level of eyes to vertex; male frons somewhat irregular, lateral areas at least partly rugose, female frons finely punctured, finely pubescent; female declivital interstriae 1 and 3 unarmed; Panama; 1.7–2.0 mm (see also 11. ***punctiger*** **Schedl**, "Mexico," 1.7 mm) ..... 10. ***degener*** **Wood**

— Median line smooth, brightly shining from upper level of eyes to vertex; frons not sexually dimorphic, surface coarsely punctured, neither rugose nor of irregular sculpture; declivital interstriae 1 and 3 armed by tubercles in both sexes; Veracruz to Costa Rica; woody vine; 1.7–1.9 mm ..... 12. ***amiculus*** **Wood**

15(10). Frontal punctures fine; declivity with striae strongly impressed, surface of sulcus ascending from striae 1 to 2; Costa Rica to Panama; woody vine; 1.4–1.6 mm ..... 13. ***dissolutus*** **Wood**

— Frontal punctures coarse; declivital sulcus broad, deep, its surface on lower half not ascending from striae 1 to 2; Puebla woody vine; 1.5–1.7 mm ..... 14. ***explicitus*** **Wood**

16(3). Male frons unarmed or with a median carina between epistoma and upper level of eyes, those species having male carina poorly developed or absent with interstrial punctures on at least alternate discal interstriae or with all discal punctures confused; species with male frontal carina poorly developed, usually with declivital sulcus shallowly impressed, its margins weakly tuberculate and punctures on striae 2 visible (except margins spectacularly elevated in *cristatus*) ..... 17

— Male frons either with a transverse carina, a weak median carina above upper level of eyes, or, when absent, strial punctures in definite rows and discal interstriae devoid of punctures (except *medialis*) ..... 106

17(16). Male frons either with or without a median carina; female frons simple or pubescent, with or without a median carina; declivital interstriae 2 little if any wider than on disc, either not impressed or narrowly impressed only at or near striae 1, interstriae 1 and 3 usually devoid of granules, very minute granules present in two species; strial punctures very small, usually in rows, interstrial punctures sparse to obsolete; elytra usually with rather abundant, short setae of about equal length arising from strial and interstrial punctures; mostly smaller species ..... 18

— Male frons with or without a median carina; female frons simple or pubescent, never with a median carina; declivital interstriae 2 much wider than on disc, shallowly to rather strongly impressed, 1 and 3 usually with distinct tubercles; discal punctures confused or in rows, interstrial punctures absent and striae in definite rows only when male frons with a conspicuous median carina; mostly larger species with strial setae obsolete ..... 35

18(17). Anterior margin of pronotum armed by 14 serrations; long hair on female frons extending to vertex; Durango; *Pinus cooperi*; 1.3–1.5 mm ..... 15. ***thomasi*** **Bright**

— Anterior margin of pronotum armed by 2–8 serrations; hair on female frons never extending more than slightly above upper level of eyes ..... 19

19(18). Anterior margin of pronotum armed by six to eight denticles; female frons never ornamented by a tuft of long hair; male frons either with or without a median carina ..... 20

— Anterior margin or pronotum usually armed by two or four denticles (up to eight if female frons pubescent); female frons either with or without a tuft of long hair, when female hair present then male carina short, occupying about half distance from epistoma to upper level of eyes ..... 30

20(19). Frons with a sharply elevated median carina in both sexes, carina extending from epistomal margin at least to upper level of eyes ..... 21

— Either frons without a definite median carina in either sex or else male with short carina ..... 22

21(20). Elytral disc with punctures conspicuously smaller toward declivity, those on basal fourth strongly confused, interstrial punctures moderately abundant; British Columbia and Alberta to California and New Mexico; *Pinus*; 1.4–2.0 mm ..... 16. ***digestus*** **(LeConte)**

— Strial punctures on disc in rows to base, not conspicuously reduced in size posteriorly, interstrial punctures sparse to absent; pronotum at least partly reticulate on posterior areas; Arizona and Jalisco to Veracruz; *Pinus*; 1.3–1.6 mm ..... 17. ***festus*** **Wood**

22(20). Male carina absent; elytral disc with punctures confused; pronotal disc usually partly reticulate; Minnesota and Kansas to Nova Scotia and Virginia; *Pinus*, *Abies*; 1.2–1.5 mm ..... 18. ***puberulus*** **(LeConte)**

— Elytral punctures in distinct rows, interstrial punctures sparse or absent ..... 23

23(22). Strial punctures on disc coarse, interstriae only slightly wider than striae, only slightly smaller on declivity; female frontal vestiture short, male frons with small, subdentate, median carina on lower half; Veracruz; *Pinus*; 1.5–1.6 mm ..... 19. ***abstrusus*** **Bright**

— Strial punctures smaller, interstriae at least twice as wide as striae, punctures on declivity much smaller; frons variable ..... 24

24(23). Male carina usually absent or poorly defined; female body less than 2.6 times as long as wide; strial punctures larger, interstriae about twice as wide as striae; basal area of elytra not wrinkled; elytra smooth, brightly shining, declivity more strongly convex, sulcus not indicated (punctures of declivital striae 2 and 3 replaced in one species by minute granules similar to those of interstriae) ..... 25

— Male carina always present; female body more slender, 2.8 or more times as long as wide; strial punctures very small, interstriae about four or more times (only two times in *minus*) as wide as interstriae, discal surface often subreticulate; female frons punctured, with or without long hair; base of elytra usually wrinkled ..... 26

25(24). Female frons broadly convex, rather coarsely punctured, vestiture short, inconspicuous; declivital interstriae 2 indistinctly if at all impressed, punctures on 3 not granulate; California to New Mexico; *Pinus edulis, P. monophylla, P. quadrifolia*; 1.4–1.8 mm ..... 20. ***punctifrons*** **Bright**

— Female frons flat to plano-concave, impunctate and brightly shining, with a confused row of punctures on margins, punctures bearing a marginal row of long setae; median side of declivital interstriae 2 weakly impressed, on 3 minute granules replacing punctures; California and Baja California to Utah and Durango; *Pinus edulis, P. monophylla*; 1.5–1.8 mm ..... 21. ***modicus*** **Blackman**

26(24). Pronotal and elytral surfaces often obscurely articulate; discal interstriae impunctate; odd-numbered declivital interstriae with a few rather long setae; male frons reticulate, a definite median carina on lower half, its highest point at epistoma, female frons with rather sparse, moderately long, almost uniformly distributed setae to upper level of eyes ..... 27

— Pronotal and elytral surfaces smooth; at least some punctures on odd-numbered discal interstriae; declivital setae short; male frons never reticulate ... 28

27(26). Elytral declivity with interstriae 1 and 3 entirely devoid of granules; elytral setae minute, interstrial setae not longer than those of striae; Arizona; 1.8 mm ..... 22. ***minus*** **Bright**

— Declivital interstriae 1 and 3 each armed by a row of very fine granules; odd-numbered declivital interstriae with a few setae two to four times as long as those of striae; Arizona and New Mexico to Durango; *Pinus*; 1.6–1.9 mm (see also *subopacus* Blackman) ..... 23. ***segnis*** **Blackman**

28(26). Declivity narrowly, rather deeply sulcate, lateral convexities much higher than suture; female frons never with long hair; Nuevo León; *Pinus culminicolae*; 1.5–1.9 mm ..... 24. ***culminicolae*** **Bright**

— Declivity feebly to weakly sulcate, suture as high as lateral convexities; female frons pubescent or not ..... 29

29(28). Larger; interstrial punctures on disc sparse, but more abundant; pronotal disc without granules behind summit; female frons plano-concave, rather coarsely punctured, ornamented by more abundant, longer hair; British Columbia and Alberta to California and Colorado; *Abies lasiocarpa, Pinus*; 1.6–1.8 mm ..... 25. ***absonus*** **Blackman**

— Smaller; interstrial punctures on disc minute, sparse, pronotal disc with several small, distinct granules behind summit; female frons plano-convex to moderately convex, finely to moderately punctured, glabrous to ornamented by a sparse marginal fringe of moderately long hair; Alaska and Nova Scotia to California and West Virginia; *Picea*, less common in *Abies, Pinus*; 1.1–1.6 mm ..... 26. ***opaculus*** **LeConte**

30(19). Pronotum usually reticulate; male frontal carina extending from epistoma to well above eyes, female vestiture short; punctures on basal third of elytral disc moderately confused; Hidalgo to Guatemala; *Pinus*; 1.3–1.5 mm ..... 27. ***pellitus*** **Schedl**

— Pronotal disc smooth or partly reticulate; male carina short, not extending above eyes (an obscure extension in *woodi*) ..... 31

31(30). Female frons broadly, shallowly concave; male carina attaining upper level of eyes ..... 32

— Female frons convex, more uniformly punctured; male carina not attaining upper level of eyes ..... 33

32(31). Larger; female frons shallowly concave to well above upper level of eyes, lateral and dorsal margins ornamented by long hair; declivital interstriae 3 armed by a row of fine granules; Utah and Arizona to California; *Pinus aristata, P. flexilis*; 1.7–1.9 mm ..... 28. ***mormon*** **Bright**

— Smaller; female frontal impression not extending above upper level of eyes, vestiture mostly short, sparse; declivital interstriae 3 unarmed; New Mexico; *Pinus edulis*; 1.1–1.3 mm ..... 29. ***woodi*** **Bright**

33(31). Elytral punctures very fine, usually entirely obsolete on declivity; pronotum often partly reticulate or subreticulate; male carina fine, low, extending to upper level of eyes; female frons broadly flattened, coarsely punctured, and ornamented by moderately abundant, long hair; California; *Pinus lambertiana, P. ponderosa*; 1.3–1.5 mm ..... 30. ***dolus*** **Wood**

— Elytral punctures rather fine, usually visible on declivity; pronotum surface between punctures smooth; female frons flattened on a smaller area, punctures on lower half fine, with or without long hair ..... 34

34(33). Declivity not as steep, sulcus wider, interstriae 1 and 3 armed by minute granules; strial punctures distinctly larger; female frons more broadly flattened, bearing a rather sparse marginal fringe of long hair; Nuevo León; *Pinus strobiformis*; 1.6–1.7 mm ..... 31. ***clivus*** **Bright**

— Declivity steep, sulcus feeble to moderate, narrow, unarmed; strial punctures smaller; female frons less extensively flattened, with or without sparse pubescence; California and South Dakota to Durango; *Pinus*; 1.3–1.7 mm ..... 32. ***deletus*** **LeConte**

35(17). Male and female frons similar, at least weakly convex, rather coarsely punctured, with or without a weak median carina on lower half; female frons never ornamented by long hair; antennal club with sutures aseptate; elytral punctures rather fine, in rows; declivity shallowly bisulcate; pith borers in twigs of *Pinus* ..... 36

— Male frons usually convex, often with a conspicuous median carina, female frons either bearing a tuft of long hair, or, when hair absent, much more densely, more finely punctured than in male and never with a median carina ..... 43

36(35). Frons more strongly convex, carina absent; antennal club subcircular in outline, suture 2 at or beyond middle of club; interstriae 8 never convexly elevated ..... 37

— Frons less strongly convex, with a weak, median carina on lower half; suture 2 usually attaining middle of club, antennal club distinctly longer than wide (antennal characters obscure in some males); interstriae 8 at base of declivity distinctly convex, weakly elevated ..... 39

37(36). Interstrial setae very short, not longer than those of striae; declivital interstriae without granules, striae 1 strongly impressed, lateral area evenly convex from striae 1; California; *Pinus radiata*; 1.5–1.9 mm .... 33. ***trepidus*** **Bright**

— Interstrial setae four or more times as long as those of striae; declivital interstriae 2 more distinctly impressed, 3 with fine granules ..... 38

38(37). Elytral declivity more nearly convex, very feebly sulcate; declivital interstriae 2 with a row of setiferous punctures or minute granules; frontal punctures much smaller, interspaces mostly twice as wide as a puncture; California to Colorado; *Pinus monophylla*, *P. edulis*; 1.8–2.2 mm ..... 34. ***keeni*** **(Blackman)**

— Elytral declivity weakly sulcate, interstriae 2 without punctures, granules, or setae except at base; frontal punctures very coarse, interspaces mostly narrower than punctures; E Nevada and Wyoming to Arizona and New Mexico; *Pinus flexilis*, *P. strobiformis*; 1.9–2.3 mm ..... 35. ***pinguus*** **(Blackman)**

39(36). Declivital sulcus very shallow, narrow, interstriae 2 with a row of punctures and/or minute granules, striae 1 and 2 distinctly punctured; South Carolina; 2.4 mm ..... 36. ***separatus*** **Bright**

— Declivital sulcus more strongly impressed, interstriae 2 never with punctures or granules, punctures on striae 1 and 2 strongly reduced or absent ..... 40

40(39). Declivity with convexity on interstriae 8 ending before junction with 3, 3 not convex; margins of punctures on pronotal disc bearing small granules; elytral punctures moderately fine to very fine; frons less strongly convex below upper level of eyes, punctures finer; British Columbia and California to South Dakota and Colorado; *Pinus*; 1.9–2.9 mm ..... 37. ***boycei*** **Swaine**

— Punctures on pronotal disc not armed by fine granules; elytral punctures averaging larger; frons very slightly more strongly convex ..... 41

41(40). Declivity with convexity on interstriae 8 ending before junction with 3, 3 weakly if at all convex; elytral punctures rather coarse; declivital interstriae 2 twice as wide as 1; Arizona and New Mexico; *Pinus ponderosa*; 2.1–3.0 mm ..... 38. ***amplus*** **(Blackman)**

— Declivital interstriae 8 convex to junction with 3, 3 weakly elevated; elytral punctures rather fine; declivital interstriae 2 one and one-half times as wide as 1 ..... 42

42(41). Smaller; pronotal disc smooth, shining, punctures larger; lateral convexities of declivity ascending from striae 1, much higher than suture; Wisconsin and Quebec to New York; *Pinus*; 1.9–2.6 mm ..... 39. ***ramiperda*** **Swaine**

— Larger; pronotal disc reticulate, punctures finer; lateral convexities of declivity ascending from striae 2, very slightly higher than suture; Nuevo León to Puebla; *Pinus*; 3.0–3.5 mm ..... 40. ***deleoni*** **(Blackman)**

43(35). Declivital striae 1 and 2 with punctures small to moderately large, distinctly impressed, with discal punctures coarse, deep, confused; male frons usually without a carina or carina not clearly formed ..... 44

— Punctures on declivital striae 1 and 2 obsolete, or, if present (*diglyphus* group from Mexico and Central America), discal striae in rows and interstriae impunctate; male frons with or without a carina ..... 53

44(43). Pronotum 0.8–1.0 times as long as wide, summit at or posterior to middle; anterior margin weakly serrate; declivity more broadly, more shallowly sulcate, interstriae 1 and 3 never granulate; larger, stouter species ..... 45

— Pronotum 1.1–1.2 times as long as wide, summit at or slightly in front of middle, anterior margin moderately to coarsely serrate; declivity broadly to rather narrowly sulcate, impression shallow to moderately deep, interstriae 1 and 3 either with or without granules ..... 49

45(44). Declivital interstriae 2 three times as wide as 1; male frons with a strong transverse impression but without any indication of a carina in or below this impression; elytral vestiture fine, very long, rather abundant, arising from both strial and interstrial punctures; Arizona and New Mexico to Durango; *Pinus ponderosa*; 2.3–3.2 mm ..... 41. ***comosus*** **Blackman**

— Declivital interstriae 2 less than one and one-half times as wide as 1; male frons with a short median carina dividing impressed area; elytral vestiture shorter ..... 46

46(45). Male frons indistinctly impressed; declivity more strongly impressed, discal punctures less abundant; Durango to Mexico; *Arceuthobium globosum*; 1.8–2.0 mm ..... 42. ***arceuthobii*** **Wood**

— Much larger species, on *Pinus*; male frons rather strongly impressed; declivital sulcus shallow, discal punctures more abundant ..... 47

47(46). Male frons with transverse impression rather weak, not at all concave; punctures on discs of pronotum and elytra moderately fine, spaces between punctures equal to one to three diameters of a puncture, vestiture much shorter, less abundant; Mexico to Veracruz; *Pinus*; 2.3–3.6 mm ..... 43. ***aztecus*** **Bright**

— Upper two-thirds of area below upper level of eyes on male frons rather deeply, concavely impressed; punctures on discs of pronotum and elytra coarse, spaces between punctures equal to diameter of a puncture or less, vestiture distinctly longer, coarser, more abundant ..... 48

48(47). Male frons moderately, less strongly, rather narrowly concave, median carina evident only at lower margin, rather weak; female frons irregularly, more narrowly flattened, more finely punctured, vestiture shorter, finer; pronotal disc obscurely reticulate, less closely punctured, interspaces as wide as a puncture; declivital interstriae 1 and 2 with closely spaced, short setae (spacing equal to one-third length of a seta); Chiapas; *Pinus*; 2.1–2.8 mm ..... 44. ***dispar*** **Bright**

— Male frons broadly, very strongly biconcave, median carina conspicuous; female frons more broadly flattened, more coarsely punctured, vestiture coarser, more conspicuous; pronotal disc smooth, shining, much more closely punctured, interspaces about one-fourth as wide as a puncture; setae on declivital interstriae 1 and 2 more widely spaced, spaced by more than one-half length of a seta; Nevada and Arizona to Honduras; *Pinus*; 2.2–2.8 mm ..... 45. ***schwerdtfergeri*** **(Schedl)**

49(44). Declivital interstriae 1 and 3 punctured, with no indication of granules; female frons with vestiture short to moderately long, less abundant, never extending above upper level of eyes ..... 50

— Declivital interstriae 1 and 3 each with a row of granules; female frons with abundant long hair, pubescent area extending well above eyes, male frons with a median callus at upper level of eyes ..... 52

50(49). Declivital interstriae 2 narrow, as wide as 1; male frons evenly convex, female frons ornamented by long hair; Minnesota and Nova Scotia to Texas, Florida, and Cuba; *Pinus*; 1.5–2.2 mm ..... 46. ***pulicarius*** **(Zimmermann)**

— Declivital interstriae 2 twice as wide as 1; male frons transversely impressed, longitudinally concave in median area between epistoma and upper level of eyes, female frons weakly convex, vestiture rather sparse, a few moderately long setae ..... 51

51(50). Declivital interstriae 2 coarsely, closely punctured, 1 and 3 with obscure rounded granules, 1 higher than 3; declivital sulcus broad, very shallow; Arizona and New Mexico to Chiapas; *Pinus*; 1.5–2.6 mm ..... 47. ***solus*** **Blackman**

— Declivital interstriae 2 impunctate, more strongly impressed; Mexico to Guatemala; *Pinus*; 1.9–2.5 mm ..... 48. ***aciculatus*** **Bright**

52(49). Elytral declivity shallowly impressed, interstriae 2 twice as wide as 1, tubercles on 1 and 3 minute; body slender, 2.7 times as long as wide; California; *Pinus*; 1.9–2.7 mm ..... 49. ***carmeli*** **Swaine**

— Elytral declivity rather strongly impressed, interstriae 2 little if any wider than 1, tubercles on 1 and 3 rather coarse; body stout, 2.4 times as long as wide; Nayarit to Honduras; *Pinus*; 1.9–2.4 mm ..... 50. ***scabridus*** **Schedl**

53(43). Mostly smaller (1.4–2.4 mm), more slender species; strial punctures in rows to base or, if moderately confused, then male frons without a carina, male carina strongly developed when discal interstriae impunctate ..... 54

— Larger (2.1–2.9 mm), stouter species; punctures on elytral disc coarse, deep, very strongly confused; male frons armed by a short, strongly elevated carina; elytral declivity rather strongly sulcate ..... 102

54(53). Lateral margins of punctures on pronotal disc armed by a granule (except *scalptor, fuscus*); declivity more gradual, occupying 35–40 percent of elytral length, broadly, shallowly sulcate, striae 2 distinctly, regularly, minutely punctured to apex, interstriae 2 at least twice as wide as 1 (except *scalptor*), granules on 1 and 3 subequal in size, minute; pronotal disc never reticulate (except *scalptor*); male frontal carina weakly elevated, strongest on epistomal margin; declivital interstriae 8 sometimes feebly convex ..... 55

— Lateral margins of punctures on pronotal disc unarmed (except *elatinus*); declivity steeper, usually occupying less than 30 percent of elytral length, declivity variable, punctures on striae 2 obsolete through most of its course (except *orarius, sierraensis*); interstriae 8 never elevated ..... 62

55(54). Elytral surface at least weakly reticulate; declivital interstriae 2 one and one-half times as wide as 1; punctures on pronotal disc without granules on their lateral margins; female frons very shallowly concave on central half, ornamented by yellow hair ..... 56

— Elytral surface smooth, often with irregular lines; declivital interstriae 2 two to three times as wide as 1; margins of punctures on pronotal disc armed by granules; female frons weakly convex to narrowly plano-concave (except concave in *scalptus*), epistoma with a weak elevation or fine tubercle ..... 57

56(55). Female frons almost flat to shallowly concave on small area not extending above eyes, vestiture more uniformly distributed, little if any longer on margins, longest setae equal to less than one-third distance between eyes; elytral vestiture more consistently present; declivital tubercles usually slightly larger; California; *Pinus ponderosa*; 2.0–2.6 mm ..... 51. ***leechi*** **Wood**

— Female frons rather strongly, broadly concave, impression extending well above eyes, vestiture sparse and short in central area, dense and very long on margins, longest setae equal to at least two-third distance between eyes; elytral vestiture often less abundant to absent; declivital tubercles usually smaller; British Columbia to California; *Pinus*p; 2.2–2.7 mm ..... 52. ***scalptor*** **Blackman**

57(55). Female frons concave, concavity rather sparsely punctured, margin ornamented by long hair; discal interstriae 2 and 4 impunctate; declivital interstriae 2 less strongly impressed; British Columbia to Colorado; *Pinus ponderosa*; 2.3–2.8 mm ..... 53. ***scalptus*** **Bright**

— Female frons convex; all discal interstriae with at least some punctures (absent on 2 and 4 on posterior two-thirds in *nitidus*); declivital interstriae 2 more strongly impressed ..... 58

58(57). Discal interstriae 2 and 4 impunctate on posterior two-thirds; female frons feebly to moderately convex, with or without long hair, margins near eyes rounded; male frons with carina fine, low, usually long; punctures on declivital striae 1 and 2 usually conspicuous; Alaska and Newfoundland to Oregon, Colorado, and Nova Scotia; *Picea*, *Pinus*; 1.6–2.4 mm ..... 54. ***nitidus*** **Swaine**

— Discal interstriae 2 and 4 punctured at least on posterior third; female frons either plano-convex and with long hair or convex and with very minute hair; male carina much more strongly developed ..... 59

59(58). Discal punctures on pronotum minute or entirely replaced by granules; discal punctures on elytra minute, interstriae regularly punctured; female frons convex, margins near eyes rounded, vestiture minute ..... 60

— Discal puntures on pronotum moderately coarse, usually larger than granules; discal punctures on elytra moderately fine, interstrial punctures irregular; female frons at least partly plano-concave, margins abruptly subangulate near eyes, lateral and dorsal margins ornamented by long hair ..... 61

60(59). Pronotal and elytral discs with punctures minute, interstriae at least six times as wide as striae; declivital sulcus slightly deeper; Colorado; *Pinus contorta*; 2.0–2.3 mm ..... 55. ***indigus*** **Wood**

— Pronotal and elytral punctures moderately coarse, interstriae not more than twice as wide as striae; declivital sulcus not as deep; British Columbia to Montana; *Pinus contorta*; 2.0–2.2 mm ..... 56. ***fuscus*** **Blackman**

61(59). Lower half of male frons more shallowly impressed, smoother, more finely punctured; longitudinal crest of carina concave, poorly developed on upper half; female frons dull, more finely punctured, spaces between punctures equal to one to three diameters of a puncture, hair usually longer; declivital striae 1 and 2 finely, distinctly punctured; Alberta to Idaho; *Larix lyallii*; 2.3–2.7 mm ..... 57. ***alpinensis*** **G. Hopping**

— Lower half of male frons more strongly impressed, more coarsely, subgranulately punctured, longitudinal crest of carina convex, upper half more strongly elevated; female frons more nearly shining, more coarsely punctured, spaces between punctures equal to less than diameter of a puncture, marginal hair usually slightly shorter; declivital striae 1 and 2 obsolete or very minutely punctured; British Columbia and Alberta to California and Utah; *Pinus*; 2.1–2.7 mm ..... 58. ***toralis*** **Wood**

62(54). Male declivity convex or normally sulcate, with minute to moderately coarse granules on interstriae 3 and usually on 1; female frons convex, flat, or shallowly concave, variously ornamented by setae; stouter species ..... 63

— Male declivity entirely devoid of granules, interstriae 3 with middle area rather prominently elevated to almost spinelike process and weakly to very strongly protruding or displaced toward suture; female frons variously, concavely impressed and ornamented by spongy areas, carinae, or patches of setae; rather small, slender species from NE North America (see also *carinulatus*) ..... 96

63(62). Declivital striae 2 regularly punctured to near apex, these punctures coarse to very minute, but clearly indicated on surface (see also *brevis*) ..... 64

— Punctures on declivital striae 2 obsolete except near base (an occasional puncture sometimes present, but not in a row, except variable in *brevis*) ..... 80

64(63). Declivity moderately to strongly, rather narrowly sulcate, striae 2 finely to rather coarsely punctured, striae 1 and 2 almost parallel, tubercles on interstriae 3 usually more numerous and regularly placed to level of junction with 8, 1 partly or entirely without tubercles, S USA to Honduras ..... 65

— Declivital sulcus moderately impressed to almost absent, rather wide when present, punctures on striae 2 minute but distinct on surface, interstriae 2 much wider near middle of declivity, tubercles on interstriae 3 usually less numerous, often obsolete on lower fourth, 1 always with fine tubercles ..... 74

65(64). Lower third of declivital interstriae 3 convex, rather weakly, narrowly elevated, elevation continued to junction with 8 and along apical part of 8 ..... 66

— Lower third of declivital interstriae 3 not elevated or convex ..... 71

66(65). Male frons convex, carina short to long, if long more strongly elevated on its middle third; female frons minutely punctured, vestiture moderately abundant, very fine, slightly longer on margins, longest setae equal to less than half distance between eyes; declivital setae rather short ..... 67

— Male frons conspicuously, transversely impressed below upper level of eyes, carina strongly developed (except absent in *ineditus*), subdentate on its lower half; female frontal vestiture distinctly more abundant and longer ..... 68

67(66). Male frontal carina extending about half distance from epistoma to upper level of eyes; female frons distinctly convex, punctures slightly larger; pronotal disc smooth; declivital interstriae 2 ascending laterally; declivital setae moderately long; Veracruz; *Pinus*; 1.5–1.6 mm (see also 60. ***sapineus*** **Bright**) ..... 59. ***litos*** **Bright**

— Male frontal carina much longer, extending to upper level of eyes; female frons more broadly flattened, punctures minute; pronotal disc reticulate; declivital interstriae 2 flat; declivital setae short; Oaxaca to Guatemala; *Pinus*; 1.7–2.1 mm ..... 61. ***glabratulus*** (Schedl)

68(66). Male frontal carina absent; declivital striae 1 impressed, interstriae 2 ascending, little if any wider than 1, tubercles on 3 rather coarse; Veracruz to Oaxaca; *Pinus*; 1.7–2.0 mm ..... 62. ***ineditus*** **Bright**

— Male frontal carina well developed; declivital striae 1 and 2 equally impressed, interstriae 2 flat, twice as wide as 1, tubercles on 3 fine ..... 69

69(68). Female frons with median sixth glabrous from epistoma to vertex, this area usually impunctate; declivital setae short, rarely longer than diameter of an interstriae; punctures on pronotal disc averaging larger; Michoacán to Veracruz and Oaxaca; *Pinus*; 1.9–2.3 mm ..... 63. ***leiophyllae*** **Blackman**

— Female frons with punctures and setae on mesal sixth; either some declivital setae three or more times longer than width of an interstriae or else pronotal disc subreticulate; punctures on pronotal disc averaging smaller ..... 70

70(69). Elytral declivity with setae on interstriae 3 three or more times as long as width of an interstriae; pronotal disc smooth; male frons more strongly impressed, carina more strongly elevated, occupying only lower half of impressed area; Guatemala; *Pinus pseudostrobus*; 2.3–2.3 mm ..... 64. ***diglyphus*** **Blandford**

— Elytral declivity with setae short, none longer than width of an interstriae; pronotal disc usually reticulate; male frons weakly impressed, a weak median carina occupying most of length of impressed area; Durango; *Pinus*; 1.7–1.8 mm ..... 65. ***vespertinus*** **Bright**

71(65). Elytral surface subreticulate; declivity more gradual, setae on interstriae 3 very long; Mexico; *Abies religiosa*; 2.3–2.7 mm ..... 66. ***rudis*** **Blackman**

— Elytral surface smooth; declivity steep, setae shorter ..... 72

72(71). Male carina acutely elevated; declivity more narrowly, less strongly sulcate, its lateral convexities more broadly rounded, granules fine, punctures on striae 2 very fine; British Columbia and South Dakota to California and W Texas; *Pinus*; 1.7–2.1 mm ..... 67. ***venustus*** **Blackman**

— Male frontal carina low, long, thick to obsolete; declivity very steep, strongly sulcate, its lateral convexities rather abruptly rounded and armed on interstriae 3 by a row of rather large tubercles, punctures on striae 2 moderately fine to rather coarse (not clearly visible in male *laticeps*) ..... 73

73(72). Female frons more distinctly convex, punctures slightly coarser, not as close, vestiture of moderate length; declivity with suture more strongly arched, sulcus deeper, lateral convexities higher, particularly on lower third, margins armed by about six tubercles; Arizona to Oaxaca; *Pinus*; 1.9–2.6 mm ..... 68. ***durus*** **Blackman**

— Female frons weakly plano-convex, punctures smaller, closer, more abundant, vestiture much longer; declivity less strongly arched, very weakly in male, margins armed in female by two to four small tubercles, in male areas laterad from interstriae 3 much more massive, causing lower third to appear more broadly flattened; Oaxaca; *Pinus*; 2.1–2.8 mm ..... 69. ***laticeps*** **Bright**

74(64). Interstriae 2 at base of declivity armed by two or three fine granules, usually a few additional punctures present; female frons not entirely flat, with pubescence sparse, short, inconspicuous; male frontal carina not as high ..... 75

— Interstriae 2 at base of declivity never with tubercles, rarely with punctures; female frons mostly flat, with a conspicuous brush of long hair (glabrous in *tumidus*); male frontal carina higher, usually subdentate ..... 78

75(74). Declivity shallowly, broadly sulcate, granules on interstriae 1 and 3 very fine; punctures on posterior half of pronotum much closer, surface often subrugose in lateral areas; color black; British Columbia; *Pseudotsuga*; 2.0–2.2 mm ..... 70. ***orarius*** **Bright**

— Declivity rather strongly sulcate, granules on interstriae 3 rather coarse; punctures on posterior half of pronotum less numerous, surface regular; color brown ..... 76

76(75). Declivital sulcus rather shallow, suture as high as lateral convexities; elytral and pronotal punctures rather fine; British Columbia; *Picea*; 1.8–2.0 mm ..... 71. ***recens*** **Bright**

— Declivital sulcus rather deep, lateral convexities conspicuously higher than suture; elytral and pronotal punctures rather coarse; Veracruz to Oaxaca; *Pinus*; 1.4–1.7 mm (see also 72. ***amoenus***, Guatemala, 2.0 mm) ..... 73. ***declivisetosus*** **Bright**

78(74). Declivital interstriae feebly impressed at striae 1; female frons rather coarsely, closely punctured, subglabrous, male frons with a strong, subdentate carina; pronotal disc very coarsely, very closely punctured; California; 2.1–2.2 mm ..... 74. ***tumidus*** **Blackman**

– Declivity more distinctly impressed, pronotal disc less closely, more finely punctured; female frons pubescent ..... 79

79(78). Male frontal carina poorly developed, visible only near epistoma; female frons more extensively flattened, about one-third of area above eyes, very closely, rather coarsely punctured, vestiture more abundant, slightly longer; surface of elytral disc more regular, punctures mostly finer, more regularly in strial rows; British Columbia and California to Wyoming; *Pinus*, *Abies*; 2.0–2.5 mm ..... 75. ***sierraensis*** **Bright**

– Male frontal carina strongly, acutely elevated, subdentate in many specimens; female frons flattened on a semicircular area, less than one-sixth of it above upper level of eyes, vestiture much finer, less abundant, slightly shorter; surface of elytral disc often irregular, punctures averaging slightly larger, interstrial punctures more commonly present; Alberta and California to New Mexico; *Pinus*; 1.9–2.2 mm ..... 76. ***aquilus*** **Blackman**

80(63). Male and female frons similar, moderately convex, coarsely, deeply punctured, a conspicuous carina from epistoma to upper level of eyes; declivity very broadly, rather shallowly sulcate, upper third of striae 2 strongly divergent from suture and armed by a row of very fine granules similar to those on interstriae 1 and 3; Arizona and New Mexico to Chihuahua; *Pinus cembroides*, *P. edulis*; 1.7–2.2 mm ..... 77. ***lecontei*** **Bright**

– Male and female frons strikingly dissimilar; declivital striae 2 never armed by granules except for one to three at extreme base present in some species ..... 81

81(80). Male frontal carina absent or weakly developed, its summit obtusely rounded; interstriae 2 at base of declivity armed by about one to three tubercles, several punctures sometimes also present ..... 82

– Male frontal carina strongly, acutely elevated; interstriae 2 at base of declivity unarmed and usually devoid of punctures ..... 93

82(81). Discal interstriae 2 impunctate (all interstriae impunctate in some specimens), strial punctures in definite rows to base, strial setae obsolete; declivital sulcus deep, rather narrow; Mexico ..... 83

– Discal interstriae 2 punctured, strial punctures on disc usually confused toward base, strial setae present to base (abraded in some older specimens); declivital sulcus shallow, broad (except moderately deep in *blandus*, *brevis*) ..... 85

83(82). Female frons plano-convex; vestiture sparse, short; posterior areas of pronotum obscurely subreticulate; elytral declivity with no tubercles lateral to those on interstriae 3; length of setae on lateral areas of declivity three or more times greater than width of an interstriae; Colorado to Durango; *Pinus*; 1.6–2.1 mm ..... 78. ***brevis*** **Blackman**

– Female frons more broadly flattened, more coarsely punctured, vestiture abundant, very long; posterior areas of pronotum almost smooth, impressed points sometimes visible; elytral declivity with two or three tubercles lateral to those on interstriae 3, vestiture about half as long ..... 84

84(83). Female frons densely, finely punctured, vestiture much more abundant; lower declivity lateral to interstriae 3 more fully rounded; Oregon to California; *Pinus ponderosa*; 2.2 mm ..... 79. ***electus*** **Blackman**

– Female frons less closely, more coarsely punctured, vestiture less abundant; lower declivity in lateral areas more narrowly rounded; California to Colorado and Arizona; *Pinus edulis*, *P. monophylla*; 1.8–2.0 mm ..... 80. ***blandus*** **Blackman**

85(82). Declivity very strongly, broadly excavated from base to apex, lateral margins strongly, subacutely elevated throughout, its crest serrate on basal third; Arizona to Michoacán and Veracruz; *Pinus*; 1.8–2.2 mm ..... 81. ***cristatus*** **Wood**

— Declivity rather shallowly sulcate, margins rounded ..... 86

86(85). Pronotal disc reticulate; male frontal carina strongly elevated, subdentate on lower half; declivital sulcus rather shallow, lateral margins armed by small tubercles; Alaska to Arizona and New Mexico; *Picea engelmannii, P. pungens*; 2.1–2.4 mm ..... 82. ***carinulatus*** **Swaine**

— Pronotal disc smooth, often with impressed points; male carina absent or very weakly elevated; declivital sulcus more deeply impressed, tubercles usually larger ..... 87

87(86). Declivital sulcus moderately to rather strongly impressed, lateral convexities strongly elevated, summit of male more broadly rounded, interstriae 1 with granules throughout its length; female frontal pubescence separated from margin of eye by space equal to diameter of about two facets ..... 88

— Declivital sulcus strongly to very strongly impressed, lateral convexities in male strongly, subacutely elevated, interstriae 1 unarmed by granules on basal two-thirds; female frontal pubescence usually extending to margin of eye or less than diameter of one facet from it ..... 89

88(87). Female frontal vestiture very little longer on margins, male frons more strongly convex; declivital sulcus narrower, ascending laterally from striae 1, sulcus slightly deeper, areas laterad from interstriae 3 more fully rounded; Chiapas to Guatemala; *Pinus hartwegii*; 1.9–2.2 mm ..... 83. ***blandulus*** **Schedl**

— Female frontal vestiture much longer on margins, male frons less strongly convex; declivital sulcus wider; interstriae 2 flatter, ascending from its lateral third, area laterad from interstriae 3 more narrowly rounded; Veracruz; *Pinus*; 1.7–2.1 mm ..... 84. ***ciliatus*** **Blackman**

89(87). Smaller; punctures (when present) on interstriae 2 at base of declivity not tuberculate; lateral convexities on declivity less strongly elevated, summit armed by fine tubercles; anterior margin of pronotum rather narrowly rounded; California; *Pinus attenuata*; 1.7 mm ..... 85. ***californicus*** **Bright**

— Larger; interstriae 2 at base of declivity with a row of 2–5 small tubercles; lateral convexities on declivity strongly elevated, summit armed by several moderately coarse tubercles; anterior margin of pronotum rather broadly rounded ..... 90

90(89). Female frons minutely punctured, interspaces two to five diameters of a puncture; male frons with a broad callus or low carina; lateral margins of declivital sulcus less strongly elevated ..... 91

— Female frons finely punctured, interspaces averaging about one diameter of a puncture in width, male frons with a definite carina ..... 92

91(90). Pronotal disc dull, reticulate; female frons plano-convex, vestiture on margins less abundant, not as long; male declivity deeply impressed, sulcus not as narrow; male frons with a median callus or carina near and above upper level of eyes; color almost black; Arizona; *Abies concolor*; 2.0–2.4 mm ..... 86. ***apachae*** **Bright**

— Pronotal disc smooth, shining; female frons feebly, transversely impressed near middle, vestiture on margins more abundant, much longer; male declivity much deeper, narrower; male frons with a low, obtuse carina almost from epistoma to upper level of eyes; color dark brown; Mexico; *Abies religiosa*; 2.0–2.5 mm (see also 88. ***micans*** **Bright**) ..... 87. ***blackmani*** **Bright**

92(90). Carina on male frons short, at upper level of eyes, female frontal setae more abundant, longer, longest setae equal to almost one-third distance between eyes; declivity not as steep, middle third of lateral margins more abruptly elevated; Durango to Guatemala and El Salvador; *Pinus*; 2.2–2.4 mm ..... 89. ***nigricans*** **Blandford**

— Carina on male frons long, extending from epistoma to upper level of eyes; female frontal setae less abundant, shorter, longest setae equal to less than one-fourth distance between eyes; declivity steeper, suture and lateral margins more evenly arched; Oaxaca to Veracruz; *Pinus*; 1.6–2.5 mm ..... 90. ***lepidus*** **Bright**

93(81). Female frons very broadly plano-concave, margins abrupt, pubescence reddish yellow, longest setae equal in length to distance between eyes; male frontal carina almost uniformly elevated, rather low; declivity strongly sulcate, lateral convexities very much higher than suture ..... 94

— Female frons plano-convex, setae shorter; male carina strongly elevated, subdentate; declivity less strongly sulcate, suture about as high as lateral convexities ..... 95

94(93). Punctures on pronotal disc with fine granules; declivital sulcus more strongly impressed, interstriae 1 and 3 without definite granules; Michoacán to Tlaxcala; *Abies religiosa*; 1.8–2.5 mm ..... 91. ***elatinus*** **Wood**

— Punctures on pronotal disc without granules; declivital sulcus less strongly impressed, interstriae 1 and 3 with small tubercles; Nuevo León; *Abies*, *Pseudotsuga*; 1.9–2.7 mm ..... 92. ***speculum*** **Bright**

95(94). Lateral convexities of declivity armed on interstriae 3 by a single row of tubercles, rarely one or two supplemental tubercles in lateral areas, vestiture sparse, normal; male frons weakly convex, carina subdentate; female frons almost flat, vestiture less abundant in central area; Alberta and Nova Scotia to North Carolina; *Picea*; 1.9–2.2 mm ..... 93. ***dentifrons*** **Blackman**

— Lateral convexities of declivity armed by numerous small, rounded granules, pubescence much more abundant, forming a conspicuous tuft in female; male frons impressed to upper level of eyes; female frons more strongly convex, vestiture more abundant; California; *Pinus radiata*; 1.8–2.0 mm ..... 94. ***setosus*** **Blackman**

96(62). Male declivity normally bisulcate, lateral summits not noticeably displaced toward suture (except *concavus*); female frons highly variable ..... 97

— Male declivity with lateral summits displaced mesally and reaching interstriae 1; female frons variable ..... 99

97(96). Female frons biconcave to upper level of eyes, with elevated median line subcarinate, concavities glabrous, brightly shining, lateral and dorsal margins of frons ornamented by a fringe of moderately long hair; Ontario to New York and Maine; *Picea*, *Pinus*; 1.7–2.0 mm ..... 95. ***biovalis*** **Blackman**

— Female frons with spongy areas, median line impressed or sulcate ..... 98

98(97). Median half or more of female frons concave to upper level of eyes, lateral areas spongy and protuberant or not; male declivity with lateral convexities almost reaching striae 1; British Columbia, Ontario, and Wisconsin to New Brunswick and Maine; *Pinus*, *Picea*; 1.8–2.0 (see also 96. ***cavatus*** and 97. ***hesperius***) ..... 97. ***concavus*** **Blackman**

— Female frons usually more narrowly sulcate, lateral spongy areas variable, median half of spongy areas sometimes protuberant; if so, then sulcus usually carried on protuberance or occasionally replaced by a median elevation; Ontario and Minnesota to New Brunswick and Pennsylvania; *Pinus*, *Picea*; 1.6–1.9 mm ..... 98. ***briscoei*** **Blackman**

99(96). Female frons slightly convex, broadly spongy, median line feebly elevated, with or without a median epistomal tubercle; Michigan and Nova Scotia to North Carolina; *Picea, Abies, Pinus*; 1.6–1.8 mm ..... 99. ***balsameus*** **Blackman**

— Female frons biconcave to upper level of eyes, median line strongly elevated, elevation commencing at upper level of eyes, ending at epistomal margin in a tubercle, surface of elevation spongy, its crest pubescent or not .... 100

100(99). Median crest on female frons obtuse, rather low, lateral concavities shallow; Ontario and Nova Scotia to North Carolina; *Abies, Picea, Pinus*; 2.0–2.1 mm ..... 100. ***angustus*** **Blackman**

— Median crest on female frons strongly, acutely elevated, forming a thin, rather high partition, lateral concavities deep, rather extensive ..... 101

101(100). Median crest on female frons very thin, its summit glabrous; New Brunswick to New York; *Picea*; 1.8–1.9 mm ..... 101. ***carinatus carinatus*** **Bright**

— Median crest on female frons thicker, its crest pubescent; British Columbia to Alberta; *Pinus contorta*; 1.9–2.1 mm ..... 102. ***carinatus monticolae*** **Bright**

102(53). Male declivital sulcus very narrow on upper half, lateral convexities appearing to arise from interstriae 2, a blunt, hornlike process arising just above middle on lateral convexity and projecting toward suture, often crossing striae 1 (specimens from southern part of range may lack this horn); female frons minutely pilose to above eyes (North Carolina specimens somtimes with longer, less dense setae); Manitoba and Nova Scotia to Kentucky and North Carolina; *Picea, Pinus, Abies*; 2.1–2.5 mm ..... 103. ***cariniceps*** **LeConte**

— Declivity more broadly sulcate, lateral convexities arising from lateral half of interstriae 2, lateral convexities in male armed by small denticles directed caudad; female frons with long to moderately long setae ..... 103

103(102). Male carina consisting of a coarse, blunt tubercle slightly below upper level of eyes and receding to slightly above eyes; female frons convex except flattened on median half of lower half, pubescent area extending slightly above eyes; British Columbia and Montana to California and New Mexico; *Pinus*; 2.2–2.9 mm ..... 104. ***confinis*** **LeConte**

— Male carina acute, occupying part or all of median line on lower half, frons transversely impressed at upper level of eyes (except in *montezumae*); female frons flattened and pubescent to well above upper level of eyes ..... 104

104(103). Male frons not impressed, its surface reticulate; pronotum reticulate; vestiture on female frons distinctly longer; interstriae 1 on declivity armed by a row of fine tubercles; Chiapas; *Pinus montezuma*; 2.3–2.5 mm ..... 105. ***montezumae*** **Bright**

— Male frons distinctly impressed below upper level of eyes, its surface shining; pronotum smooth, shining, usually with impressed points; vestiture on female frons distinctly shorter; declivital interstriae 1 usually unarmed ..... 105

105(104). Antennal club larger, subcircular in outline, its width equal to length of scape; male frontal carina very short, subdentate, occupying less than middle third of distance between epistoma and upper level of eyes; male declivital interstriae 3 terminating abruptly at middle of declivity, its summit strongly elevated but short, armed by about three or four granules, granules on lower area confused, not in line with those on elevated area; female frons less extensively flattened above eyes, its surface more finely, more sparsely punctured; longest setae on elytral disc not longer than width of an interstriae, those on declivity about twice as long; Utah to Tlaxcala; *Pinus edulis, P. cembroides*, etc.; 1.8–2.5 mm ..... 106. ***schwarzi*** **Blackman**

– Antennal club smaller, elongate, scape 1.2 times as long as width of club; male frontal carina occupying about two-thirds of median line between epistoma and upper level of eyes; crest of elevation on male declivital interstriae 3 longer, declining posteriorly more gradually, armed by five to ten granules, most of those on lower half of declivity in line with those on crest; longest setae on disc equal to one to three times width of an interstriae, those on declivity little if any longer; Wyoming to Oaxaca and Veracruz; *Pinus*; 2.5–2.9 mm ..... 107. ***crassus*** **Blackman**

106(16). Elytral declivity convex to moderately impressed (if moderately impressed then host *Quercus*), striae 2 distinctly, regularly punctured to near apex; male frons either without a carina or with a weak median carina; in either coniferous or nonconiferous hosts ..... 107

– Declivity moderately to strongly sulcate, striae 2 impunctate or at most with a few minute, irregularly placed punctures near apex; male frons either without a carina or with a transverse carina at upper level of eyes; in coniferous hosts ..... 118

107(106). Male frons convex, without any indication of a carina between epistoma and upper level of eyes; discal interstriae with confused impressed points appearing as minute punctures; tropical species in nonconiferous hosts ..... 108

– Male frons with a short, poorly developed median carina at epistomal margin (occasionally somewhat longer, but absent in *anthricinus*); declivity convex to narrowly, shallowly impressed; in coniferous hosts ..... 115

108(107). Pronotum less than 1.05 times as long as wide; lateral granules on elytral declivity minute to obsolete, declivity convex or very shallowly sulcate; in hosts not *Quercus* ..... 109

– Pronotum 1.1–1.3 times as long as wide; lateral granules on elytral declivity minute to rather coarse, sulcus feebly to strongly impressed; in *Quercus* ..... 110

109(108). Declivity convex, lateral granules obsolete; pronotal disc with numerous impressed points; declivital interstriae 1 and 3 each with a row of about 12 setae; Costa Rica; tree branch; 1.6–1.7 mm ..... 108. ***laetus*** **Wood**

– Declivity rather narrowly, moderately sulcate, lateral granules small, distinct; pronotal disc reticulate; declivital interstriae 1 and 3 each with a row of about six setae; Costa Rica; woody vine; 1.2–1.4 mm ..... 109. ***lenis*** **Wood**

110(108). Punctures on declivital striae 1 and 2 rather coarse, only slightly smaller than on disc; smaller species ..... 111

– Punctures on declivital striae 1 and 2 minute, usually less than one-fourth as large as those on disc ..... 112

111(110). Declivity convex, interstriae 1 distinctly, weakly elevated, 1 and 3 with a few fine granules; pronotal disc subreticulate, punctures moderately coarse; female frons with marginal hair rather long, setae in central area uniformly short; Honduras; *Quercus*; 1.6–1.7 mm ..... 110. ***parilis*** **Wood**

– Declivity steep, rather strongly sulcate, suture unarmed, lateral convexities armed by two pairs of denticles on upper half; pronotal disc shining, minute and rather fine punctures intermixed; female frons with central pubescence only slightly shorter than on margins; Costa Rica and Panama; *Quercus*; 1.8–2.1 mm ..... 111. ***scitulus*** **Wood**

112(110). Declivity not impressed, granules on 1 and 3 very small; sutures 1 and 2 on antennal club rather strongly procurved; male frons almost flat, shining, more sparsely, more finely punctured; female frons flattened on smaller area, vestiture less abundant; Costa Rica; *Quercus*; 1.6–1.8 mm ..... 112. ***conspectus*** **Wood**

— Declivity sulcate, granules on 1 and 3 larger; male frons strongly convex and granulate-punctate above; female frons flattened on a larger area, vestiture rather abundant; sutures on antennal club either straight or moderately procurved ..... 113

113(112). All discal interstriae with a row of punctures subequal to those of striae in addition to confused, minute impressed points; declivity less strongly impressed, granules on lateral areas slightly smaller; female frons more extensively flattened, with more abundant hair; antennal club with sutures 1 and 2 moderately procurved; Costa Rica; *Quercus*; 1.9–2.4 mm ..... 113. ***medialis*** **Wood**

— Discal interstriae impunctate, minute, confused, impressed points present; declivity more strongly impressed, granules on interstriae 1 and 3 larger; sutures 1 and 2 on antennal club straight ..... 114

114(113). Female frons more distinctly convex, finely punctured only on median half below upper level of eyes, smooth median area on lower third distinctly carinate, vestiture confined to median half below upper level of eyes; Guatemala; *Quercus*; 1.8–2.7 mm ..... 114. ***guatemalensis*** **Blandford**

— Female frons broadly flattened, more coarsely punctured, carina absent, vestiture confined to median two-thirds, at least one-third of setae above upper level of eyes; Durango to Michoacán and Oaxaca; *Quercus*; 1.9–2.4 mm ..... 115. ***quercinus*** **Wood**

115(107). Elytral disc reticulate; declivital striae 1 and 2 rather coarsely punctured, punctures almost as coarse as on disc, interstriae 2 weakly impressed; vestiture on female frons less abundant, shorter ..... 116

— Elytral disc shining; punctures on declivital striae 1 and 2 very small, sulcus narrow but distinctly impressed; female frontal vestiture more abundant, longer ..... 117

116(115). Declivity more evenly convex, sulcus at striae 1 almost obsolete; male frons more distinctly convex on lower half, carina obtuse to obsolete, female frontal vestiture sparse; Durango and Nuevo León to Michoacán and Veracruz; *Pinus*; 1.6–2.0 mm (to 2.2 mm in var. *elimatus*) (intergrades with *segnis*) ..... 116. ***subopacus*** **Blackman**

— Declivity more distinctly sulcate; male frons more nearly flattened on lower half, carina short, usually acutely elevated, female frontal vestiture more abundant; Durango to Michoacán and Mexico; *Pinus*; 1.5–2.0 mm ..... 117. ***impexus*** **Bright**

117(115). Female frons flat, male frons without a carina; strial punctures very fine, interstriae more irregular, with impressed lines; color almost black; Nuevo León; *Abies*; 1.6–1.7 mm ..... 118. ***anthracinus*** **Bright**

— Female frons slightly, transversely impressed on middle third, uniformly, rather closely, finely punctured over entire surface; male frontal carina moderately long, setae very short, inconspicuous; color brown; Hidalgo to Guatemala; *Pinus*; 1.7–1.9 mm ..... 119. ***nocturnus*** **Blandford**

118(106). Interstriae 2 at base of declivity smooth, without punctures or tubercles (occasionally present in some *cascoensis*); male with or without a carina, transverse carina when present usually rather poorly developed or with a dorsal extension ..... 119

— Interstriae 2 at base of declivity with a row of punctures and/or tubercles, in several species these tubercles form a row slightly mesad of lateral crest and supplement those of interstriae 3; male frons with transverse carina strongly, rather sharply elevated, never with a dorsal extension on median line ..... 126

119(118). Male frons convex, coarsely punctured, without a carina; female frons flat, coarsely, closely punctured, setae in central area minute, those on margins very long; pronotal punctures small, elongate; Guatemala; *Abies guatemalensis*; 1.9–2.2 mm ..... 120. ***mesembria*** **Bright**

— Male frons either with a carina or variously impressed, female frons finely or more sparsely punctured; north temperate species ..... 120

120(119). Male frons convex, not transversely impressed on lower half, a weak median carina usually present on lower half; elytral disc feebly reticulate, almost never with impressed points, interstriae 2–5 usually sparsely punctured; declivital interstriae 1 with a row of regularly placed setae; female frons variable, pubescent or not but marginal setae never longer than those in central area; Northwest Territories to Newfoundland and New York; *Picea*; 1.6–2.2 mm ..... 121. ***cascoensis*** **Blackman**

— Male frons transversely impressed on lower half, never with a median carina on lower half; elytral disc smooth, shining, often with impressed points (reticulate in some *tuberculatus*); declivital interstriae 1 glabrous or with only one or two setae and discal interstriae impunctate, impunctate only when setae in central area of female frons subequal in abundance and length with those on margins ..... 121

121(120). Declivital interstriae 1 glabrous, rarely with one or two setae; discal interstriae impunctate; female frons variable, glabrous to densely pubescent, setae uniformly distributed; male transverse carina at upper level of eyes present or absent, never with a dorsal extension, interstrial setae on female declivity usually minute ..... 122

— Declivital interstriae 1 with a row of regularly spaced setae; discal interstriae frequently sparsely punctured; female frons with central area subglabrous and impunctate to sparsely punctured; male carina usually with a dorsal extension ..... 125

122(121). Female frons glabrous to rather densely pubescent, lateral margins rounded, longest setae equal to up to one-fourth distance between eyes; male transverse carina at upper level of eyes obscure or absent; British Columbia and Wyoming to Newfoundland and West Virginia; *Picea*; 1.4–2.0 mm ..... 122. ***intextus*** **Blackman**

— Female frons rather densely pubescent, margins rather abruptly subangulate, longest setae on dorsal margin equal in length to at least half distance between eyes; male transverse carina usually subacutely elevated (not elevated in some species) ..... 123

123(122). Female frontal pubescence rather dense, mostly of uniform length; male carina usually well defined, surface more coarsely punctured; Utah to Wyoming and Colorado; *Picea pungens*; 1.6–2.3 mm ..... 123. **ornatus Blackman**

— Female frontal pubescence less dense in central area, very long on margins, particularly above, longest setae almost equal in length to distance between eyes; male frons less distinctly carinate at upper level of eyes ..... 124

124(123). Pronotal disc usually feebly reticulate, discal punctures without minute granules on margins; female frontal punctures close, rather abundant; Arizona to New Mexico; *Pinus ponderosa, P. strobiformis*; 1.5–2.0 mm ..... 124. ***infulatus*** **Blackman**

– Pronotal disc smooth, shining, discal punctures each with a feeble granule on margin; female frontal punctures apparently more numerous; California; *Pinus sabiniana*; 1.9 mm ..... 125. ***novellus*** **Blackman**

125(121). Female frons with central area near lateral and upper margins bearing a few rather coarse setiferous punctures, row of marginal setae rather sparse; elytra never reticulate, punctures averaging slightly larger; NE British Columbia and New Brunswick to E Texas and North Carolina; *Pinus*; 1.6–2.2 mm ..... 126. ***pulchellus*** **Eichhoff**

– Female frons almost never with punctures or setae in central area, marginal row of setae rather dense and longer; elytra frequently reticulate, punctures averaging smaller; Alaska and Alberta to California and Coahuila; *Pinus*; 1.7–2.4 mm ..... 127. ***tuberculatus*** **Eichhoff**

126(118). Elytral disc rather strongly, uniformly reticulate; male frontal carina less strongly elevated, female frons smooth, with moderately coarse, rather widely spaced punctures; male declivital sulcus similar to female, punctures at base of interstriae 2 weakly if at all tuberculate; British Columbia and Montana to California and Colorado; *Abies, Pseudotsuga, Picea, Pinus*; 1.6–2.0 mm ..... 128. ***pseudotsugae*** **Swaine**

– Elytral disc shining; male carina more strongly elevated (except *montivagus, furnissi*), female frons either much more finely punctured or punctures much more abundant; male declivital sulcus much stronger than female and punctures at base on interstriae conspicuously tuberculate and continued on inner margin of lateral crest to middle of declivity in addition to tubercles on interstriae 3 ..... 127

127(126). Smaller; male frons without a median carina, transverse carina only moderately elevated; declivital sulcus narrow, tubercles on lateral convexities very small ..... 128

– Larger; lower half of male frons with a median carina, transverse carina much more strongly elevated; declivital sulcus deeper, wider, tubercles on lateral convexities larger ..... 129

128(127). Female frons with short hair uniformly distributed; declivity rather narrowly sulcate in both sexes, without an additional constriction near middle; declivital vestiture much more abundant; Mexico; *Pinus hartwegii*; 1.9–2.3 mm ..... 129. ***furnissi*** **Bright**

– Male elytral declivity at middle with sulcus very narrow, lateral margins devoid of tubercles; female frons rather strongly biconcavely impressed, lateral margin on lower half of each concavity with a small tuft of very short hair; Oaxaca; *Pinus*; 1.9–2.3 mm ..... 130. ***montivagus*** **Bright**

129(127). Hair on female frons uniformly short, longest setae equal to less than one-sixth distance between eyes; declivital sulcus not as deep; declivital vestiture much more abundant; Nuevo León; *Pinus strobiformis*; 1.9–2.1 mm ..... 131. ***brevicomatus*** **Bright**

– Hair on female frons long, much longer on margins; declivital sulcus deeper; declivital hair less abundant ..... 130

130(129). Female frons with punctures very small, less abundant, vestiture on vertex of greater length than distance to epistomal margin ..... 132

— Female frons with punctures moderately coarse, rather abundant, vestiture much shorter ..... 135

132(131). Elytral setae on disc and declivity short, interstrial setae little if any longer than those of striae, particularly in female; punctures on discal interstriae and striae smaller; declivity less strongly sulcate in male, in female striae 2 with punctures absent; SW Wyoming, SE Utah, Colorado, and New Mexico; *Picea engelmannii, P. pungens*; 1.9–2.4 mm ..... 132. ***occidentalis*** **Blackman**

— Strial setae on disc usually absent, interstrial setae on and near declivity at least four times as long as those of striae; punctures on discal interstriae larger; pronotal disc more nearly glabrous; male declivity much more strongly sulcate, female striae 2 with minute punctures through much of its course (except in *cortezi*) ..... 133

133(132). Smaller; declivity steeper, sulcus not as deep or as wide; Alaska and California to Utah and South Dakota; *Picea, Pinus*; 1.8–2.6 mm ..... 133. ***nitidulus*** **(Mannerheim)**

— Larger; declivity not as steep, sulcus much deeper, wider ..... 134

134(133). Smaller; declivity not as deep, wider on basal half; strial setae on disc usually obsolete; longest female frontal setae equal in length to less than half distance between eyes; Nuevo León; *Pinus culminicola*; 2.5–2.7 mm ..... 134. ***viminalis*** **Bright**

— Larger; declivity deeper, narrower on basal half; strial setae on disc usually conspicuous, extending to base; longest setae on female frons equal in length to two-thirds distance between eyes; Mexico to Puebla; *Pinus hartwegii*; 2.4–3.2 mm ..... 135. ***cortezi*** **Bright**

135(130). Posterolateral areas of pronotum reticulate, rather coarsely punctured; female frons rather closely punctured, punctures spaced by about one diameter of a puncture, vestiture finer, slightly shorter, less abundant; Mexico and Puebla to Oaxaca; *Abies religiosa*; 2.0–2.4 mm ..... 136. ***abiegnus*** **Wood**

— Posterolateral areas of pronotum smooth, finely punctured; female frons densely punctured, interspaces between punctures less than half as wide as a puncture, vestiture moderately coarse, slightly longer, more abundant; Arizona to New Mexico; *Pinus strobiformis*; 1.9–2.8 mm ..... 137. ***immanus*** **Blackman**

136(2). Tropical and temperate species in coniferous hosts; pronotum smooth, shining (partly, weakly reticulate in *perotei*); declivity not as steep, punctures on striae 2 smaller to obsolete, interstriae 2 usually less strongly, more broadly impressed ..... 137

— Tropical species in nonconiferous hosts; pronotum strongly reticulate (except *sparsepilosus*); declivital striae 2 with punctures strongly impressed, usually larger; declivity steeper, interstriae 2 usually more strongly impressed (pronotal asperities in some species either confused or concentric; although some species always have confused asperities, all are referred to the division where allied species are placed; see also couplet 1) ..... 164

137(136). Male frons weakly convex to slightly impressed on lower half, never with a transverse carina at upper level of eyes; strial punctures varying from straight, regular rows to slightly confused; declivital striae 2 usually more strongly punctured; interstriae 2 at base of declivity usually without punctures or tubercles ..... 138

— Male frons with a conspicuous transverse carina at upper level of eyes, area below carina moderately impressed (never finely, densely punctured or with fine, abundant vestiture); strial punctures varying from strongly confused to definite, regular rows; punctures on declivital striae 2 fine to obsolete; punctures or tubercles usually present on interstriae 2 at base of declivity ..... 149

138(137). Male frons punctured similar to female (very fine and dense except in *perotei*) and ornamented by moderately long, rather abundant, fine hair (less abundant and shorter than in female), surface (except *discretus*) finely, densely punctured (as in females of many species), sometimes irregularly to rather strongly impressed; lateral margin of pronotum never grooved ..... 139

— Male frons with vestiture short, sparse, inconspicuous, punctures rather coarse, larger and much less abundant than in female; lateral margin of pronotum sometimes longitudinally grooved ..... 143

139(138). Male frons moderately convex, rather coarsely punctured, female frons plano-convex; pronotal disc either reticulate or else with granules replacing punctures; elytral apex strongly acuminate ..... 140

— Male frons almost flat to irregularly impressed, surface densely, finely impressed; pronotum never reticulate; elytral apex subacuminate ..... 142

140(139). Pronotal disc rather strongly reticulate, punctures moderately coarse, their margins not tuberculate; frons more coarsely punctured, vestiture shorter, longest setae in female equal in length to about one-fifth distance between eyes, shorter in male; declivity slightly steeper, sulcus slightly wider and deeper; Durango to Jalisco and Puebla; *Pinus*; 1.6–2.2 mm ..... 138. ***discretus*** **Wood**

— Pronotal disc smooth and shining, small, rounded tubercles replace most punctures; frons more finely punctured, longest setae in female equal in length to half distance between eyes, shorter in male; declivity more gradual, sulcus narrower, not as deep; Veracruz; *Pinus*; 1.5–1.9 mm ..... 139. ***perotei*** **Blackman**

141(139). Frons coarsely, closely, deeply punctured in both sexes, frontal vestiture less abundant, male frons shallowly impressed on lower half, a conspicuous median callus on vertex, female frons plano-convex; Michoacán to Mexico; *Pinus*; 2.4–2.5 mm ..... 140. ***chalcoensis*** **Hopkins**

— Frons very finely, densely punctured in both sexes, vestiture more abundant, male without a median elevation on vertex ..... 142

142(141). Male and female frons plano-convex, surface sometimes granular in female; female frons with a few marginal setae longer than those in central area; Oaxaca to NW Nicaragua; *Pinus*; 2.1–2.6 mm ..... 141. ***miniatus*** **Bright**

— Male frons subconcavely impressed; female frons flat to feebly impressed, punctures fine, dense, close, pubescence much more abundant, numerous marginal setae conspicuously longer than those in central area; Arizona to Durango; *Pinus*; 2.3–3.2 mm ..... 142. ***ingens*** **Blackman**

143(138). Lateral margin of pronotum longitudinally grooved (occasionally obscure in males); female frons feebly to moderately concave on more than central two-thirds, marginal vestiture rather abundant, long ..... 144

— Lateral margin of pronotum normal, marked by a finely elevated line; female frons flat to moderately concave, vestiture variable, often sparse, short, or absent ..... 145

144(143). Larger; female frons rather strongly concave, rather coarsely, closely punctured; male frons transversely impressed to moderately concave, closely, rather coarsely punctured; declivital interstriae 2 minutely reticulate; Pennsylvania and E Texas to Florida, Durango and Jalisco to N Nicaragua; *Pinus*; 1.9–2.4 mm ..... 143. ***confusus*** **Blandford**

— Smaller; female frons plano-concave, smooth, shining, punctures minute, rather abundant; male frons rather weakly, transversely impressed, often with a weak transverse carina at upper level of eyes, coarsely, less closely punctured; declivital interstriae 2 smooth, brightly shining; Virginia and West Virginia to E Texas and Florida, Durango and Veracruz to British Honduras; *Pinus*; 1.3–1.7 mm ..... 144. ***annectens*** **LeConte**

145(143). Female frons more extensively plano-convex and pubescent to well above eyes, punctures smaller, vestiture finer and much longer; interstriae 2 at base of declivity often without punctures or tubercles; from Mexico and Central America ..... 146

— Female frons usually more strongly convex, short pubescent not extending above upper level of eyes (some variants of *murrayanae* with frons flat and densely pubescent to vertex); interstriae 2 at base of declivity with a few punctures or tubercles; from America north of Mexico ..... 147

146(145). Female frons more broadly, more densely pubescent, flattened area separated from eye by distance equal to diameter of two facets, punctures much finer, closer; body 2.9 times as long as wide; declivity steeper, apex less strongly acuminate, interstriae 2 minutely reticulate, its lateral margin more strongly impressed; Jalisco to Honduras; *Pinus*; 1.5–1.7 mm ..... 145. ***cacuminatus*** **Blandford**

— Female frons more narrowly, more sparsely pubescent, flattened area separated from margin of eye by at least diameter of four facets, punctures coarser, not as close; body 3.1 times as long as wide; declivity not as steep, apex more strongly acuminate, interstriae 2 smooth, usually shagreened (slightly), its lateral margin not impressed; Oaxaca to Guatemala; *Pinus*; 1.3–1.7 mm (see also couplet 209) ..... 209. ***subsimilis*** **Schedl**

147(145). Female frons partly to extensively flattened, more finely, more densely punctured, varying from glabrous to elaborately ornamented by short or long setae; discal interstriae only slightly wider than striae, a few interstrial punctures usually present; body 3.1 times as long as wide; Alaska and Manitoba to California and Arizona; *Pinus*; 1.8–2.4 mm ..... 146. ***murrayanae*** **Blackman**

— Female frons more strongly convex, more coarsely punctured, vestiture usually absent, sometimes short and rather sparse; discal interstriae about twice as wide as striae, almost never with any interstrial punctures; body 2.9 times as long as wide ..... 148

148(147). Declivital interstriae 1 and 3 unarmed or granules very feeble; male frons with elevation obscure to absent, female frons flattened on a larger area, more finely, more closely punctured; NE British Columbia and Nova Scotia to E Texas and Florida; *Pinus*; 1.3–1.7 mm ..... 147. ***consimilis*** **LeConte**

– Declivital interstriae 1 and 3 each armed by about two pointed denticles; male frons with subcarinate elevation more prominent, female frons more uniformly convex, more coarsely punctured; Arizona; *Pinus*; 1.4–1.7 mm ..... 148. ***intentus*** **Bright**

149(137). Mostly smaller than 2.3 mm (except *grandis*); sutural apex subacuminate, sutural profile at least weakly convex, more strongly so near apex ..... 150

– Larger than 2.5 mm; sutural apex very strongly, acutely acuminate (except *megas*), sutural profile straight, often slightly concave near apex (except female *megas*) ..... 159

150(149). Male and female frons similarly sculptured, with a conspicuously elevated transverse carina at upper level of eyes; elytral punctures coarse, deep, strongly confused ..... 151

– Male frons with a transverse carina; female frons flattened or weakly concave, more finely, densely punctured, with or without a brush of hair, without a carina ..... 152

151(150). Transverse impression on lower frons shallow, sculpture much finer; elytral declivity steeper, sulcus not as wide; Michigan and New York to E Texas and South Carolina; *Pinus*; 1.8–2.6 mm ..... 149. ***pullus*** **(Zimmermann)**

– Frons below upper level of eyes rather strongly, transversely impressed, its sculpture rather coarse; elytral declivity more gradual, sulcus distinctly wider; British Columbia and South Dakota to Arizona and New Mexico; 2.3–3.1 mm ..... 150. ***grandis*** **Blackman**

152(150). Discal punctures on elytra rather strongly confused; female pronotum usually stouter 1.0–1.1 times as long as wide; female frons flat or with a transverse impression, punctures finer, more dense, vestiture more abundant (usually) and with setae in central area rather long, at least half as long as those on margins ..... 153

– Discal punctures largely or entirely in rows; female pronotum usually more slender, 1.2–1.3 times as long as wide; female frons weakly convex to weakly concave, punctures fine to moderately coarse, less abundant, vestiture variable ..... 154

153(152). Declivital interstriae 1 unarmed by tubercles, lateral convexities very strongly elevated, summit conspicuously higher than suture and armed on upper two-thirds by a row of 10–14 moderately coarse denticles; British Columbia and Idaho to California; *Pinus ponderosa*; 2.1–2.2 mm ..... 151. ***serratus*** **Swaine**

– Elytral declivity with interstriae 1 armed by a few fine tubercles, lateral convexities about as high as interstriae 1 and armed by about 3–6 fine denticles; British Columbia and Montana to California and Hidalgo; *Pinus*; 1.8–2.3 mm ..... 152. ***confertus*** **Swaine**

154(152). Female frons moderately convex to flattened on a limited area extending to only slightly above upper level of eyes, vestiture sparse, rather short to obsolete; declivity usually steeper, sulcus deeper ..... 155

– Female frons broadly flattened to well above eyes, vestiture abundant, long; declivity usually more gradual, sulcus not as deep (except very deep in *bassetti*) ..... 157

155(154). Declivity slightly steeper, striae 1 and 2 clearly punctured, interstriae 2 only slightly wider than 1; female frons with a slight median callus at upper level of eyes, vestiture slightly more abundant and longer in lateral areas; Arizona; *Pinus ponderosa*; 2.0–2.1 mm ..... 153. ***clarus*** **Blackman**

— Declivity not quite as steep, striae 1 and 2 with punctures minute, obscure, interstriae 2 about twice as wide as 1; female frons without median callus, vestiture less abundant, shorter ..... 156

156(155). Female frontal vestiture extending slightly above eyes, more abundant, longer; pronotal and elytral discs smoother; declivital sulcus distinctly wider and deeper, more strongly reticulate, vestiture slightly longer; Oaxaca; 1.9–2.2 mm ..... 154. ***solatus*** **Wood**

— Female frontal vestiture not extending above eyes, vestiture less abundant, shorter; pronotal and elytral discs usually with impressed points or other irregularities, not as smooth; declivital sulcus slightly narrower, not as deep, obscurely reticulate, vestiture slightly shorter; Utah to Chihuahua; *Abies*; 1.5–2.1 mm ..... 155. ***solers*** **Blackman**

157(154). Sutural interstriae on declivity unarmed in male, fine, sparse tubercles sometimes present in female; lateral convexities of declivity in male much higher than suture, summit armed by 8–12 rather coarse denticles; female frons variable, glabrous to rather densely pubescent, longest setae equal to as much as half distance between eyes; Northwest Territories to Chihuahua; *Picea*; 1.8–2.4 mm ..... 156. ***bassetti*** **Blackman**

— Sutural interstriae armed by tubercles in both sexes, lateral convexities as high as suture; pronotal asperities either confused or subconcentric; female frons flat to plano-concave, punctures rather fine to very fine, close ..... 158

158(157). Female frons more extensively flat to plano-concave, more than one-third of flattened area above upper level of eyes, punctures minute, spaced by one to four diameters of a puncture, vestiture more abundant, longer; pronotal asperities confused, punctures on posterior areas usually armed by a minute granule on lateral or posterior margin; declivital sulcus deeper, apparently narrower; strial hair longer on posterior half; Chihuahua to Guatemala; *Pinus*; 1.6–2.1 mm ..... 157. ***delicatus*** **Wood**

— Female frons flat to plano-convex, one-fourth or less above upper level of eyes, punctures larger, spaced by less than diameter of a puncture; pronotal asperities subconcentric, punctures never with a granule on margins; declivital sulcus not as deep, apparently narrower; strial hair very short, not longer on declivity; Nevada to Arizona and W Texas; *Pinus ponderosa*; 1.7–1.8 mm ..... 158. ***arcanus*** **Bright**

159(149). Smaller; discal striae with punctures in definite rows, interstriae without punctures; declivital suture usually as high as lateral convexities ..... 160

— Larger; punctures on elytral disc confused or at least with interstriae punctured; declivital lateral convexities usually much higher than suture ..... 162

160(159). Declivital striae 1 and 2 strongly punctured, sulcus rather shallow; female frontal vestiture very long, unusually dense; Arizona to Nuevo León; *Pinus*; 2.2 mm ..... 159. ***zonalis*** **Bright**

— Declivital striae 1 with punctures obsolete, 2 punctured or not; sulcus much more strongly impressed ..... 161

161(160). Declivity much less strongly impressed, interstriae 2 less than twice as wide as 1, its base rarely with punctures, almost never with a granule; declivital interstriae 1 usually with more than seven setae; Durango to Mexico and Veracruz; *Pinus*; 1.6–2.3 mm ..... 160. ***cuspidatus*** **Blackman**

– Declivity strongly impressed, interstriae 2 almost three times as wide as 1, its base almost always armed by one or more tubercles; declivital interstriae 1 usually with five or fewer setae; Utah and Colorado to Arizona and New Mexico; *Pinus flexilis*, *P. strobiformis*; 2.0–2.3 mm ..... 161. ***acutus*** **Blackman**

162(159). Declivity not as steep, apex very strongly acuminate, interstriae 1 usually unarmed through more than middle half of its length, interstriae 2 reticulate; body more slender, 2.8–3.0 times as long as wide; color very dark brown; Chihuahua to Oaxaca and Veracruz; *Pinus*; 2.4–2.8 mm ..... 162. ***spadix*** **Blackman**

– Declivity very steep, apex subacuminate to moderately acuminate, interstriae 1 armed throughout (usually); body 2.6–2.8 times as long as wide .... 163

163(162). Smaller; color reddish brown; elytral apex moderately acuminate; body 2.6 times as long as wide; strial setae minute, their length less than twice diameter of puncture from which they arise; Arizona to Durango; *Pinus* engelmannii; 2.4–2.7 mm ..... 163. ***rubidus*** **Wood**

– Larger; very dark brown; elytral apex weakly subacuminate; body 2.8 times as long as wide; strial setae very long, some more than four times diameter of puncture from which they arise; Nuevo León; *Pinus culminicola*; 3.5–3.7 mm ..... 164. ***megas*** **Bright**

164(1,136). Base of declivital interstriae 2 with a row of puncture or tubercles or both (not always evident in *barberi*), punctures may or may not occur on disc . 165

– Interstriae 2 entirely devoid of punctures or tubercles on disc or declivity (except on lower declivity in *lautus*) (three species with pronotal asperities confused) ..... 175

165(164). Declivital interstriae 2 moderately impressed, only slightly wider than 1 or 3, armed by a row of fine setiferous tubercles or punctures as on 1 and 3, setae equal in length to those on 1; discal interstriae impunctate; frons similar in both sexes, convex, punctured, vestiture inconspicuous, without a carina ..... 166

– Declivital interstriae 2 without setae, punctures, or tubercles on face of declivity, much wider than 1 or 3; frons usually sexually dimorphic, male usually with a transverse carina, female often pubescent ..... 167

166(165). Pronotum reticulate; discal interstriae 1 impunctate; declivital interstriae 2 on upper half with a row of fine granules; color dark brown; Honduras to Costa Rica; *Aristolchia anguicida*; 1.4–1.8 mm ..... 165. ***nemoralis*** **Wood**

– Pronotum smooth, shining; discal interstriae 1 with a row of punctures; declivital interstriae 2 with a row of punctures; color yellowish brown; Florida to Cuba; *Metopium toxiferum*; 1.2–1.5 mm ..... 166. ***concentralis*** **Eichhoff**

167(165). Posterior areas of pronotum reticulate; declivital striae 1 and 2 with punctures reduced, much smaller than on disc; basal half of declivital sulcus less strongly impressed, apex rather strongly acuminate ..... 168

– Posterior areas of pronotum smooth, shining; declivital striae 1 and 2 rather coarsely punctured; declivital sulcus often deeper, apex not acuminate (except *mexicanus*) ..... 169

168(167). Smaller; female frons less strongly impressed, vestiture yellowish, shorter, less abundant, longest setae equal to less than one-third distance between eyes; lateral convexities of declivity only slightly higher than suture; Jalisco; *Sambucus*; 1.4–1.9 mm ..... 167. ***coronarius*** **Blackman**

— Larger; female frons more strongly impressed, vestiture reddish brown, longer, much more abundant, longest setae equal to more than half distance between eyes; lateral convexities of declivity distinctly higher than suture; "Plaquepaque, Mexico"; in unidentified wood; 1.7–2.3 mm ..... 168. ***concinnus*** **Wood**

169(167). Declivity shallowly, broadly sulcate, surface of interstriae 2 subreticulate to abundantly marked by minute impressed points, apex rounded, not at all acuminate; female frons sparsely pubescent; host *Pinus* ..... 170

— Declivity usually more strongly impressed, its surface smooth, brightly shining, elytral apex moderately to strongly acuminate; female frons with moderately to very abundant pubescence; hosts desert shrubs ..... 171

170(169). Discal interstriae regularly punctured; male frons shallowly impressed from epistoma to upper level of eyes, transverse carina obscure, female similar but more weakly impressed and with a few moderately long setae; granules on declivital interstriae 1 and 3 fine; California to Oregon; *Pinus jeffreyi*; 1.7–1.9 mm ..... 169. ***jeffreyi*** **Blackman**

— Discal interstriae mostly to entirely impunctate; transverse carina at or slightly below upper level of eyes, strongly developed in male, rather weak in female; female frontal vestiture short, sparse; tubercles on declivital interstriae 3 larger; Utah and Colorado to Durango and Nuevo León; *Pinus edulis*; 1.7–2.2 mm ..... 170. ***barberi*** **Blackman**

171(169). Larger species; male frons convex, without a carina; declivity more gradual, apex more distinctly acuminate, interstriae 1 armed by a row of small tubercles (see also *coronarius, concinnus*) ..... 172

— Smaller species; male frons transversely impressed, a distinct transverse carina at upper level of eyes; declivity steeper, apex indistinctly subacuminate, interstriae 1 unarmed except for one or two small granules near apex ..... 173

172(171). Pronotal disc finely, rather sparsely punctured; all discal interstriae with a few punctures on posterior half; declivity shallowly sulcate, suture as high as interstriae 3, apex subacuminate; New Mexico ..... 171. ***torridus*** **Wood**

— Pronotal disc coarsely, closely punctured; discal interstriae impunctate except 2; declivity strongly sulcate, interstriae 3 much higher than 1, apex strongly acuminate; Coahuila to Jalisco and Tabasco; *Parthenium argentatum*; 2.0–2.9 mm ..... 172. ***mexicanus*** **Blackman**

173(171). Declivity much more shallowly impressed, lateral areas on lower half not flattened, more regularly rounded, tubercles on lateral margins smaller; Texas to North Carolina and Georgia; *Rhus*; 1.3–1.5 mm ..... 173. ***scriptor*** **Blackman**

— Declivity more deeply, broadly sulcate, lateral areas on lower half weakly to moderately flattened; average size slightly larger ..... 174

174(173). Male declivity obscurely flattened on median half on lower half, lateral margin subacute only near apex; punctures on female frons very fine; Utah and Wyoming to Chihuahua and W Texas; *Rhus*; 1.4–1.8 mm ..... 174. ***virilis*** **Blackman**

– Male declivity somewhat flattened on lower half, lateral margin from apex to above middle weakly, subacutely elevated; punctures on female frons moderately coarse; Hidalgo; *Rhus*; 1.4–1.7 mm ..... 175. ***hylocuroides*** **Wood**

175(164). Elytral declivity convex or at most with striae 1 impressed, punctures on striae 1 and 2 often reduced or obsolete, granules on lateral convexities small or absent ..... 176

– Elytral declivity moderately to strongly sulcate, interstriae 2 impressed, striae 1 and 2 usually clearly punctured, granules on lateral convexities small to moderately coarse (see also male *nanus*) (asperities confused on three tropical species) ..... 189

176(175). Concentric rows of pronotal asperities forming continuous costae; summit of each costa weakly subserrate, clefts between dentations, restricted to distal third of height of costa or less; male frons convex, punctured, without a carina, female frons moderately, flattened, vestiture rather short; declivital striae 1 and 2 much more coarsely punctured in female, punctures minute to almost obsolete in male; pronotum with numerous, deeply impressed points; suture 1 on antennal club clearly septate, 2 obscurely septate ..... 177

– Asperities in concentric rows more strongly serrate, divided to or near their bases ..... 178

177(176). Sutures of antennal club straight to moderately procurved; declivital striae 1 and 2 more finely punctured in both sexes, interstriae 2 weakly impressed in female; male frons subglabrous; Jalisco to Oaxaca; *Thevetia*; 0.9–1.3 mm ..... 176. ***costatulus*** **Wood**

– Sutures of antennal club strongly procurved; declivital interstriae 1 and 2 rather coarsely punctured in female, interstriae 2 moderately impressed; male epistomal brush rather conspicuous; Jalisco; possibly *Thevetia*; 1.6–1.8 mm ..... 177. ***costabilis*** **Wood**

178(176). Elytral declivity convex, interstriae 1 weakly, gradually elevated or not, striae 1 not impressed ..... 179

– Elytral declivity convex to weakly sulcate, striae 1 abruptly impressed ..... 181

179(178). Declivity more broadly convex, punctures on striae 1 and 2 minute; male frons moderately, transversely impressed from epistoma to upper level of eyes; female frons minutely punctured, longest setae on vertex too short for tips to reach epistomal margin, epistomal margin of normal coloration; Michoacán to Queretaro; *Rhus*; 1.4–1.8 mm ..... 178. ***detentus*** **Wood**

– Declivity more narrowly convex, punctures on striae 1 and 2 moderately coarse; male frons convex; female frons with setae on vertex very long, their tips capable of extending beyond epistomal margin, epistomal area pale yellow; antennal club with sutures almost obsolete ..... 180

180(179). Pronotum reticulate; elytral disc with numerous clearly impressed points; frons more finely punctured, male reticulate from epistoma to upper level of eyes; Costa Rica; 1.1–1.2 mm ..... 179. ***inops*** **Wood**

– Pronotal disc smooth, shining; elytral disc with impressed points obscure to obsolete; frons rather coarsely punctured, male without reticulation below upper level of eyes; Chiapas to Costa Rica; *Mauria glauca*; 1.2–1.4 mm ..... 180. ***debilis*** **Wood**

181(178). Male frons convex, without any indication of a transverse carina; mostly larger species, 1.3–1.9 mm ..... 182

– Male frons weakly to moderately impressed, usually with a transverse crest or carina at upper level of eyes; mostly smaller species, 1.1–1.5 mm ..... 184

182(181). Sutures of antennal club straight; anterior margin of pronotum armed by about 20 serrations; California and New Mexico to Chihuahua; *Juglans*; 1.5–1.9 mm ..... 181. ***juglandis*** **Blackman**

– Sutures of antennal club moderately procurved; anterior margin of pronotum armed by about 10 serrations ..... 183

183(182). Declivity bisulcate, interstriae 2 moderately impressed; punctures on pronotal disc rather coarse, close; Guatemala; 1.6–1.7 mm ..... 182. ***tenax*** **Wood**

– Declivity convex, interstriae 2 not impressed; punctures on pronotal disc fine, rather widely spaced, Costa Rica; *Rheedia edulis*; 1.3 mm ..... 183. ***strictus*** **Wood**

184(181). Declivital interstriae 1 armed by a row of fine granules; male frons armed by a strongly, subacutely elevated transverse carina; female frons flattened on a rather narrow area, vestiture moderately abundant, uniformly short, uniformly distributed; color very dark brown; New Mexico; *Franseria*; 1.2–1.4 mm ..... 184. ***franseriae*** **Wood**

– Declivital interstriae 1 unarmed; male frontal carina weak if present; color yellowish brown ..... 185

185(184). Female frons with lateral margins rounded, pubescent area less extensive, setae on margins not longer than elsewhere; declivity moderately sulcate ..... 186

– Lateral margins of female frons abruptly subangulate; pubescent area more extensive, extending to vertex, setae on margins conspicuously longer; declivity weakly or not at all sulcate ..... 188

186(185). Female frons rather densely, finely punctured on lower half, this area covered by dense, very long, mustachelike pubescence; male frons more strongly impressed, summit at upper level of eyes more conspicuous; female declivity shallow, granules almost obsolete on lateral convexities, male sulcus much deeper, lateral convexities conspicuously higher than suture, armed by two to four moderately coarse tubercles; Jalisco to Chiapas; *Bursera*; 1.2–1.5 mm ..... 185. ***nanus*** **Wood**

– Female frons rather coarsely punctured, pubescent area extending to slightly above eyes, setae rather sparse, uniformly rather short; male frons weakly impressed, carina not indicated; declivity shallowly sulcate, lateral convexities sometimes slightly higher than suture, granules minute ..... 187

187(186). Female frons flat, pubescence shorter, surface more finely, more sparsely punctured; pronotal asperities in clearly concentric rows; pronotal disc and elytral declivity shining; declivity more strongly sulcate, lateral convexities higher than suture, granules minute; Costa Rica; *Rheedia edulis*; 1.1–1.2 mm ..... 186. ***galeritus*** **Wood**

– Female frons transversely impressed to upper level of eyes, surface more coarsely, more closely punctured; pronotal asperities largely confused, only first two rows obscurely concentric; pronotal disc and elytral declivity shagreened; declivity obscurely sulcate, suture and lateral convexities subequal in height, unarmed; Veracruz; *Bursera*; 1.4–1.7 mm ..... 187. ***nebulosus*** **Wood**

188(185). Declivity more narrowly convex, interstriae 2 weakly impressed on mesal side, punctures on striae 2 distinctly larger; declivital setae usually slightly shorter, stouter; female frontal vestiture apparently shorter, less abundant; Jalisco to Oaxaca; *Bursera*; 1.2–1.4 mm ..... 188. ***indigens*** **Wood**

— Declivity more broadly convex, interstriae 2 more broadly, more distinctly impressed, punctures on striae 2 minute; declivital setae longer, more slender; female frontal vestiture longer, apparently more abundant; Jalisco; *Bursera*; 1.5–1.6 mm ..... 189. ***burserae*** **Wood**

189(175). Lower half of declivity much steeper, often subvertical, apex much more broadly rounded, interstriae 2 more strongly impressed, tubercles on 3 usually smaller; body usually stouter; pubescence on female frons sparse, short, inconspicuous (except long in *crinalis* and *liquidambaris*) ..... 190

— Lower half of declivity more gradual, apex narrowly rounded to subacuminate, interstriae 2 usually less strongly impressed, tubercles on 3 usually larger; body usually more slender; female frons usually ornamented by long, more abundant setae, male frons with few setae, usually transversely impressed (asperities confused on three tropical species) ..... 205

190(189). Female frons with pubescence sparse, short; frons weakly if at all sexually dimorphic ..... 191

— Female frons ornamented by several to many long setae; frons conspicuously sexually dimorphic ..... 203

191(190). Elytral declivity very steep, subvertical on more than lower half, interstriae 2 strongly impressed, not wider than 1, sometimes extending to posterior fourth of disc, lateral areas on lower half broadly elevated, denticles on 3 mesad of crest; on *Pinus* (except host unknown for *germanus*); from Mexico to Hondurus ..... 192

— Elytral declivity steep, lateral areas on lower half less strongly elevated, denticles on 3 on crest; never on coniferous hosts (except *lautus* accidentally) . 195

192(191). Larger; tubercles on crest of declivity more numerous, in a staggered row; Oaxaca; 2.5 mm ..... 190. ***germanus*** **Bright**

— Smaller than 2.0 mm; tubercles on crest of declivity uniseriate ..... 193

193(192). Larger; body less slender, 2.6 times as long as wide; Nayarit and Hidalgo to Guatemala; *Pinus*; 1.5–2.0 mm ..... 191. ***obtusipennis*** **Blandford**

— Smaller; body more slender than 2.7 times as long as wide ..... 194

194(193). Elytral declivity more deeply impressed, body more slender; frons not at all aciculate; Chiapas; *Pinus*; 1.5–1.8 mm ..... 192. ***euterpes*** **Bright**

— Elytral declivity less deeply impressed; body less slender; lower half of frons aciculate; Nayarit to Honduras; *Pinus*; 1.3–1.6 mm ..... 193. ***occlusus*** **Bright**

195(194). Male and female frons never dimorphic, with a rather broad, median, transversely etched median callus extending from upper level of eyes toward vertex (except in *morosus*) ..... 196

— Frons often sexually dimorphic, median area above eyes punctured, never transversely etched ..... 200

196(195). Antennal club slightly larger, sutures 1 and 2 distinctly arcuate; median frontal callus above upper level of eyes poorly developed or absent, without a transverse impression at its lower margin ..... 196

— Antennal club smaller, sutures 1 and 2 straight; frontal callus marked on its lower margin by a slight, transverse impression at upper level of eyes ..... 199

197(196). Frons smooth, shining, transversely impressed on lower half; pronotal disc more broadly, transversely arched, smooth, shining, punctures very fine, impressed points abundant, rather coarse; declivital interstriae 2 usually narrower; Oaxaca; 1.7–2.0 mm ..... 194. ***speciosus*** **Wood**

— Frons convex on lower half; pronotal disc weakly to strongly reticulate, punctures moderately coarse, impressed points obscure to absent; declivital interstriae 2 usually wider ..... 198

198(197). Larger, stouter; frons and pronotum reticulate; declivital interstriae 2 more strongly impressed on lateral half; Oaxaca to Chiapas; 1.9–2.2 mm ..... 195. ***assitus*** **Wood**

— Smaller, more slender; frons without reticulation, pronotum obscurely reticulate; Chiapas to Honduras; *Eupatorium dalioides*; 1.3–1.6 mm ..... 196. ***morosus*** **Wood**

199(196). Strial punctures on disc smaller, interstriae two to four times as wide as striae; all declivital setae short, each about equal in length to width of an interstriae; S Florida; *Borrichia*; 1.1–1.3 mm ..... 197. ***borrichiae*** **Wood**

— Strial punctures on disc larger, interstriae one to two times as wide as striae; lateral declivital setae more than twice as long as width of an interstriae; Chihuahua and Michoacán to Chiapas; various shrubs and vines; 1.4–1.8 mm ..... 198. ***paulus*** **Wood**

200(195). Declivital interstriae 1 and 3 armed by small granules, those on 3 distinctly larger ..... 201

— Declivital interstriae 1 and 3 without granules ..... 202

201(200). Frons with a weak, median carina from epistoma to upper level of eyes; San Luis Potosí; *Liquidambar*; 1.3–1.5 mm ..... 199. ***molestus*** **Wood**

— Frons with a slight, transverse impression on lower area, never with a carina, punctures rather coarse; Minnesota and Quebec to Kansas and Mississippi; various hosts; 1.3–1.5 mm ..... 200. ***lautus*** **Eichhoff**

202(200). Declivity less widely impressed, lateral convexities more broadly rounded; frons weakly impressed below, convex above, without a carina, punctures rather coarse; Jalisco; *Sambucus*; 1.3–1.4 mm ..... 201. ***sambuci*** **Blackman**

— Declivity more broadly impressed, lateral convexities more abruptly rounded; frons weakly impressed, a slight, transverse carina at upper level of eyes, punctures finer; Hidalgo; 1.3–1.5 mm ..... 202. ***diligens*** **Wood**

203(190). Female frons weakly convex, sparsely punctured throughout, sparse vestiture almost uniformly distributed, rather short except moderately long on dorsal margin; male frons rather strongly, transversely impressed below upper level of eyes; Puebla; *Toxicodendron*; 1.4–1.8 mm ..... 203. ***corruptus*** **Wood**

— Female frons broadly plano-convex, shining, moderately abundant vestiture almost all concentrated on margins; male frons rather weakly impressed ..... 204

204(203). Female frons sparsely, minutely punctured in central area, lateral and dorsal margins ornamented by long setae; West Virginia to Arkansas and Florida; *Liquidambar*; 1.3–1.5 mm ..... 204. ***liquidambarus*** **Blackman**

— Female frons impunctate in central area, lateral margins without setae below eye; Michigan and West Virginia to Florida; *Toxicodendron*; 1.3–1.5 mm ..... 205. ***crinalis*** **Blackman**

205(189). Female frons less strongly, less extensively flattened, margins rounded, vestiture variable (asperities confused on three species) ..... 206

— Female frons more extensively flattened, margins more abruptly subangulate, vestiture on margins conspicuously longer than in central area .... 212

206(205). Pronotal asperities confused; facets of eye coarse, eye larger than normal; elytral apex acuminate or not ..... 207

— Pronotal asperities concentric (often confused in *subsimilis*); facets of eye normal, eye not noticeably enlarged; female frons somewhat flattened, vestiture longer and more abundant than in male ..... 209

207(206). Pronotum reticulate, discal punctures minute; female frons sparsely inconspicuously pubescent; eye rather coarsely facted; apex of elytra subacuminate; Oaxaca to Honduras; in log; 1.2–1.5 mm ..... 206. ***acuminatus*** **(Schedl)**

— Pronotal disc smooth and shining, more coarsely punctured; female frons moderately to densely pubescent ..... 208

208(207). Elytral declivity more narrowly, rather weakly sulcate, interstriae 1 and 3 tuberculate in both sexes, apex acuminate; vestiture on female frons of uniform length; Panama; in log; 1.3–1.5 mm ..... 207. ***vesculus*** **Wood**

— Elytral apex rounded, not acuminate, sulcus much wider and deeper, interstriae 1 and 3 unarmed in female, rather coarsely tuberculate in male, each with 2–4 tubercles; female frontal vestiture much longer on margins; Costa Rica; tree limb 1.5–1.7 mm ..... 208. ***sparsepilosus*** **(Schedl)**

209(206). Declivity more gradual, sulcus deeper, punctures on striae 1 small to minute, less than half as large as those on disc ..... 210

— Declivity steeper, sulcus not as deep, punctures on striae 1 subequal in size to those on disc ..... 211

210(209). Pronotal asperities almost always confused; declivital striae 1 rather coarsely punctured; male frons more distinctly impressed, carina moderately strong; female frons usually more coarsely punctured, vestiture coarser, usually longer; Puebla to Chiapas; *Pinus*; 1.1–1.7 mm (see also couplet 146) ..... 209. ***subsimilis*** **Schedl**

— Pronotal asperities almost always concentric; declivital striae 1 with punctures small to obsolete; male frons feebly impressed, carina very weak; female frons usually more finely punctured, vestiture usually finer, shorter; Jalisco and Veracruz to Guatemala; in shrubs; 1.2–1.5 mm ..... 210. ***attenuatus*** **Blackman**

211(210). Male frons with a fine, low, distinct, transverse carina at upper level of eyes; declivital striae 2 not distinctly impressed; female frons flattened on a smaller area, plano-convex, punctures more numerous; Veracruz to Oaxaca; shrub; 0.8–1.1 mm ..... 211. ***atomus*** **Wood**

— Male frons devoid of carina; female frons slightly, transversely impressed to upper level of eyes, sparsely punctured in central area; declivital striae 2 impressed; pronotum finely reticulate on posterior half ..... 212

212(211). Female frons narrowly flattened to upper level of eyes, pubescence moderately abundant, rather short, not conspicuously longer laterally; declivity not as steep, more distinctly impressed; "Mexico"; 1.2 mm (see also 213. ***timidus*** **Blandford**) ..... 212. ***dimidiatus*** **Blackman**

— Female frons more distinctly, transversely impressed, more sparsely punctured, setae in lateral areas longer; declivity slightly steeper, less strongly impressed; Costa Rica to Panama; 1.0–1.2 mm ..... 214. ***perexiguus*** **Wood**

213(205). Female epistomal margin on median half extended into a pubescent subacutely pointed premandibular process; male frons convex without a carina or other elevation at upper level of eyes; Guatemala; liana; 1.2–1.3 mm ..... 215. ***nugalis*** **Wood**

— Female epistomal margin normal, almost straight, male frons with a carina or other distinct elevation at upper level of eyes ..... 214

214(212). Pronotum finely reticulate; female frons ornamented by a dense brush of very long hair; Honduras; *Eupatorium, Perymanium*; 1.0–1.3 mm ..... 216. ***hermosus*** **Wood**

— Pronotum smooth, shining, with numerous impressed points; female frons with vestiture less abundant, somewhat shorter ..... 215

215(214). Declivital interstriae 2 less strongly impressed, ascending laterally, striae 2 not impressed, punctures small; female frons plano-convex, longest setae equal to one-third distance between eyes; Guatemala; shrub; 0.9–1.0 mm ..... 217. ***minutalis*** **Wood**

— Declivital interstriae 2 more strongly impressed, flat, striae 2 slightly impressed, punctures half as large as on disc; female frons planoconcave on central half, longest setae equal to more than half distance between eyes; Costa Rica; liana; 1.5–1.7 mm ..... 218. ***sobrinus*** **Wood**

### 1. *Pityophthorus costatus* Wood

*Pityophthorus costatus* Wood, 1975, Great Basin Nat. 35:395 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This aberrant species has a variable number of segments in the antennal funicle; it is also distinguished by the long, costiform pronotal asperities, by the stout body form, by the frons, and by other characters.

FEMALE.— Length 1.1–1.2 mm, 2.3 times as long as wide; color dark reddish brown.

Frons rather strongly convex, an abrupt, moderately deep impression immediately above epistomal margin, epistomal margin distinctly elevated except for small median notch; surface smooth shining, sparsely punctured, punctures rather coarse, area above eyes somewhat reticulate; vestiture very sparse, short. Antennal funicle variable, 3–5-segmented; club ovate, small, sutures almost straight, 1 and 2 septate only at margins.

Pronotum 1.0 times as long as wide; widest at base, weakly arcuate on basal third, rather strongly converging toward narrowly rounded anterior margin; anterior margin continuously costate; summit just behind middle, rather indefinite, asperities long, subcostate, confused, continued to basal fourth in median area; posterior areas strongly reticulate, punctures small, not close. Glabrous.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures small, deep, spaced by one to two diameters of a puncture; interstriae smooth, shining, two to three times as wide as striae, punctures minute, confused, rather close. Declivity steep, convex; striae not impressed, punctures greatly reduced to obsolete; interstriae as on disc except punctures reduced to obsolete. Vestiture confined to declivity, of sparse, short, stout interstrial setae.

MALE.— Similar to female except epistomal impression usually more strongly impressed in lateral areas, with a weak median elevation dividing this impression.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 13 km SE Cartago, Cartago, 3-VII-63, 1800 m, No. 11b, liana, S. L. Wood; Tapantí, Cartago, 2-VII-63, 1300 m, No. 11a, liana, S. L. Wood.

NOTES.— The above treatment was based on the type series of 17 specimens.

### 2. *Pityophthorus pudicus* Blackman

*Pityophthorus pudicus* Blackman, 1942, Proc. U.S. Nat. Mus. 92:208 (Holotype, male; Guadalajara, Jalisco, Mexico; U.S. Nat. Mus., 55983)

DIAGNOSIS.— This species is distinguished from *exquisitus* Blackman by the smaller size, by the less coarsely punctured pronotum and elytra, and by the less strongly convex male frons.

FEMALE.— Length 1.3–1.5 mm, 2.6 times as long as wide; color very dark brown.

Frons as in *exquisitus* except more nearly flat on lower fourth.

Pronotum as in *exquisitus* except less strongly reticulate, punctures averaging distinctly smaller.

Elytra as in *exquisitus* except punctures averaging smaller, particularly near declivity; interstriae about as wide as striae on basal half of disc (interstriae about twice as wide as *exquisitus*).

MALE.— Similar to female, with frons as in male *exquisitus* except less strongly convex on lower half.

DISTRIBUTION.— Jalisco.

MEXICO: Jalisco: Volcán Colima, 23-VI-65, 2500 m, No. 107, shrub, S. L. Wood; intercepted at New York in *Sambucus* wood from Guadalajara.

NOTES.— The above treatment was based on the holotype and on 16 other specimens.

### 3. *Pityophthorus exquisitus* (Blackman)

Fig. 198

*Neodryocoetes exquisitus* Blackman, 1942, Proc. U.S. Nat. Mus. 92:196 (Holotype, female; Mexico; U.S. Nat. Mus., 55977)

*Pityophthorus inceptis* Wood, 1975, Great Basin Nat. 35:396 (Holotype, female; 4 miles or 6 km W Quiroga, Michoacán, Mexico; Wood Coll.). *New synonymy*

DIAGNOSIS.— This species is distinguished by the simple male frons and declivity, by the female frontal vestiture, and by the coarse pronotal and elytral punctures. It is not closely allied to other known species.

FEMALE.— Length 1.5–1.6 mm, 2.7 times as long as wide; color very dark brown.

Frons basically convex except flattened on median half from epistoma to slightly above eyes; surface shining, punctures rather coarse, moderately close; vestiture rather sparse and short except on margins of upper half of flattened area, there forming a dense fringe of long, yellow hair, longest setae equal in length to three-fourths distance from their bases to epistomal margin. Antennal club broadly obovate, 1.2 times as long as wide, suture 1 almost straight, 2 moderately procurved.

Pronotum 1.07 times as long as wide; widest on basal third, moderately arcuate from base to rather broadly rounded anterior margin; anterior margin armed by about six to eight low, basally contiguous teeth; summit at middle; asperities rather coarse, confused; posterior areas subrugose-reticulate, punctures coarse, deep, mostly spaced by distances equal to one-half diameter of a puncture, median line impunctate. Vestiture of sparse semirecumbent short hair in lateral and asperate areas.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal three-fourths, somewhat narrowly rounded behind; striae not impressed, punctures rather coarse, deep, occasional punctures not in row, spaced by less than diameter of a puncture; interstriae almost smooth, shining, impunctate except for an occasional puncture near declivity. Declivity steep, convex; striae not impressed, punctures reduced, about one-third as large as on disc, distinctly impressed; interstriae as on disc except 1 and 3 each with a row of fine punctures. Vestiture confined to sides and declivity, that on sides of minute strial hair, that on declivity of fine, rather short interstrial setae on odd-numbered interstriae.

MALE.— Similar to female except frons more uniformly convex, without brush of long hair; serrations on anterior margin of pronotum slightly larger.

DISTRIBUTION.— Michoacán to Jalisco.

MEXICO: Jalisco: Guadalajara, 30-XII-42, in pottery crate wood; Tlaquepaque, 7-XI-41, *Sambucus* canes intercepted at New York 91171. Michoacán: 6 km W Quiroga, 17-VI-65, 2200 m, No. 72, shrub, S. L. Wood.

NOTES.— The above treatment was based on the type series of three specimens. This species should probably be placed in *Araptus* near *speciosus* Wood; the type series are not sufficient to adequately place it.

### 4. *Pityophthorus melanurus* Wood

*Pityophthorus melanurus* Wood, 1976, Great Basin Nat. 36:364 (Holotype, female?; 5 miles or 8 km W San Cristóbal de las Casas, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *alni* Blackman by the smaller average

size, by the rugose-reticulate pronotal surface, by the coarser pronotal rugae on the posterior half, by the wrinkled elytral surface, and by other characters described below.

FEMALE(?).— Length 1.7–2.0 mm, 3.0 times as long as wide; color black.

Frons broadly convex, a slight transverse impression immediately above epistoma; surface reticulate, punctures fine, rather sparse; vestiture fine, short, sparse. Antennal club 2.0 times as long as wide, sutures 1 and 2 straight, not marked by grooves or setae on middle half.

Pronotum 1.16 times as long as wide; outline about as in *alni*; anterior margin armed by about 16 rather coarse serrations; longitudinal rugae extending to base as in *alni* except much coarser ón disc; surface between asperities and rugae rugose-reticulate, punctures not clearly evident. Vestiture restricted to margins and asperate area.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; outline as in *alni*; striae not impressed, moderately to strongly confused, 1 and 2 often distinguishable on posterior half; surface shining, wrinkled, interstrial punctures similar to and largely confused with those of striae. Declivity steep, convex; sculpture as on disc, striae 1 and 2 slightly confused but identifiable, their punctures almost as large as on disc; interstrial punctures not granulate. Vestiture extending to base, similar on disc and declivity; consisting of moderately coarse, rather long strial hair and similar interstrial setae, interstrial setae on declivity slightly longer.

DISTRIBUTION.— Chiapas.

MEXICO: **Chiapas**: San Cristobal de las Casas, 3–10-V-69, beating *Quercus*, H. F. Howden.

NOTES.— The above treatment was based on the type series of four specimens, apparently all females.

### 5. *Pityophthorus alni* Blackman

Fig. 200

*Pityophthorus alni* Blackman, 1942, Proc. U.S. Nat. Mus. 92:209 (Holotype, female; Jalapa, Veracruz, Mexico; U.S. Nat. Mus., 55984)

DIAGNOSIS.— This species is distinguished by the near absence of secondary sexual characters, by the unique pronotum, by the spatulate interstrial setae, and by other characters.

FEMALE.— Length 2.0–2.4 mm, 2.8 times as long as wide; color black.

Frons convex on upper half, lower half shallowly, transversely impressed with median area weakly elevated; surface shining, punctures on marginal areas rather coarse, deep, close, becoming smaller and granulate toward central half, central third on lower half rather sparsely punctured, without granules, a few subaciculate lines usually present; vestiture of sparse, fine, rather long hair below upper level of eyes. Antennal club 1.3 times as long as wide, slightly wider through segment 3, sutures 1 and 2 weakly procurved.

Pronotum 1.2 times as long as wide; sides almost straight and parallel on basal third, then arcuately converging to broadly rounded anterior margin; anterior margin subserrately costate; summit at middle; asperities moderately large, confused, decreasing in size behind summit, continued almost to base as declining costae in lateral areas; posterior areas between costae etched with minute points, punctures moderately coarse, rather close. Glabrous except for a few short setae on lateral margins and in asperate area.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae 1 slightly, others not impressed, punctures rather coarse, deep, close; interstriae smooth, shining, twice as wide as striae, small, uniseriate, restricted to base and to near declivity. Declivity convex, steep; sculpture similar to disc except interstriae 1 weakly elevated, striae 1 more strongly impressed, strial punctures less than half as large, interstriae uniseriately punctured (sparse on 2), most punctures finely granulate. Vestiture confined to declivity, of minute strial hair and erect, spatulate interstrial bristles, each two-thirds as long as distance between rows, more widely spaced within a row.

MALE.— Similar to female in all respects.

DISTRIBUTION.— Hidalgo to Veracruz.

MEXICO: **Hidalgo**: Tlahuelumpa, Zacultipan, 16-X-80, *Alnus*, T. H. Atkinson. **Veracruz**: Las Vigas, 5-VII-67, *Alnus*, S. L. Wood; Jalapa, 9-II-36, *Alnus*, D. DeLeon.

NOTES.— The above treatment was based on the holotype and on six other specimens.

### 6. *Pityophthorus alnicolens* Wood

*Pityophthorus alnicolens* Wood, 1977, Great Basin Nat. 37:213 (Holotype, male?; Highway 131, 115 miles or 184 km S Oaxaca, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *alni* Blackman by the smaller size, by the reticulate, dull pronotum, by the smaller, less deeply impressed strial punctures, and by the proportionately wider discal interstriae, which have numerous, irregular, impressed lines.

MALE(?).— Length 1.5–1.7 mm, 2.6 times as long as wide; color dark brown.

Frons broadly convex, flattened on lower half, a very feeble median carina from epistoma to upper level of eyes; epistomal margin slightly elevated; vestiture sparse, short, inconspicuous. Antennal club as in *alni* except slightly smaller, slightly more slender.

Pronotum much as in *alni* except discal area strongly reticulate, punctures coarser, margins not asperate; asperities absent from posterior third.

Elytra much as in *alni* except striae not impressed, punctures much smaller, not as deep, interstriae three times as wide as striae, with fine, irregular impressed lines and points, with fine, rather sparse, uniseriate punctures. Declivity about as in *alni* except punctures much finer. Vestiture about as in *alni* except much longer.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: Highway 131, 115 miles or 184 km S Oaxaca, 27–30-V-71, 6000 ft, *Alnus*, D. E. Bright.

NOTES.— The above treatment was based on the type series of five specimens.

### 7. *Pityophthorus elegans* Schedl

*Pityophthorus elegans* Schedl, 1938, Archiv Naturgesch. 7:184 (Holotype, male; Guatemala; U.S. Nat. Mus., 60251)

DIAGNOSIS.— This species is distinguished from the remotely allied *sparsepilosus* (Schedl) by the smaller size, by the more slender form, and by other characters cited below.

MALE.— Length 1.3 mm, 3.1 times as long as wide; color brown.

Frons moderately, transversely impressed from epistoma to upper level of eyes, upper margin of impression rather abrupt but not carinate, surface almost smooth, shining, punctures rather small, moderately close except impunctate on a small median area on lower fourth.

Pronotum 1.2 times as long as wide; sides almost straight and parallel on basal half, rather broadly rounded in front, anterior margin armed by 12 rather low, equal serrations; summit anterior to middle; asperities small, rather numerous, confused; posterior areas smooth, shining, impressed points present (mostly covered by debris), punctures rather small, moderately close.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; striae not impressed, punctures moderately coarse; interstriae shining, almost smooth, many impressed points present, almost twice as wide as striae, punctures absent. Declivity steep, rather strongly bisulcate, lateral areas superficially appear slightly flattened; punctures on striae 1 evidently obsolete, distinctly, rather coarsely impressed on 2; interstriae 1 distinctly elevated, with a few fine granules, 2 rather strongly impressed, about one and one-half times as long as wide, somewhat flat, lateral areas rather broadly rounded, upper half very slightly higher than suture, granules fine. Vestiture of stout setae of moderate length on and near declivity on odd-numbered interstriae, rather close.

DISTRIBUTION.— Guatemala.

"Guatemala, Conradt."

NOTES.— The above treatment was based on the holotype.

### 8. *Pityophthorus timidulus* Wood

*Pityophthorus timidulus* Wood, 1975, Great Basin Nat. 35:396 (Holotype, male; Volcán Chiriquí, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *mendosus* Wood by the larger size, by the coarser pronotal punctures, and by slight differences on the elytral declivity. Both species are allied to *mandibularis* Schedl

MALE.— Length 1.8–2.0 mm, 2.5 times as long as wide; color very dark brown.

Frons convex above eyes, upper half of area below upper level of eyes rather abruptly, strongly, transversely impressed almost from eye to eye, a smaller transverse impression in lateral areas immediately above epistoma; surface shining, coarsely, rather closely

punctured; vestiture sparse except on epistoma. Antennal club oval, 1.3 times as long as wide, sutures 1 and 2 moderately arcuate, 2 at middle of club.

Pronotum 1.1 times as long as wide; sides on basal half almost straight, subparallel, rather broadly rounded in front; anterior margin armed by about 12 low serrations; summit at middle; asperities on anterior slope rather coarse, close, confused; posterior areas smooth, shining, with moderately abundant minute impressed points, punctures rather coarse, deep, moderately close, irregularly spaced by about one to two diameters of a puncture. Glabrous except a few setae on margins.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae 1 weakly, others not impressed, punctures rather small, deep, spaced by diameter of one puncture; interstriae smooth, shining, a few small punctures on 1 near declivity, others impunctate. Declivity steep, convex, shallowly bisulcate; interstriae 1 distinctly elevated, armed by a row of about seven rounded tubercles, 2 moderately impressed, slightly wider than 1, smooth, shining, devoid of punctures, 3 convex, as high as 1, armed as on 1, lateral areas with punctures somewhat confused. Vestiture confined to declivity, consisting of rather short, moderately coarse, sparse, interstrial setae on odd-numbered interstriae.

FEMALE.— Similar to male except frons below upper level of eyes shallowly, broadly, transversely impressed, surface regular, not granulate, punctures moderately fine, vestiture sparse, declivital sulcus much less strongly impressed, granules on interstriae 1 and 3 minute.

DISTRIBUTION.— Panama.

PANAMA: Volcán Chiriquí, Chiriquí, 11-I-64, 1800 m, No. 407, sapling, S. L. Wood.

NOTES.— The above treatment was based on the type series of 14 specimens. The host may have been *Oreopanax nubigenus*.

### 9. *Pityophthorus mendosus* Wood

*Pityophthorus mendosus* Wood, 1975, Great Basin Nat. 35:397 (Holotype, male; San Isidro del General, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *timidulus* Wood by the smaller size, by the smaller pronotal punctures, by the shorter, stouter elytral bristles, and by the complete absence of tubercles on female declivital interstriae 1 and 3.

MALE.— Length 1.5–1.7 mm, 2.8 times as long as wide; color very dark brown.

Frons as in *timidulus* except callus at level of antennal insertion usually more strongly developed and with a small cusp at dorsomedian extremity. Pronotal punctures averaging slightly smaller than in *timidulus*. Elytra as in *timidulus* except declivital setae slightly shorter and distinctly stouter.

FEMALE.— As in female *timidulus* except frons less distinctly impressed, declivital granules absent, and declivital setae shorter and stouter.

DISTRIBUTION.— Costa Rica.

COSTA RICA: San Isidro del General, San José, 5-XII-63, 1000 m, No. 282, "Fosforo" leaf petioles, S. L. Wood.

NOTES.— The above treatment was based on the type series of 20 specimens.

### 10. *Pityophthorus degener* Wood

*Pityophthorus degener* Wood, 1975, Great Basin Nat. 35:397 (Holotype, male; Volcán Chiriquí, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the allied *timidulus* Wood and *mendosus* Wood by the much more weakly impressed male frons, by the strongly impressed elytral declivity, and by the finer pronotal punctures.

MALE.— Length 1.7–2.0 mm, 2.8 times as long as wide; color very dark brown.

Frons convex, but with abrupt, irregular, shallow, transverse impressions just below upper level of eyes and just above epistoma; surface subshining, coarsely, closely punctured; almost glabrous except at epistomal margin. Pronotum and elytral disc as in *timidulus* and *mendosus* except pronotal punctures much smaller, slightly closer; elytral declivity strongly bisulcate, interstriae 1 almost as high as wide, 3 higher than 1, each armed by a row of moderately coarse tubercles. Elytral vestiture as in *timidulus*.

FEMALE.— Similar to male except median half of frons flattened below upper level of

eyes, surface smooth, with punctures rather fine, close, deep, with rather abundant, fine, moderately long hair; declivital sulcus only half as deep, interstriae 1 and 3 unarmed.

DISTRIBUTION.— Panama.

PANAMA: Volcán Chiriquí, Chiriquí, 11-I-64, 1800 m, No. 384, tree limb, S. L. Wood.

NOTES.— The above treatment was based on the type series of nine specimens.

### 11. *Pityophthorus punctiger* (Schedl)

*Neodryocoetes punctiger* Schedl, 1951, Dusenia 2:108 (Holotype, sex?; Mexico; Schedl Coll.)

DIAGNOSIS.— The placement of the unique specimen of this species is complicated by the complete concealment of the frons by the pronotum. It apparently is allied to *degener* Wood, but it is distinguished by the coarser, usually subasperate pronotal punctures on the disc, by the presence of minute strial setae to the elytral base, by the coarser, longer, interstrial setae on the declivity, and by the elytral declivity.

FEMALE.— Length 1.7 mm, 2.7 times as long as wide; color brown, basal half of pronotum darker.

Head concealed. Antennal club rather small, segment 1 rather short, sutures 1 and 2 equally marked, rather strongly arcuate.

Pronotum 1.13 times as long as wide; widest at base, sides on basal half feebly arcuate, converging slightly, weakly constricted one-third pronotum length from anterior margin, anterior margin rather narrowly rounded; summit indefinite, anterior to middle; anterior slope moderately asperate, asperities confused; disc smooth, shining punctures moderately coarse, impressed, those on anterior half of disc accompanied on lateral side by a small, subasperate elevation. Vestiture of short hair on disc and asperate areas.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather broadly rounded behind; striae not impressed, punctures moderately large, rather strongly impressed, mostly spaced by diameter of a puncture; interstriae one to one and one-half times as wide as striae, smooth, shining, with moderately abundant very minute points, 5 with a few punctures. Declivity confined to posterior fourth, steep; upper three-fourths strongly, rather broadly sulcate; striae 1 and 2 shallowly, rather coarsely punctured; interstriae 1 moderately elevated, with a row of small punctures, 2 as wide as 1, strongly, broadly impressed but deepest on median side, impunctate, smooth, shining, 3 distinctly higher than 1, abruptly rounded, with a row of punctures. Vestiture consisting of fine, short, strial hair to base; declivity with interstrial setae except on 2; rather long, moderately abundant, these setae extend to middle of disc on 5 and in lateral areas.

DISTRIBUTION.— Mexico.

MEXICO: "Mexico, Flohr coll."

NOTES.— The above treatment was based on the holotype.

### 12. *Pityophthorus amiculus* Wood

*Pityophthorus amiculus* Wood, 1975, Great Basin Nat. 35:398 (Holotype, male; Guápiles, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *degener* Wood by the absence of sexual dimorphism and by the different frons, pronotum, and other characters.

MALE.— Length 1.7–1.9 mm, 2.7 times as long as wide; color reddish brown.

Frons convex above eyes, with median line smooth, impunctate, a median callus at upper level of eyes, area below upper level of eyes broadly, shallowly, transversely impressed to epistoma; surface almost smooth, punctures moderately coarse, close, deep; almost glabrous except along epistoma.

Pronotum 1.2 times as long as wide; outline as in *degener*; asperate area continued slightly into lateral portion of posterior half as weak rugae; posterior areas smooth, shining, with rather numerous impressed points, punctures rather fine, moderately close, median line impunctate. Sparse setae confined to asperate area.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; outline as in *timidulus* Wood; striae not impressed, punctures rather small, deep, close, rows occasionally slightly confused; interstriae smooth, shining, slightly irregular, with a few impressed lines, impressed points moderately abundant, 1 with obscure subgranulate punctures almost to base, others with an occasional similar puncture. Declivity steep, strongly bisulcate, sulcus commencing slightly behind middle of

elytral length; striae 1 and 2 with punctures reduced in size but clearly impressed; interstriae 1 almost as high as wide, 3 higher than 1, each armed by a row of about eight subacute tubercles of moderate size, 2 wider than 1, its surface ascending laterally, unarmed. Vestiture consisting of interstrial bristles on declivity, continued to middle of disc on odd-numbered interstriae; longest bristles rather slender, equal in length to twice width of an interstriae.

FEMALE.— Similar to male in all respects.

DISTRIBUTION.— Veracruz to Costa Rica.

MEXICO: Veracruz: Coatzocoalcos, 26-VI-67, 30 m, No. 103, liana, S. L. Wood. COSTA RICA: Guápiles, Limón, 22-VIII-66, 100 m, No. 121, liana, S. L. Wood.

NOTES.— The above treatment was based on the type series of 32 specimens.

### 13. *Pityophthorus dissolutus* Wood

*Pityophthorus dissolutus* Wood, 1975, Great Basin Nat. 35:398 (Holotype, female; 13 km SE Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *explicitus* Wood by the finer frontal punctures, by the finer granules on the pronotal disc, and by the shallower declivital sulcus that is armed by finer granules.

MALE.— Length 1.4–1.6 mm, 2.7 times as long as wide; color dark brown.

Frons convex, a fine median tubercle on epistomal process; surface strongly reticulate, punctures rather fine, deep, spaced by diameter of a puncture or more; vestiture fine, sparse, inconspicuous.

Pronotum 1.1 times as long as wide; widest on basal half, sides feebly arcuate, subparallel, rather narrowly rounded in front; anterior margin armed by about eight moderately coarse serrations; summit at middle, indefinite; asperities rather fine, confused; posterior areas strongly reticulate, punctures rather fine, moderately close. Vestiture confined to marginal and asperate areas.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae 1 weakly, others not impressed, punctures fine, distinct, decreasing in size posteriorly; interstriae almost smooth, with some indistinctly impressed lines, about three times as wide as striae on basal fourth, six times as wide near declivity. Declivity rather steep, shallowly bisulcate; striae 1 deeply impressed, punctures small, indistinct, surface ascending gradually to lateral convexity, striae 2 obscure; interstriae 1 almost as high as wide, almost smooth, with a row of fine tubercles, 2 and lateral areas shining, rather densely covered by impressed points, 3 slightly higher than 1, similarly armed. Vestiture of minute strial hair, and, on posterior half, interstrial bristles on odd-numbered interstriae; bristles sparse, rather fine, short.

FEMALE.— Similar to male except epistomal tubercle evidently absent and declivital impressed points reduced or absent.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: 13 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 201, liana, S. L. Wood; Tapantí, Cartago, 24-X-63, 1300 m, No. 244, liana, S. L. Wood. PANAMA: Volcán Chiriquí, Chiriquí, 11-I-64, 1800 m, No. 394, sapling, S. L. Wood.

NOTES.— The above treatment was based on the type series of 37 specimens.

### 14. *Pityophthorus explicitus* Wood

*Pityophthorus explicitus* Wood, 1975, Great Basin Nat. 35:399 (Holotype, female; 9 km NE Teziutlán, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *dissolutus* Wood by the coarser frontal punctures, by the larger granules on the pronotal disc, and by the deeper declivital sulcus that is armed by coarser granules.

MALE.— Length 1.5–1.7 mm, 2.7 times as long as wide; color very dark brown.

Frons as in *dissolutus* except punctures distinctly larger, spaced by less than diameter of a puncture. Pronotum as in *dissolutus* except granule on lateral margins of discal punctures distinctly larger. Elytra as in *dissolutus* except declivital sulcus deeper, wider, interstriae 2 not ascending laterally on lower half.

FEMALE.— Similar to male in all respects.

DISTRIBUTION.— Puebla.

MEXICO: Puebla: 9 km NE Teziutlán, 2-VII-67, 1600 m, No. 143, liana, S. L. Wood.

NOTES.— The above treatment was based on the type series of 16 specimens.

### 15. *Pityophthorus thomasi* Bright

*Pityophthorus thomasi* Bright, 1976, Great Basin Nat. 36:443 (Holotype, female; 10 miles or 17 km SW El Salto, Durango, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished by the convex, unarmed declivity, by the minute elytral punctures, by the large number (14) of serrations on the anterior margin of the pronotum, and by the female frontal vestiture, which extends abnormally high on the vertex.

FEMALE.— Length 1.3–1.5 mm, 2.8 times as long as wide; color very dark brown.

Frons flattened on median three-fourths from epistoma to very high on vertex; margins subabrupt, spaced by diameters of three facets of eye from margin of eye; surface almost smooth, punctures minute; vestiture largely confined to margin, most abundant on vertex, longest setae on vertex reaching epistoma. Antennal club broadly oval; sutures 1 and 2 rather strongly procurved, 2 at middle of club.

Pronotum much as in *blandus* Blackman except discal punctures smaller; anterior margin armed by 14 small, subequal serrations.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; outline about as in *opaculus* LeConte; striae not impressed, punctures minute, spaced within row by three diameters of a puncture; interstriae three times as wide as striae, shining, wrinkled near scutellum, obscure lines in other areas, semiobscure impressed points rather abundant, punctures mostly obsolete. Declivity broadly convex, very steep; strial punctures obsolete; interstrial punctures mostly obsolete, one or two on odd-numbered interstriae; surface obscurely shagreened. Vestiture of minute strial hair to base, 2–4 short interstrial setae on odd-numbered interstriae on declivity.

MALE.— Similar to female except frons weakly convex, punctures rather coarse, a moderate median carina from epistoma to upper level of eyes.

DISTRIBUTION.— Durango.

MEXICO: Durango: 16 km W El Salto, 7-VII-64, 2600 m, *Pinus cooperi*, J. B. Thomas.

NOTES.— The above treatment was based on the type series of 24 specimens.

### 16. *Pityophthorus digestus* (LeConte)

*Cryphalus digestus* LeConte, 1874, Trans. Amer. Ent. Soc. 5:71 (Lectotype, sex?, Mojave Desert, California; Mus. Comp. Zool., 997, designated by Bright 1976, Coleopt. Bull. 30:185)

*Pityophthorus digestus*: LeConte, 1876, Proc. Amer. Philos. Soc. 15:355

*Pityophthorus idoneus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:55 (Holotype, female; Centerville, Idaho; U.S. Nat. Mus., 41279); Bright, 1977, Canadian Ent. 109:514. *Synonymy*

*Pityophthorus hopkinsi* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:56 (Holotype, female; Ventura Co., California; U.S. Nat. Mus., 41280); Bright, 1966, Pan Pacific Ent. 42:304. *Synonymy*

*Pityophthorus ponderosae* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:57 (Holotype, female; Las Vegas Hot Springs, New Mexico; U.S. Nat. Mus., 41281); Bright, 1966, Pan Pacific Ent. 42:304. *Synonymy*

*Pityophthorus aplanatus* Schedl, 1930, Canadian Ent. 62:195 (Holotype, female, Athabasca Falls, Alberta; Canadian Nat. Coll., 3132); Wood, 1978, Great Basin Nat. 38:398. *Synonymy*

DIAGNOSIS.— This species is distinguished by the distinct median carina in both sexes, by the distinctive size and arrangement of elytral punctures and setae, and by other characters.

FEMALE.— Length 1.4–2.0 mm, 2.6 times as long as wide; color very dark brown.

Frons broadly convex, less strongly so on lower half; a conspicuous median carina from epistoma to slightly above upper level of eyes (somewhat variable), its highest point on upper half; surface shining, coarsely, closely, deeply punctured; vestiture of sparse, short, fine, inconspicuous hair. Antennal club broadly ovate, sutures weakly procurved.

Pronotum 1.02 times as long as wide; widest one-third pronotum length from base, sides on basal half moderately arcuate, feebly constricted on anterior half, rather broadly rounded in front; anterior margin armed by six to eight rather coarse, slender serrations, lateral pair notably smaller; summit at middle, a distinct impression behind it; asperities moderately abundant except near anterior margin, rather narrow, moderately coarse; posterior areas smooth, shining, rarely with areas of feeble subreticulation, punctures usually fine, sometimes irregular, some specimens from northern area rather coarse, close; median line usually impunctate. Vestiture of semirecumbent, fine hair, a seta arising from each puncture.

Elytra 1.6 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly

rounded behind; striae not impressed except 1 weakly near declivity, punctures varying from very fine (New Mexico to Alberta) to moderately coarse (Pacific Coast), usually larger and slightly confused on basal half, uniseriate and decreasing in size toward declivity; interstriae shining, often almost subrugose on basal fourth, usually with impressed lines, rarely smooth, about two to six times as wide as striae, punctures slightly smaller than those of striae, varying from regular on all interstriae (southern) to a partial reduction on even-numbered interstriae. Declivity broadly convex, rather steep; striae 1 slightly impressed, strial punctures minute, spaced by three or more diameters of a puncture; interstriae shining, almost smooth, 1 rather abruptly, weakly elevated, 2 two to three times as wide as 1, impunctate to very sparsely, minutely punctured, 3 gradually ascending to height of 1, 1 and 3 rather finely punctured, 3 armed by about four to six fine tubercles reduced in size (Wyoming) to absent (Alberta). Vestiture of rows of minute strial hair and slightly longer interstrial setae; declivital interstrial setae on 3 longer, absent on 2; discal setae on even-numbered interstriae reduced to absent when punctures obsolete.

MALE.— Similar to female except carina usually slightly higher.

DISTRIBUTION.— British Columbia and Alberta to California and New Mexico.

CANADA: **Alberta**: Athabasca Falls. **British Columbia**: Copper Mt., Peachland. USA: **Arizona**: Carr Canyon in Huachuca Mts., Chiricahua Mts., Kaibab N.F., Santa Catalina Mts., Santa Rita Mts., Williams. **California**: Big Meadows, Elk Creek in Glen Co., Fallen Leaf Lake in Eldorado N.F., Glass Mt. in Modoc Co., Harvey Valley, Hat Creek, Lake Tahoe, Los Angeles Co., Mariposa Co., Mojave Desert, Mt. Laguna, Old Station in Lassen N.F., Plumas Co., Riverside Co., San Bernardino Co., San Diego Co., Shasta Co., Tulare Co., Tuolumne Co., Ventura Co., Whitehorse, Yosemite N.P. **Idaho**: Centerville, Coeur d'Alene, Moscow Mts. **Montana**: Deer Lodge Co. **Nevada**: Little Valley in Washoe Co. **New Mexico**: Capitan Mts., Cloudcroft, Las Vegas Hot Springs, Meek, Sandia Mts., San Lorenzo. **Oregon**: Ashland, Deschutes N.F., Klamath Falls, Paisley, Salem. **Utah**: Alta. **Washington**: Elberton in Whitman Co. **Wyoming**: Lusk.

HOSTS.— *Pinus contorta, P. jeffreyi, P. ponderosa.*

BIOLOGY.— Specimens were taken from branches 2–5 cm in diameter.

NOTES.— The above treatment was based on the syntypes of *digestus,* on the holotypes of *idoneus, hopkinsi, ponderosae,* and *aplanatus,* and on 446 other specimens.

As indicated in the description, this species varies within series as well as geographically. The Alberta population differs rather sharply except that series from New Mexico to Wyoming indicate it is just the extreme end of a gradual cline. I have not recognized that population as a geographical race because of inadequate material, although there may be some evidence for doing so.

### 17. *Pityophthorus festus* Wood

*Pityophthorus festus* Wood, 1967, Great Basin Nat. 27:39 (Holotype, male; 18 miles W El Salto, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *digestus* (LeConte) by the smaller average size, by the larger, more regular strial punctures, by the near absence of interstrial punctures, and by other characters cited below.

FEMALE.— Length 1.3–1.6 mm, 2.6 times as long as wide; color very dark brown.

Frons as in *digestus* except lower half more distinctly flattened and carina often reduced near epistoma.

Pronotum as in *digestus* except serrations on anterior margin smaller, posterior areas almost always subreticulate in specimens from southern part of range, shining, punctures uniformly rather coarse.

Elytra similar to *digestus* except smooth to base, strial punctures more nearly in rows to base, moderately coarse to declivity; interstriae less than twice as wide as striae, almost entirely impunctate; declivital striae 2 more coarsely punctured, interstriae 2 more distinctly impressed, only twice as wide as 1, 3 with small granules more closely spaced on middle half; interstrial setae absent on even-numbered interstriae, sparse on disc on odd-numbered interstriae, regular on declivity and uniformly as long or longer than those on 3 of *digestus.*

MALE.— Similar to female except serrations on anterior margin of pronotum slightly larger, elytral punctures slightly more confused.

DISTRIBUTION.— Arizona to Jalisco and Chiapas.

USA: **Arizona**: Bear Canyon, Santa Catalina Mts., Chiricahua Mts. MEXICO: **Chiapas**: Ocosingo, Teopisca, Yerba Buena. **Chihuahua**: 37 km S Creel. **Durango**: 5, 29, 35 km W El Salto, Palmito. **Jalisco**: 23 km NW Guadalajara. **Mexico**: Nepantla, Ocoyoacac. **Veracruz**: Las Vigas.

HOSTS.— *Pinus ayacahuite*, *P. leiophylla*, *P.* spp.

BIOLOGY.— Specimens infested the phloem of small branches.

NOTES.— The above treatment was based on the type series of 19 specimens and on 166 other specimens. The pronotal disc is smooth in specimens from Durango to Arizona, but partly reticulate in those from southern areas.

### 18. *Pityophthorus puberulus* (LeConte)

*Cryphalus puberulus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:157 (Holotype, sex?; District of Columbia; Mus. Comp. Zool., 998)

*Pityophthorus puberulus*: LeConte, 1876, Proc. Amer. Philos. Soc. 15:354

*Pityophthorus infans* Eichhoff, 1872, Berliner Ent. Zeitschr. 15:135 (Holotype, sex?; Amer. Bor. (Civitat. unit.); (Apparently lost with Hamburg Mus.); Bright, 1978, Great Basin Nat. 38:72 (Neotype, female; Syracuse, New York; U.S. Nat. Mus.); Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:49. *Synonymy*

DIAGNOSIS.— This species is distinguished from *opaculus* LeConte and allied species by the partly to entirely reticulate pronotal disc and by the more crowded, more nearly confused discal interstrial punctures.

FEMALE.— Length 1.2–1.5 mm, 2.5 times as long as wide; color brown.

Frons broadly convex, surface shining, rather closely punctured; vestiture sparse, inconspicuous; occasional specimens with a weak median carina.

Pronotum 1.05 times as long as wide; widest near base, sides rather weakly arcuate on basal half, distinctly constricted in front of middle; anterior margin rather narrowly rounded, armed by about six teeth, median ones usually slightly larger; posterior areas partly to entirely reticulate, punctures moderately coarse, rather deep, without granules behind summit. Vestiture of fine, semirecumbent hair.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures rather fine, in rows on about posterior third of disc, moderately to strongly confused toward base; interstriae shining, almost smooth, punctures moderately abundant, similar to and confused with those of striae. Declivity convex, moderately steep; sutural interstriae distinctly elevated, 2 slightly impressed, lateral convexities as high as suture, broadly rounded, punctures minute but visible; granules on interstriae 3 very minute. Vestiture of moderately abundant, rather short hair.

MALE.— Similar to female in all respects.

DISTRIBUTION.— Minnesota and Nova Scotia to Kansas and Virginia.

CANADA: Nova Scotia, New Brunswick, Ontario, Quebec. USA: District of Columbia, Indiana, Kansas, Kentucky, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, Virginia, West Virginia, Wisconsin.

HOSTS.— *Abies balsamea*, *Picea* spp., *Pinus banksiana*, *P. resinosa*, *P. silvestris*, *P. strobus*.

BIOLOGY.— This species breeds in small twigs of its hosts.

NOTES.— The above treatment was based on the holotype of *puberulus* and on 981 other specimens.

### 19. *Pityophthorus abstrusus* Bright

*Pityophthorus abstrusus* Bright, 1976, Great Basin Nat. 36:427 (Holotype, female; 25 miles or 40 km W Orizaba, Veracruz, Mexico; Canadian Nat. Coll., 15071)

DIAGNOSIS.— This species is distinguished by the coarse strial punctures on both disc and declivity, by the short female frontal vestiture, and by the short, subdentate male frontal carina.

FEMALE.— Length 1.5–1.6 mm, 2.7 times as long as wide; color very dark brown.

Frons very broadly convex, punctures coarse, close, uniformly distributed; vestiture rather inconspicuous, mostly short, about a dozen setae of moderate length.

Pronotum and elytra as in *petillus* Schedl except pronotal disc smooth, shining; elytra with strial punctures coarse, almost as wide as interstriae, those on declivity about two-thirds as long as those on disc.

MALE.— Similar to female except frons with a short, high, subdentate median carina on lower half.

DISTRIBUTION.— Veracruz.

MEXICO: **Veracruz**: 40 km W Orizaba, 29-IV-69, *Pinus*, D. E. Bright.

NOTES.— The above treatment was based on the holotype and allotype. The paratypes, four from Durango, are not of this species.

### 20. *Pityophthorus punctifrons* Bright

*Pityophthorus punctifrons* Bright, 1966, Pan Pacific Ent. 42:298 (Holotype, female; Frazier Park, Kern Co., California; California Acad. Sci.)

DIAGNOSIS.— This species is distinguished from *modicus* Blackman by the smaller size, by the very different frons in both sexes, and by the different declivity as described below.

FEMALE.— Length 1.4–1.8 mm, 2.6 times as long as wide; color very dark brown.

Frons broadly convex; surface smooth, shining, punctures rather coarse, moderately close, uniformly distributed; vestiture short, sparse, inconspicuous.

Pronotum about as in *modicus* except with 8–12 serrations on anterior margin, only slightly larger in median area.

Elytra as in *modicus* except punctures on declivital striae 2 minute, distinct, not replaced by granules, interstriae 2 very feebly impressed on median side (much less than in *modicus*), 3 with minute punctures, granules entirely absent; vestiture minute but very slightly longer than in *modicus*.

MALE.— Similar to female except frons more distinctly convex, more coarsely punctured, usually with an obscure, low median carina indicated.

DISTRIBUTION.— California to New Mexico.

USA: **California**: Frazier Park, 9-IX-65, *Pinus monophylla*, D. E. Bright; Mt. Laguna, 19-III-41, Hopk. 32525B, *P. quadrifolia*, D. DeLeon; Wrightwood, 21-X-41, *P. monophylla*, J. M. Miller. **New Mexico**: Santa Fe, Hopk. US 37219-F, *P. edulis*.

HOSTS.— *Pinus edulis*, *P. monophylla*, *P. quadrifolia*.

NOTES.— The above treatment was based on 17 paratypes.

### 21. *Pityophthorus modicus* Blackman

*Pityophthorus modicus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:94 (Holotype, female; Las Vegas H.S., New Mexico; U.S. National Mus., 41299)

*Pityophthorus navus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:95 (Holotype, female; Morgan Hill, California; U.S. National Mus., 41300); Bright, 1966, Pan Pacific Ent. 42:304. *Synonymy*

DIAGNOSIS.— Not closely related to any known species except *punctifrons* Bright; male frons without a carina, female frons as in *tuberculatus*; elytral disc usually glabrous (due to abrasion). Declivital striae 2 and 3 each with a row of minute granules.

FEMALE.— Length 1.5–1.8 mm, 2.6 times as long as wide; color very dark brown.

Frons plano-concave from eye to eye from epistoma to well above eyes, central area smooth, shining, impunctate (similar to *tuberculatus* Eichhoff), lateral and upper margins with a row of coarse punctures; these punctures bearing a marginal row of long hair.

Pronotum 1.1 times as long as wide; widest on feebly arcuate basal half; anterior margin rather narrowly rounded, armed by about eight serrations, median pair much larger; disc smooth, shining, punctures moderately coarse, rather close. Vestiture of fine, short, recumbent hair.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; outline about as in *puberulus*; striae not impressed, except 1 slightly near declivity, punctures in rows, moderately coarse, rather deep, close; interstriae smooth, shining, 1, 3, and 5 each with about three widely spaced punctures. Declivity convex, steep; strial punctures reduced in size (usually obsolete in California specimens), shallow, those on 2 and 3 replaced by minute granules, interstriae 1 and 3 each with a row of similar granules; interstriae 2 wider than 1 or 3, smooth, impunctate, shallowly, rather broadly impressed. Vestiture of minute strial hair and an occasional similar interstrial hair; abraded on disc in most specimens.

MALE.— Similar to female except frons broadly convex, coarsely, deeply punctured, brightly shining; a feeble, irregular, median carina present in one series from New Mexico, entirely absent in others.

DISTRIBUTION.— California and Utah to Baja California and Durango.

USA: **Arizona**: Chiricahua Mts., Jacob's Lake, Jerome, Parker Canyon in Cochise Co., Sweetwater in Apache Co., Williams. **California**: Big Bear in San Bernardino Co., Frazier Park, Morgan Hill, Mt. Hamilton, Pine Mt. Summit in Los Padres N.F., Valyermo, Wrightwood in San Bernardino Co. **Nevada**: Baker, Steamboat in

Washoe Co. New Mexico: Lake Roberts, Sandia Mts., San Lorenzo, Silver City. Utah: Arches Nat. Mon., Orderville, Zion N.P. MEXICO: Chihuahua: La Pinta. Durango: 30 km W Durango.

HOSTS.— *Pinus cembroides, P. edulis, P. monophylla, P. sabiniana.*

NOTES.— The above treatment was based on 223 specimens. Bright (1966:304) cites the occurrence of this species in Baja California.

### 22. *Pityophthorus minus* Bright

*Pityophthorus minus* Bright, 1976, Great Basin Nat. 36:437 (Holotype, female; Hannagan Camp, Greenlee Co., Arizona; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *segnis* Blackman by the minute elytral hair and by the complete absence of granules on declivital interstriae 1 and 3.

FEMALE.— Length 1.8 mm, 2.9 times as long as wide; color brown.

As in *segnis* except as noted in the diagnosis.

MALE.— Similar to female except frons as in male *segnis*.

DISTRIBUTION.— Arizona.

USA: Arizona: Hannagan Camp, Greenlee Co., 12-VII-68, D. E. Bright.

NOTES.— The above treatment was based on the holotype and allotype.

### 23. *Pityophthorus segnis* Blackman

*Pityophthorus segnis* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:52 (Holotype, female; Santa Catalina Mts., Arizona; U.S. Nat. Mus. 41278)

DIAGNOSIS.— This species is distinguished from *opaculus* LeConte by the dull, subreticulate to reticulate surfaces of the pronotum and elytra and by the coarse, erect, sparse setae on the odd-numbered declivital interstriae. It intergrades with *subopacus* Blackman in Durango.

FEMALE.— Length 1.6–1.9 mm, 2.9 times as long as wide; color very dark brown.

Frons as in *opaculus* except with fewer than a dozen setae in lateral areas much longer. Pronotum as in *opaculus* except surface dull, at least partly reticulate on disc (varying from shining to strongly reticulate in some series), punctures usually distinctly smaller. Elytra as in *opaculus* except surface dull, punctures larger but less sharply impressed, odd-numbered declivital interstriae each with a sparse row of coarse, erect setae, each equal in length to one or two times width of an interstriae.

MALE.— Similar to female except frons less clearly flattened and without long setae, a long, weak, median carina usually present.

DISTRIBUTION.— Arizona and New Mexico to Durango.

USA: Arizona: Bear Wallow in Santa Catalina Mts., 11-VI-69, 2600 m, No. 92, *Pinus strobiformis*, S. L. Wood, 31-VII-74 by D. E. Bright, and 19-VIII-07, Hopk. 5613a4, J. L. Webb; Sabino Canyon in Pima Co.; San Francisco Mts.; Santa Rita Mts. New Mexico: Sacramento Mts., Hopk. 5752, *P. strobiformis*, J. L. Webb. MEXICO: Durango: 70 km W Durango.

HOSTS.— *Pinus strobiformis, P. engelmannii.*

BIOLOGY.— Specimens were taken from small twigs.

NOTES.— The above treatment was based on the holotype and on 364 other specimens.

his species intergrades with *subopacus* to a remarkable degree, but it is distinguished by the slightly impressed, shining female frons with punctures indistinct (more strongly convex, reticulate, and clearly punctured in *subopacus*), there is also a slight difference in the punctures near the elytral apex.

### 24. *Pityophthorus culminicolae* Bright

*Pityophthorus culminocolae* Bright, 1977, Canadian Ent. 109:524 (Holotype, female; Cerro Potosí, Nuevo León; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *absonus* Blackman by the much more strongly impressed declivial sulcus, by the absence of long hair on the female frons, by the shorter, less abundant elytral vestiture, and by other characters.

FEMALE.— Length 1.5–1.9 mm, 2.8 times as long as wide; color very dark brown.

Frons somewhat flattened on median two-thirds of area below upper level of eyes, convex elsewhere; surface smooth, shining, rather coarsely, not closely punctured, a very feeble median carina indicated in most specimens.

Pronotum as in *absonus* except vestiture much less abundant.

Elytra as in *absonus* except disc smoother, strial punctures in more regular, definite rows, declivity much more deeply sulcate, with lateral convexities conspicuously higher than suture, punctures more nearly obsolete.

MALE.— Similar to female except frons more strongly convex, a distinct, low, median carina occupying at least two-thirds distance between epistoma and upper level of eyes.

DISTRIBUTION.— Nuevo León.

MEXICO: **Nuevo León**: Cerro Potosí, 4-V-71, D. E. Bright and 19-III-74, Hopk. 58606-B, *Pinus culminacola*, M. M. Furniss.

NOTES.— The above treatment was based on the type series of 135 specimens.

### 25. *Pityophthorus absonus* Blackman

*Pityophthorus absonus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:35 (Holotype, female; Mineral King, California; U.S. Nat. Mus., 41269)

*Pityophthorus demissus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:74 (Holotype, female; Glacier National Park, Montana; U.S. Nat. Mus., 41289); Bright, 1977, Canadian Ent. 109:513. *Synonymy*

*Pityophthorus inyoensis* Bright, 1971, Pan Pacific Ent. 47:65 (Holotype, female; 1 mile S Onion Valley, Inyo Co., California; Canadian Nat. Coll.; Bright, 1977, Canadian Ent. 109:513. *Synonymy*

DIAGNOSIS.— This species is distinguished from *opaculus* LeConte by the slightly larger size, by the absence of tubercles behind the pronotal summit, and by the different female frons.

FEMALE.— Length 1.6–1.8 mm, 2.8 times as long as wide; color very dark brown.

Frons broadly flattened to well above eyes, plano-concave on about central half; surface shining, coarsely punctured, punctures somewhat smaller and less dense on central area of lower half; a sparse brush of long hair extending to center, marginal setae longer and more numerous.

Pronotum 1.1 times as long as wide; outline about as in *puberulus* (LeConte); anterior margin armed by six teeth (usually irregular); posterior areas smooth, shining, punctures small, usually of irregular size at least near posterior margin, punctures immediately behind summit never granulate. Vestiture of fine, rather short, semirecumbent hair.

Elytra 1.7 times as long as wide, 1.8 times as long as pronotum; outline about as in *puberulus*; striae not impressed, punctures very fine, in rows on posterior half of disc, moderately to strongly confused toward base; interstriae smooth and shining, with a few lines on posterior half, moderately to strongly wrinkled on basal third, punctures mostly confined to basal half. Declivity convex, steep; strial punctures very minute, but visible; interstriae 1 distinctly elevated, 2 shallowly impressed, wider than 1 or 3, impunctate, almost smooth, 3 with a row of fine punctures (occasionally some of them feebly granulate). Vestiture of fine, short strial and interstrial hair on disc and declivity.

MALE.— Similar to female except frons broadly convex below upper level of eyes, more strongly convex above, surface more irregular, more finely, sparsely punctured, a strong, rather short, median carina on middle half of area between epistomal margin and upper level of eyes, vestiture sparse, inconspicuous; teeth on anterior margin of pronotum larger, regular.

DISTRIBUTION.— British Columbia and Alberta to California and Colorado.

CANADA: **Alberta**: Banff, Blairemore. **British Columbia**: Coal Creek in Kootenay District, Creston, Lorna, Nahun, Rossland. USA: **California**: Hat Creek, Lake Tenaya, Mineral King, Mt. Lassen, Robinson Lake (Onion Valley), Yosemite N.P., Westgard Pass in Inyo Co. **Colorado**: Cameron Pass, Evergreen, Gould. **Montana**: Glacier N.P. **Nevada**: Wheeler Peak. **Utah**: Logan Canyon, Park City, Scofield.

HOSTS.— *Abies lasiocarpa, Pinus albicaulis, P. aristata, P. balfouriana, P. contorta, P. monticola.*

BIOLOGY.— This species breeds in small branches and in shaded out seedlings.

NOTES.— The above treatment was based on 176 specimens. The holotypes of *absonus*, *demissus*, and *inyoensis* were examined.

### 26. *Pityophthorus opaculus* LeConte

*Pityophthorus opaculus* LeConte, 1878, Proc. Amer. Philos. Soc. 17:623 (Holotype, female; Marquette, Michigan; Mus. Comp. Zool., 1290)

*Pityophthorus abietis* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:49 (Holotype, female; Silver Lake, Utah; U.S. Nat. Mus., 41275); Bright, 1977, Canadian Ent. 109:517. *Synonymy*

*Pityophthorus albertensis* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:50 (Holotype, female; Banff Sp., Alb., presumably Banff Springs, Alberta; U.S. Nat. Mus., 41276); Bright, 1977, Canadian Ent. 109:517. *Synonymy*

*Pityophthorus exiguus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:51 (Holotype, female; Ft. Garland, Colorado; U.S. Nat. Mus., 41277); Bright, 1977, Canadian Ent. 109:517. *Synonymy*

*Pityophthorus pygmaeus* Schedl, 1931, Canadian Ent. 63:165 (Holotype, female; Ste. Anne's, Quebec; Canadian Nat. Coll., 3169); Wood, 1957, Canadian Ent. 89:401. *Synonymy*

DIAGNOSIS.— This species is distinguished from *absonus* Blackman by the smaller size, by the presence of minute granules on the pronotal disc, and by the very different female frons.

FEMALE.— Length 1.1–1.6 mm, 2.6–2.9 times as long as wide; color brown to dark brown. Specimens from eastern part of range distinctly stouter than those from west.

Frons convex, a weak (variable) transverse impression on lower half; surface shining, rather coarsely, uniformly punctured; vestiture variable; glabrous to inconspicuously pubescent. Females from Colorado and Utah very different, see Notes below.

Pronotum 1.05 times as long as wide; outline about as in *puberulus* LeConte; anterior margin armed by six teeth; posterior areas shining, rather coarsely, deeply punctured, punctures on disc each with a minute granule on posterior rim. Vestiture of fine, short, semirecumbent hair.

Elytra 1.7–1.8 times as long as wide, 1.8 times as long as pronotum; outline about as in *puberulus*; striae not impressed, rows of minute punctures extend to base; interstriae minutely irregular, not smooth, wrinkled on basal fourth. Declivity as in *absonus*.

MALE.— Similar to female, frons as described above.

DISTRIBUTION.— Alaska and Nova Scotia to California and West Virginia.

ALASKA: Fairbanks, Hope. CANADA: Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland, Northwest Territories, Nova Scotia, Ontario, Quebec, Saskatchewan, Yukon. USA: Arizona, California, Colorado, Idaho, Maine, Michigan, Minnesota, Nevada, New Hampshire, New Mexico, New York, Pennsylvania, South Dakota, Utah, West Virginia, Wyoming.

HOSTS.— *Abies balsamea, A. concolor, A. lasiocarpa, Picea engelmannii, P. glauca, P. pungens, Pinus sylvestris.*

NOTES.— The above treatment was based on the holotypes of *opaculus, pygmaeus,* and *exiguus* and on 881 other specimens.

The only two females at hand from Utah and Blackman's females of *exiguus* have the frons almost flat and rather abruptly angled at the margin near the eye, and the surface is finely, rather sparsely punctured and ornamented by moderately abundant, rather long hair. Specimens from Nevada, South Dakota, and northeastern Wyoming do not share this character. If the population from Utah and Colorado consistently exhibits this character, then *exiguus* should be given subspecific rank.

### 27. *Pityophthorus pellitus* Schedl

*Pityophthorus pellitus* Schedl, 1955, Zeitsch. angew. Ent. 38:23 (Lectotype, female; Quezaltenango, Guatemala; Schedl Coll., designated by Bright, 1976:186)

DIAGNOSIS.— This species is distinguished from *deletus* LeConte by the reticulate pronotum, by the coarser elytral punctures, and by the differences on the frons of both sexes.

FEMALE.— Length 1.3–1.5 mm, 2.6 times as long as wide; color dark brown.

Frons feebly convex, shining, finely, rather closely punctured, ornamented by sparse, rather short hair, longest setae equal to less than one-fifth distance between eyes.

Pronotum 1.0 times as long as wide; similar to *deletus* but more broadly rounded in front; anterior margin armed by four teeth; posterior areas reticulate, punctures rather fine, moderately close. Vestiture of fine, semirecumbent hair.

Elytra 1.7 times as long as wide, 1.8 times as long as pronotum; outline about as in *puberulus* LeConte; striae 1 feebly, others not impressed, punctures moderately coarse, rows slightly confused on basal half; interstriae smooth, about two to three times as wide as striae, punctures sparse. Declivity convex, steep; punctures greatly reduced; essentially as in *puberulus*.

MALE.— Similar to female except frons more strongly convex, more coarsely punctured, armed by a fine, low, median carina from epistoma to upper level of eyes, vestiture shorter.

DISTRIBUTION.— Hidalgo to Guatemala.

MEXICO: Chiapas: 9 km SE San Cristóbal, *Pinus*, D. E. Bright. Hidalgo: 6 km E Zacatlán, 12-VI-67, 2500 m, No. 19, *Pinus*. Oaxaca: 184 km S Oaxaca, *P. lawsonii*, D. E. Bright; Suchixtepec, *P. oocarpa*, D. E. Bright. Puebla: 9 km NE Teziutlán, 2-VII-67, 1600 m, *Pinus*; 17 km SE Nochixtlán, 17-VI-67, *Pinus*. Querétaro: Pinal del Amoles, *Pinus greggii*, D. E. Bright. GUATEMALA: Guatemala City, 30-V-64, 1300 m, *Pinus*; Quezaltenango, 26-V-64, *P. pseudostrobus*; Totonicipan, 28-V-64, 1600 m, *P. pseudostrobus*; San Cristóbal, 28-V-64, 2300 m, *P. pseudostrobus*; Volcán de Agua, 19-V-64, 1000 m, *P. pseudostrobus*; all were collected by me.

HOSTS.— *Pinus greggii, P. lawsonii, P. oocarpa, P. pseudostrobus, P.* spp.

BIOLOGY.— Specimens were taken from small branches.

NOTES.— The above treatment was based on Schedl's syntypes and on 51 other specimens.

### 28. *Pityophthorus mormon* Bright

*Pityophthorus mormon* Bright, 1977, Canadian Ent. 109:528 (Holotype, female; Parowan Canyon, Utah; Wood Coll.)

DIAGNOSIS.— This species is distinguished from others in the *digestus* group by the feebly concave female frons, which bears a tuft of long hair, by the distinct tubercles on declivital interstriae 1 and 3, and by other characters.

FEMALE.— Length 1.7–1.9 mm, 2.7 times as long as wide; color dark brown.

Frons very broadly, feebly concave from near epistoma to above upper level of eyes; surface shining, closely, rather finely, uniformly punctured; margins ornamented by rather abundant, very long hair.

Pronotum about as in *absonus* except punctures on posterior areas much coarser, closer; anterior margin with four to eight serrations.

Elytra as in *absonus* Blackman except declivity more broadly impressed, interstriae 1 and 3 each with a row of fine granules, declivital vestiture slightly longer.

MALE.— Similar to female except frons distinctly convex, shining, vestiture inconspicuous, a sharply elevated median carina from epistoma to upper level of eyes, highest just below its middle.

DISTRIBUTION.— California to Arizona and Utah.

USA: **Arizona**: Agassiz Peak, San Francisco Mts., 16-VIII-68, *Pinus aristata*, D. E. Bright. **California**: Blancos Corral at White Mts., Mono Co., 23-VI-53, 3300 m, *P. aristata*, J. W. MacSwaine. **Utah**: Convulsion, Fishlake N.F., 9-VI-60, *P. flexilis*, S. L. Wood; Parowan Canyon, Iron Co., 20-VI-60, *P. aristata, P. flexilis*, S. L. Wood; Pin Hollow, Fishlake N.F., 9-VI-60, *P. flexilis*, S. L. Wood.

HOSTS.— *Pinus aristata, P. flexilis.*

BIOLOGY.— Specimens were taken from small branches.

NOTES.— The above treatment was based on the type series of 56 specimens and on one other specimen.

### 29. *Pityophthorus woodi* Bright

*Pityophthorus woodi* Bright, 1977, Canadian Ent. 109:531 (Holotype, female; 11.5 km or 7 mi W Kingston, New Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished by the small size, by the total absence of punctures and granules on the declivity, by the feebly concave female frons, and by other characters.

FEMALE.— Length 1.1–1.3 mm, 2.6 times as long as wide; color brown.

Frons feebly concave on median two-thirds below upper level of eyes; surface smooth, shining, vestiture short, inconspicuous.

Pronotum about as in *dolus* Wood except anterior slope with fewer, higher asperities, anterior margin armed by two to four serrations, median pair much larger, posterior areas smooth, shining, rather coarsely punctured.

Elytra much as in *opaculus*; strial punctures small, not close, in semidefinite rows; interstriae smooth, shining, punctures sparse, similar to those of striae. Declivity steep, convex, almost smooth, completely without punctures or granules. Vestiture of minute strial and slightly longer, sparse interstrial setae; absent on declivity.

MALE.— Similar to female except frons weakly convex, coarsely punctured, with a weak median carina from epistoma to upper level of eyes.

DISTRIBUTION.— New Mexico.

USA: **New Mexico**: 11 km or 7 miles W Kingston, 5-VI-69, 2200 m, No. 58, *Pinus edulis* twigs, S. L. Wood.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 30. *Pityophthorus dolus* Wood

*Pityophthorus dolus* Wood, 1964, Great Basin Nat. 24:65 (Holotype, female; McCloud, Siskiyou Co., California; Wood Coll.)

DIAGNOSIS.— Declivital punctures and granules obsolete, pronotal and elytral punctures on disc very small, male frons with a very low, fine carina from epistoma to upper level of eyes, female frons broadly flattened, coarsely punctured, and ornamented by moderately abundant long hair.

FEMALE.— Length 1.3–1.5 mm, 2.8 times as long as wide; color very dark brown.

Frons flattened from eye to eye, gradually, transversely impressed above epistoma;

surface rather sparsely punctured, punctures distinctly larger than in *deletus* LeConte; vestiture as in *deletus*.

Pronotum very slightly longer than wide; similar to but more broadly rounded in front than in *deletus*; anterior margin bearing four serrations, median pair rather widely set but with their bases almost touching; posterior area subshining, with minute points, punctures rather large, deep, close; vestiture evident only at sides.

Elytra 1.8 times as long as wide; sides almost straight and subparallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures small, in irregular rows; interstriae almost smooth, subshining, with a few scattered punctures equal in size to those of striae. Declivity moderately steep, convex; striae 1 strongly impressed, punctures only slightly smaller than on disc, other striae not impressed but punctures strongly reduced; interstriae 1 abruptly, slightly elevated, unarmed, 2 and 3 smooth, 3 with minute punctures. Vestiture consisting of minute strial and interstrial hair, sometimes longer at sides.

MALE.— Similar to female except frons weakly convex, with a fine, low, median carina on lower half; punctures of pronotum and elytra smaller; punctures on declivity greatly reduced, scarcely visible.

DISTRIBUTION.— California.

USA: California: Bass Lake; Idyllwild; McCloud, 14-VI-61, *Pinus ponderosa*, S. L. Wood.

HOSTS.— *Pinus lambertiana*, *P. ponderosa*.

BIOLOGY.— Specimens were taken from small twigs.

NOTES.— The above treatment was based on the type series of 26 specimens. Other records are cited by Bright (1973:107).

### 31. *Pityophthorus clivus* Bright

*Pityophthorus clivus* Bright, 1977, Canadian Ent. 109:522 (Holotype, female; Cerro Potosí, Nuevo León, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— The position of this species is uncertain; it could be easily placed in any one of at least three species groups. It is distinguished from *deletus* LeConte by the more gradual declivity, with minute tubercles on interstriae 1 and 3, by the larger strial punctures, and by the different frons in both sexes.

FEMALE.— Length 1.6–1.7 mm, 2.7 times as long as wide; color dark brown.

Frons broadly plano-convex from epistoma to slightly above upper level of eyes; surface smooth, shining, sparsely, rather finely punctured; vestiture largely confined to margins, consisting of a moderately closely set row of very long hair.

Pronotum as in *digestus* LeConte.

Elytral outline as in *digestus*; striae not impressed except 1 on posterior third of disc, punctures fine, in definite rows on at least posterior half; smooth, shining, slightly wrinkled and with confused punctures toward scutellum; interstriae about three times as wide as striae, even-numbered impunctate, others sparsely punctured. Declivity moderately steep, convex, shallowly sulcate; striae 1 and 2 with punctures very fine, distinct; interstriae 1 distinctly elevated, with a row of minute granules, 2 at least twice as wide as 1, smooth, shining, 3 rounded, as high as 1, with several minute granules. Vestiture of minute strial hair, length of each up to twice diameter of a puncture, sparse interstrial setae similar to those of striae.

MALE.— Similar to female except frons moderately convex, more coarsely punctured, moderate carina extending from epistomal margin two-thirds distance to upper level of eyes, vestiture short, inconspicuous.

DISTRIBUTION.— Nuevo León.

MEXICO: Nuevo León: Cerro Potosí, 4-V-71, *Pinus strobiformis*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 30 specimens.

### 32. *Pityophthorus deletus* LeConte

*Pityophthorus deletus* LeConte, 1879, U.S. Dept. Interior, Geol., Geogr. Surv. Bull. 5:519 (Lectotype, sex?; Veta Pass, Colorado; Mus. Comp. Zool. designated by Bright, 1976, Coleopt. Bull. 30:185)

*Pityophthorus inquietus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:46 (Holotype, female; Las Vegas Hot Springs, New Mexico; U.S. Nat. Mus., 41272); Wood, 1977, Great Basin Nat. 37:387. *Synonymy*

*Pityophthorus monophyllae* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:47 (Holotype, female; Argus Mts., California; U.S. Nat. Mus., 41273); Wood, 1977, Great Basin Nat. 37:387. *Synonymy*

*Pityophthorus socius* Blackman, 1928, New York Coll. For., Syracuse, Tech. Pub. 25:48 (Holotype, female; Argus Mts., California; U.S. Nat. Mus., 41274); Bright, 1971, Pan Pacific Ent. 47:67. *Synonymy*

*Pityophthorus piceus* Bright, 1966, Pan Pacific Ent. 42:297 (Holotype, female; Mount Pinos, Ventura Co., California; California Acad. Sci.); Bright, 1971, Pan Pacific Ent. 47:67. *Synonymy*

*Pityophthorus praealtus* Bright, 1966, Pan Pacific Ent. 42:303 (Holotype, female; Mt. Shasta Ski Area, Siskiyou Co., California; California Acad. Sci.); Wood, 1977, Great Basin Nat. 37:387. *Synonymy*

*Pityophthorus brucki* Bright, 1971, Pan Pacific Ent. 47:63 (Holotype, female; San Bernardino, California; Ohio State University); Wood, 1977, Great Basin Nat. 37:388. *Synonymy*

DIAGNOSIS.— This variable species is most likely to be confused with *opaculus* LeConte. It is distinguished from *opaculus* by the slightly larger average size, by the presence of only two to four teeth on the anterior margin of the pronotum, by the absence of minute granules on the posterior margins of the punctures on the pronotal disc, and by frontal characters in both sexes.

FEMALE.— Length 1.3–1.7 mm, 2.6–2.8 times as long as wide; color brown to very dark brown.

Frons variable, plano-convex to plano-concave from epistoma to upper level of eyes; convex above; surface shining, rather coarsely punctured in lateral areas, rather finely to very finely punctured in central area of lower half; vestiture from fine, short, sparse to fine, very long, moderately abundant (in Utah and California both extremes may occur in same series).

Pronotum as in *opaculus* except anterior margin armed by two to four teeth (rarely six), punctures on posterior areas usually larger, deeper, more sharply defined, never with granules on posterior rims on disc.

Elytra as in *opaculus* (equally variable).

MALE.— Similar to female except frons flattened on a smaller area, subconvex, more coarsely punctured, armed by a small, short carina or tubercle (usually lower, shorter, and less well developed than in *opaculus*).

DISTRIBUTION.— California and Durango to South Dakota and New Mexico.

USA: **Arizona**: Bright Angel Point, Carr Canyon, Kaibab N.F., Santa Catalina Mts. **California**: Argus Mts., Juniper Hills near Valyermo, Mt. Pinos in Ventura Co., Sugar Loaf Mt. in San Bernardino Co. **Colorado**: Colorado N.F., Estes Park, Gould, La Veta Pass, Poudre Canyon. **Nevada**: Baker. **New Mexico**: Kingston, La Flacita, Lake Roberts, Las Vegas, Hot Springs, Meek, Nogal Lake, Sandia Mts., Santa Fe. **South Dakota**: Cheyenne Crossing, Custer. **Utah**: Beaver, La Sal, Logan Canyon, McKee Draw in Ashley N.F., Gooseberry in Fishlake N.F., Moab, Monticello, Mt. Carmel. **Wyoming**: Buffalo. MEXICO: **Durango**: 35 km W Durango.

HOSTS.— *Pinus cembroides*, *P. edulis*, *P. monophylla*, less common in *P. flexilis*, *P. ponderosa*, *P. strobiformis*, *Pseudotsuga menzeisii* (accidental?).

BIOLOGY.— This species breeds in small branches.

NOTES.— The above treatment was based on 2 syntypes and 8 topotypes of *deletus*, on the holotypes of *inquietus*, *monophyllae*, and *socius*, on 3 paratypes of *brucki*, on 2 paratypes of *piceus*, on 2 paratypes of *praealtus*, and on 439 other specimens.

Over much of its range this species might be subdivided into races based on the presence or absence of a brush of long frontal hair in the female and variability in the male frontal carina. The female frontal hair is usually short in most specimens from Arizona, New Mexico, Colorado, South Dakota, Wyoming, and southeastern Utah (*deletus* s. str.). It is usually long in specimens from northern Mexico, California, and northern and western Utah. Nevertheless, series from the Argus Mts., California, and Beaver, Utah, contain both extremes in about equal numbers. Occasional or frequent intermediates may occur in any area. The male carina is weak to absent in the southeastern parts of the range and stronger in the northwest. Until a great deal more is known of the range and variability of this species, geographical races should not be recognized. It is possible that a complex of several species is concealed in this variability in addition to geographical races, but, until a comprehensive analysis of this variability is made, it is considered best to treat all forms under the name *deletus*.

### 33. *Pityophthorus trepidus* Bright

*Pityophthorus trepidus* Bright, 1978, Great Basin Nat. 38:83 (Holotype, female; Ukiah, California; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from *pinguus* Blackman by the smaller size, by the more narrowly impressed striae 2, with the lateral areas more evenly convex, by the complete absence of granules on declivital interstriae 2, and by the very minute interstrial setae.

FEMALE.— Length 1.5–1.9 mm, 2.6 times as long as wide; color very dark brown.

As in *pinguus* except as noted in diagnosis.

MALE.— Similar to female.

DISTRIBUTION.— California.

USA: California: Ukiah, Hopk. US 20976, *Pinus radiata.*

NOTES.— The above treatment was based on the type series of 11 specimens. Since *Pinus radiata* does not occur naturally at Ukiah, the specimens must have come from an unnatural situation or from a misidentified host.

### 34. *Pityophthorus keeni* (Blackman)

*Myeloborus keeni* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:19 (Holotype, sex?; Jacumba, California; U.S. Nat. Mus., 41260)

DIAGNOSIS.— This species is distinguished from *pinguus* Blackman by the more evenly convex elytral declivity, by the row of punctures or granules on declivital interstriae 2, and by the much finer punctures on the frons.

FEMALE.— Length 1.8–2.2 mm, 2.7 times as long as wide; color very dark brown.

Female as in *pinguus* except frons much more finely punctured (interspaces mostly two or more times diameter of a puncture) and elytral declivity evenly convex, interstriae 2 less distinctly impressed, with a sparse row of fine, setiferous punctures (one or two punctures sometimes present at apex in *pinguus*).

MALE.— Similar to female.

DISTRIBUTION.— California to Colorado.

USA: California: Jacumba, 15-VIII-15, *Pinus monophylla.* Colorado: Colorado N.M., 25-X-35, *P. edulis.*

HOST.— *Pinus monophylla, P. edulis.*

NOTES.— The above treatment was based on the holotype, on five paratypes, and on eight other specimens.

### 35. *Pityophthorus pinguus* (Blackman)

Fig. 209

*Myeloborus pinguus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:17, 149, 153, 166, 178 (*pinquus*, p. 20, a lapsus calami) (Holotype, female; Longmont, Colorado; U.S. Nat. Mus., 41261)

DIAGNOSIS.— This species is distinguished from other members of the *ramiperda* group by the absence of a frontal carina (obscure in an occasional specimen), by having antennal suture 2 located at or beyond the middle of the club, and by the normal, nonconvex elytral interstriae 8.

FEMALE.— Length 1.9–2.3 mm, 2.6 times as long as wide; color very dark brown, almost black.

Frons broadly convex, surface brightly shining, very coarsely, closely, deeply punctured, interspaces narrower than diameter of a puncture; vestiture of fine, short, inconspicuous hair. Antennal club 1.05 times as long as wide, suture 2 slightly beyond middle.

Pronotum 1.03 times as long as wide; outline about as in *boycei* Swaine except anterior margin more narrowly rounded, armed by six to eight serrations, discal punctures coarser, deeper, their margins not granulate.

Elytra 1.6 times as long as wide, 1.7 times as long as pronotum; outline as in *boycei*; striae 1 slightly impressed toward declivity, others not impressed, punctures rather fine, spaced by one to two diameters of a puncture; interstriae smooth, slightly more than twice as wide as striae, almost impunctate. Declivity convex, steep; strial punctures very minute, almost obsolete; interstriae 1 distinctly elevated, with a few minute granules, 2 twice as wide as 1, smooth, impunctate, 3 armed by a sparse row of fine granules. Vestiture of fine, short, strial hair on disc, slightly longer on declivital interstriae 1 and 3.

MALE.— Similar to female except frons more strongly convex, teeth on anterior margin of pronotum slightly larger.

DISTRIBUTION.— E Nevada and Wyoming to Arizona and New Mexico.

USA: Arizona: Carr Canyon in Huachuca Mts., Chiricahua Mts., Santa Catalina Mts. Colorado: Longmont. Nevada: Baker. New Mexico: Capitan Mts., Emery Pass. Utah: Bryce Canyon N.M., Logan Canyon, Logan Dry Canyon, Panguitch, Widtsoe. Wyoming: Casper, Russell Creek in Shoshone N.F.

HOSTS.— *Pinus flexilis, P. strobiformis.*

BIOLOGY.— Specimens were taken from the cambium of small branches.

NOTES.— The above treatment was based on 36 specimens.

### 36. *Pityophthorus separatus* Bright

*Pityophthorus separatus* Bright, 1977, Canadian Ent. 109:529 (Holotype, male; Poinsett State Park, South Carolina; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *boycei* Swaine by the more finely

punctured pronotal disc and by the very different declivity as described below.

FEMALE.— Length 2.4 mm, 2.8 times as long as wide; color dark brown.

Frons as in *boycei* except punctures slightly smaller.

Pronotum as in *boycei* except punctures on posterior half much smaller, their rims not armed by a granule.

Elytra as in *boycei* except discal punctures not as deep, slightly smaller; declivity convex, sulcus feeble or absent, striae 1 and 2 punctured to apex, interstriae 2 indistinctly wider than 1, not impressed, with a row of fine, feebly granulate punctures. Vestiture largely confined to posterior half except on sides, consisting of moderately long, rather fine interstrial setae on all interstriae including 2.

DISTRIBUTION.— South Carolina.

USA: **South Carolina**: Poinsett State Park, 20-VII-57, blacklight, V. M. Kirk.

NOTES.— The above treatment was based on the holotype.

### 37. *Pityophthorus boycei* Swaine
Fig. 209

*Pityophthorus boycei* Swaine, 1925, Canadian Ent. 57:192 (Holotype, male; Cisco, Placer Co., California; Canadian Nat. Coll., 1368.)

*Myeloborus catulus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:21 (Holotype, female; Clark's Fork, Idaho; U.S. Nat. Mus., 41262); Bright, 1976, Great Basin Nat. 36:426. *Synonymy*

*Myeloborus iniquus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:27 (Holotype, female; Keystone, Wyoming; U.S. Nat. Mus., 41264); Bright, 1976, Great Basin Nat. 36:426. *Synonymy*

*Pityophthorus siouxensis* Bright, 1977, Great Basin Nat. 36:439 (Holotype, female; Black Hills, South Dakota; Canadian Nat. Coll.); Wood, 1977, Great Basin Nat. 37:387. *Synonymy*

DIAGNOSIS.— This species is distinguished from *ramiperda* Swaine by the presence of small granules on the lateral or posterolateral margins of discal punctures on the pronotum, by the flat (not elevated) declivital interstriae 3 where it joins 9, and by the less strongly convex frons.

FEMALE.— Length 1.9–2.9 mm, 2.6 times as long as wide; color very dark brown.

Frons longitudinally almost flat from epistoma to upper level of eyes, transversely rather broadly convex; surface shining, somewhat irregular, punctures moderately coarse, close; some specimens with a low, weak median carina of variable length; vestiture fine, short, inconspicuous. Antennal club 1.15 times as long as wide, sutures 1 and 2 on basal half, slightly procurved, aseptate.

Pronotum 1.1 times as long as wide; widest near base, rather weakly arcuate on basal two-thirds, rather broadly rounded in front; anterior margin armed by about 12 teeth; posterior areas shining, indistinctly, feebly wrinkled, punctures moderately fine, several punctures behind summit each armed on lateral or posterior margin by a fine granule; median line impunctate. Vestiture of fine, short hair.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, then slightly converging, broadly rounded behind; striae 1 feebly, others not impressed, punctures fine, shallow, spaced within row by three to four diameters of a puncture; interstriae shining, not entirely smooth, about five times as wide as striae, punctures very fine, widely spaced. Declivity steep, convex; strial punctures very fine, but distinct in most specimens; interstriae 1 rather narrowly, distinctly elevated, 2 shallowly, rather broadly impressed, at middle as wide as 1, narrower below, 3 indistinctly elevated, armed by a row of about six very fine granules, 8 weakly convex from base of declivity to just anterior to junction with 3. Vestiture restricted to sides; declivity glabrous, a few short setae often present on disc.

MALE.— Similar to female except frons more distinctly convex, transverse impression above epistoma weakly developed; median serrations on anterior margin of pronotum usually slightly larger.

DISTRIBUTION.— British Columbia and California to South Dakota and Colorado.

CANADA: **British Columbia**: Weywick Lake at Cariboo, 13-VI-62, G. G. E. Scudder. USA: **California**: Bridal Veil Meadows in Mariposa Co., Cisco, Donner Pass, Ebbetts Pass, Kingvale, Meyers, Mono Hot Springs in Fresno Co., Tuolumne Meadows. **Colorado**: Fairplay, Jefferson, Pike N.F., Pine, Pingree Park, Poudre Canyon. **Idaho**: Clark Fork. **Montana**: Melville. **Oregon**: Williamson River in Klamath Co. **South Dakota**: Black Hills. **Wyoming**: 25 km SW Buffalo, Black Hills, Cody Canyon, Keystone, Sheridan, Yellowstone Lake.

HOSTS.— *Pinus aristata, P. contorta, P. ponderosa.*

BIOLOGY.— This is apparently a primary enemy of pine. The adult beetles construct pith tunnels in healthy, green, leaf-bearing twigs, where they deposit their eggs. The larvae enlarge and extend the parental tunnel and emerge before the needles on infested twigs turn brown. Infested twigs usually are detected when the wind breaks them, thus causing them to fall to the ground. Severe infestations have been observed.

NOTES.— The above treatment was based on the holotypes of *boycei, iniquus, catulus,* and *siouxensis,* and on 133 other specimens.

### 38. *Pityophthorus amplus* (Blackman)
Fig. 209

*Myeloborus amplus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:18 (Holotype, female; Kaibab N.F., Arizona; U.S. Nat. Mus., 41259)

DIAGNOSIS.— This species is distinguished from *ramiperda* Swaine by the near absence of a frontal carina, by the coarser elytral punctures, and by the different elytral declivity as described below.

FEMALE.— Length 2.1–3.0 mm, 2.6 times as long as wide; color very dark brown, elytra usually lighter.

Frons less strongly convex than in *ramiperda,* with median carina usually obsolete, punctures finer, sparse.

Pronotum as in *ramiperda* except punctures rather coarse.

Elytra about as in *ramiperda* except punctures conspicuously larger, declivital interstriae 2 at least twice as wide as 1 (one and one-half times or less in *ramiperda*), 8 feebly convex on declivity.

MALE.— Similar to female except a weak, longer median frontal carina evidently always present.

DISTRIBUTION.— Arizona to New Mexico.

USA: **Arizona:** Flagstaff, 12-V-21, 24-VI-25, 25-VII-26, *Pinus ponderosa,* M. W. Blackman; Kaibab N.F., 25-VII-26, K-219, *Pinus ponderosa,* M. W. Blackman, same data except 12-VI-25, K-63; Chiricahua Mts. bred 26-IX, *P. ponderosa,* Hopk. 5793, J. L. Webb; Prescott N.F., 4-VI-10, Hopk. 20404j; Santa Catalina Mts. **New Mexico:** Lincoln N.F., Hopk. U.S. 37218-L, *Pinus "flexilis"*; Sacramento Mts.

HOST.— *Pinus ponderosa, P. strobiformis.*

NOTES.— The above treatment was based on the holotype, on 12 paratypes, and on 2 other specimens.

### 39. *Pityophthorus ramiperda* Swaine
Figs. 208, 209

*Pityophthorus ramiperda* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):28 (Holotype, female; Ile Perrot, Quebec; Canadian Nat. Coll., 3150)

*Myeloborus fivasi* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:23 (Holotype, female; Cranberry Lake, New York; U.S. Nat. Mus., 41263); Bright, 1976, Great Basin Nat. 36:426. *Synonymy*

DIAGNOSIS.— This species is distinguished from *boycei* Swaine as indicated in the diagnosis of that species and in the following treatment.

FEMALE.— Length 1.9–2.6 mm, 2.7 times as long as wide; color very dark brown.

Frons as in *boycei* except very slightly more strongly convex.

Pronotum as in *boycei* except discal punctures never armed by granules.

Elytra as in *boycei* except discal punctures slightly larger; lower part of declivital interstriae 3 convex, joining convex apex of 8 (not always distinct.)

MALE.— Similar to female except differing as in *boycei.*

DISTRIBUTION.— Wisconsin and Quebec to New York.

CANADA: **Ontario:** Bob's Lake. **Quebec:** Ile Perrot. USA: **Maine:** Bar Harbor, "Maine Coast." **Massachusetts:** Belchertown, Beverly, Rozbury, Wellesley. **Michigan:** Manitowoc Co., Romeo. **New York:** Cranberry Lake, Niagara. **Rhode Island:** Burville, Gloucester, Washington Co. **Vermont:** Danbury. **Wisconsin:** Amery in Polk Co.

HOSTS.— *Pinus resinosa, P. strobus.*

BIOLOGY.— Evidently similar to *boycei* (Blackman 28:24).

NOTES.— The above treatment was based on the holotypes of *ramiperda* and *fivasi* and on 56 other specimens.

### 40. *Pityophthorus deleoni* (Blackman)

*Myeloborus deleoni* Blackman, 1942, Proc. U.S. Nat. Mus. 92:201 (Holotype, female; El Seco, Puebla, Mexico U.S. Nat. Mus., 55975)

DIAGNOSIS.— This species is distinguished from *ramiperda* Swaine by the larger size, by the reticulate, more finely punctured elytral

disc, and by other characters described below.

FEMALE.— Length 3.0–3.5 mm, 2.6 times as long as wide; color very dark brown, elytra reddish brown.

Frons broadly, transversely convex, weakly, transversely impressed above epistoma, then longitudinally almost flat to upper level of eyes, a weak, median carina at epistoma, sometimes ending on lower fourth, occasionally extending to upper level of eyes; surface smooth, shining, punctures fine, moderately close; vestiture fine, short, inconspicuous, longest about equal in diameter to four facets.

Pronotum outline about as in *ramiperda*; surface of posterior areas weakly reticulate, punctures fine, deep, close, a few with a minute granule on lateral margin. Vestiture fine, short, moderately abundant.

Elytra outline about as in *ramiperda*; striae not impressed, punctures in slightly confused rows, punctures rather coarse, deep; interstriae about twice as wide as striae, very obscurely subreticulate, 1 and 3 punctured, 2 and 4 with a few punctures at base and near declivity. Declivity steep, shallowly bisulcate; striae 1 moderately impressed, punctures on 1 and 2 almost as large as on disc, impressed; interstriae 1 moderately elevated, shining, a row of very minute granules present, 2 moderately impressed, flat to ascending very slightly laterally, almost smooth, impunctate, 3 convex, slightly higher than 1, with moderately abundant, fine, confused punctures near base, becoming minutely granulate below, convexity of 3 joins distinctly convex 8. Disc and declivity usually glabrous; some short setae on sides.

MALE.— Similar to female except frons shallowly, transversely impressed to upper level of eyes, median carina much stronger, subacute to upper level of eyes.

DISTRIBUTION.— Nuevo León to Puebla.

MEXICO: **Puebla**: El Seco, 7-III-36, *Pinus*, 685, D. DeLeon. **Nuevo León**: Chapinque Mesa near Monterey, 23-VI-71, *Pinus*, D. E. Bright.

NOTES.— The above treatment was based on the holotype, on five paratypes, and on three other specimens.

### 41. *Pityophthorus comosus* Blackman

*Pityophthorus comosus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:65 (Holotype, female; Sacramento Mountains, New Mexico; U.S. Nat. Mus., 41284)

*Pityophthorus foratus* Wood, 1967, Great Basin Nat. 27:40 (Holotype, female; 10 miles W El Salto, Durango, Mexico; Canadian Nat. Coll.); Bright, 1977, Canadian Ent. 109:514. *Synonymy*

DIAGNOSIS.— This species is distinguished by the large size, by the confused elytral punctures, by the very long, fine, elytral hair, and by the distinctive male frons that lacks a median carina.

FEMALE.— Length 2.3–3.2 mm, 2.4 times as long as wide; color very dark brown, elytra usually reddish brown.

Frons broadly convex, with central third subconcavely impressed, punctures coarse in lateral areas (New Mexico); more broadly impressed to upper level of eyes, more finely punctured over greater area, particularly laterally (Durango); vestiture rather sparse, long, longest setae equal to about one-third distance between eyes.

Pronotum 1.0 times as long as wide; widest at base, sides weakly arcuate, converging toward rather narrowly rounded anterior margin; anterior margin armed by about 8–12 irregular, low serrations; posterior areas smooth, shining with numerous indistinctly impressed points, punctures rather coarse, deep, close. Vestiture of fine, long hair.

Elytra 1.5 times as long as wide, 1.7 times as long as pronotum; striae 1 weakly impressed toward declivity; discal surface smooth, shining, punctures strongly confused, coarse, deep, close, mostly separated by distances less than diameter of a puncture. Declivity steep, very broadly, shallowly bisulcate; striae 1 and 2 rather coarsely punctured, punctures in lateral areas confused; interstriae 1 rather narrowly convex, 2 three times as wide as 1, smooth, shining, impunctate, with numerous impressed points, lateral areas convex, as high as 1, unarmed. Vestiture fine, very long hair (in Durango specimens half as long as in New Mexico specimens).

MALE.— Similar to female except frons with a broad, strong, transverse impression occupying upper half of area below upper level of eyes, area below impression occupied by a strong transverse elevation, surface

shining, coarsely punctured, vestiture short, sparse, inconspicuous.

DISTRIBUTION.— Arizona and New Mexico to Durango.

USA: Arizona: Chiricahua Mts., Parmerly in Cochise Co. New Mexico: Cloudcroft, Sacramento Mts. MEXICO: Durango: El Salto.

HOST.— *Pinus ponderosa*.

BIOLOGY.— Specimens were taken from branches 3 cm in diameter.

NOTES.— The above treatment was based on the holotypes of *comosus* and *foratus* and on 55 other specimens. As indicated above, the length of the elytral hair and the sculpture of the female frons differs rather strikingly between the series from New Mexico and Durango. The Durango specimens are also smaller. Although different subspecies could be represented, more material is needed from northern Mexico to resolve the problem.

### 42. *Pityophthorus arceuthobii* Wood

*Pityophthorus arceuthobii* Wood, 1971, Brigham Young University Sci. Bull., Biol. Ser. 15(3):48 (Holotype, female; 96 km W Durango, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— The relationship of this species to others in the *comosus* group is remote. It is distinguished by the smaller size, by the more slender form, by the less densely placed elytral punctures, and by the declivital and frontal characters described below.

FEMALE.— Length 1.8–2.0 mm, 2.7 times as long as wide; color very dark brown, elytra usually lighter.

Frons plano-convex, with a slight transverse impression on lower third, epistomal margin weakly elevated; surface subshining, rather coarsely, closely punctured on a semicircular area; vestiture of fine, rather long hair of equal length almost uniformly distributed over punctured area. Antennal club with suture 1 straight, segments 2 and 3 about equal in width.

Pronotum 1.0 times as long as wide; widest near base, sides almost parallel on slightly less than basal half, weakly constricted on anterior half, rather broadly rounded in front; anterior margin armed by about 10 small, irregularly formed teeth; posterior area reticulate, punctures coarse, deep. Glabrous except at margins.

Elytra 1.6 times as long as wide; 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, then slightly converging, broadly rounded behind; striae 1 narrowly impressed on posterior half of disc; striae moderately confused, punctures large, deep, only moderately close, equal in size and appearance with slightly less abundant, confused, interstrial punctures; surface shining, not completely smooth. Declivity rather steep, broadly, shallowly sulcate; punctures on striae 1 and 2 minute but distinct; interstriae 2 wide, smooth, moderately impressed, 1 sharply, slightly elevated, bearing about six minute granules, 3 gradually, broadly raised, punctures very feebly granulate. Vestiture of sparse, rather short, coarse hair, mostly on sides.

MALE.— Similar to female except frons more strongly convex above, lower half with a rather thick, low, median carina that gradually increases in height to summit just above epistoma, surface subreticulate, less regularly punctured, frontal vestiture sparse, short; granules on elytral declivity scarcely evident.

DISTRIBUTION.— Durango to Mexico.

MEXICO: Durango: 96 km W Durango, 5-VI-65, 2500 m, No. 27, S. L. Wood. Mexico: 5 km W Río Frío.

HOST.— *Arceuthobium globosum* (parasite on *Pinus montezuma*).

BIOLOGY.— Specimens were removed from shoots 1–3 cm in diameter in tunnels parallel to but below the cambium.

NOTES.— The above treatment was based on the type series of 40 specimens and on 7 other specimens.

### 43. *Pityophthorus aztecus* Bright

*Pityophthorus aztecus* Bright, 1977, Canadian Ent. 109:520 (Holotype, female; km 50 Mexico-Puebla, Mexico; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from *dispar* Bright by the much finer, more widely spaced punctures on the elytral disc.

FEMALE.— Length 2.3–3.6 mm, 2.5 times as long as wide; color dark brown except elytra reddish brown.

Frons as in *schwerdtfergeri* (Schedl) except punctures distinctly smaller.

Pronotum as in *schwerdtfergeri* except disc rather strongly reticulate, punctures slightly smaller.

Elytra as in *schwerdtfergeri* except punctures conspicuously smaller, declivital interstriae 2 wider, about one and one-half times as wide as 1.

MALE.— Similar to female except frons more strongly convex, more coarsely punctured, a low median carina on lower half, most specimens with lower half weakly to moderately, transversely impressed (variable).

DISTRIBUTION.— Mexico to Veracruz.

MEXICO: **Mexico**: km 50 Mexico-Puebla, 23-I-60, *Pinus*, No. 16, 60-11564, Guerera; Río Frío, 1-IX-69, L. A. Kelton; 32 km N Cuernavaca, 15-VII-69, *Pinus*, D. E. Bright. **Veracruz**: Las Vigas, 5-VII-67, No. 157, small *Pinus* branches, S. L. Wood.

NOTES.— The above treatment was based on the holotype and on 11 paratypes.

### 44. *Pityophthorus dispar* Bright

*Pityophthorus dispar* Bright, 1976, Great Basin Nat. 36:431 (Holotype, female; 7 miles or 11 km E San Cristóbal, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *aztecus* Bright by the much coarser, closer, elytral punctures and by the uniformly dark color.

FEMALE.— Length 2.1–2.8 mm, 2.5 times as long as wide; color almost black.

As in *aztecus* except pronotal and elytral punctures much coarser, closer.

MALE.— Similar to female except frons as in *aztecus* except median carina reduced to a blunt, indistinct tubercle on epistoma.

DISTRIBUTION.— Chiapas.

MEXICO: **Chiapas**: 7 miles or 11 km E San Cristóbal, 13–26-V-69, *Pinus*, also 8 mi or 13 km E, *P. montezuma*, *P. ochoterenai*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 21 specimens.

### 45. *Pityophthorus schwerdtfergeri* (Schedl)

*Conophthorus schwerdtfergeri* Schedl, 1955, Zeitschr. angew. Ent. 38:28 (Lectotype, male; Rancho Alegre, Strasse Quezaltenango-Huehuetenango, Guatemala; Schedl Coll., designated by Bright, 1976, Coleopt. Bull. 30:187)

*Pityophthorus islasi* Wood, 1962, Great Basin Nat. 22:80 (Holotype, female; Temascaltepec, Mexico, Mexico; Wood Coll.); Wood, 1966, Great Basin Nat. 26:28. *Synonymy*

*Conophthocranulus islasi* Schedl, 1963, Ent. Arb. Mus. Frey 14:163 (Holotype, female; Temascaltepec, Mexico; Schedl Coll.); Wood, 1966, Great Basin Nat. 26:28. *Synonymy*

DIAGNOSIS.— This species is distinguished from *comosus* Blackman by the very different frons in both sexes, by the more convex, very feebly sulcate elytral declivity, and by the shorter elytral hair.

FEMALE.— Length 2.2–2.8 mm, 2.4 times as long as wide; color dark reddish brown.

Frons broadly plano-convex from epistoma to above upper level of eyes; surface smooth, shining, punctures rather fine, less numerous in central area; vestiture of fine, moderately abundant, moderately long hair, a few hairs at margin slightly longer. Antennal club with sutures 1 and 2 moderately arcute.

Pronotum 1.0 times as long as wide; outline as in *comosus*; summit poorly defined, asperities in lateral areas extending to basal fourth; posterior areas obscurely subreticulate, punctures rather fine, most not circular, some in lateral part of disc armed by a granule. Vestiture rather sparse, moderately short.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; outline and disc about as in *comosus*. Declivity convex, steep; striae 1 and 2 with punctures in rows, almost as large as on disc; interstriae 1 slightly elevated, with a row of punctures, 2 flat, not impressed, impunctate, with numerous points, slightly wider than 1, 3 broadly rounded, unarmed. Vestiture of erect, moderately long hair, stouter on declivity except absent on interstriae 2.

MALE.— Similar to female except frons deeply excavated almost from eye to eye from upper level of eyes two-thirds of distance toward epistoma, excavation divided by a median carina, carina extending at summit on epistomal margin, surface rather coarsely punctured, vestiture inconspicuous.

DISTRIBUTION.— Nevada and Arizona to Honduras.

USA: **Arizona**: Chiricahua Mts., 12-VIII-52, J. N. Knull; Globe R. D. **Nevada**: Kyle Creek, Clark Co., 24-IX-69, *Pinus ponderosa*, D. F. Zoller. **Texas**: Jeff Davis Co., 20-VI-52, J. N. Knull. MEXICO: **Chiapas**: Lazardo Cardenas, 26-VI-69, *Pinus oocarpa*, D. E. Bright. **Durango**: El Salto, 25-III-74, *Pinus*, M. M. Furniss. **Mexico**: Temascaltepec, 17-VIII-60, *P. oocarpa*, F. Islas. **Nuevo León**: Chapinque Mesa, 26-IV-69, D. E. Bright. GUATEMALA: Rancho Alegre on the Huehuetenango-Quezaltenango road. HONDURAS: Tegucigalpa, 18-I-68, *P. pseudostrobus*, E. W. Clark.

HOSTS.— *Pinus oocarpa, P. ponderosa, P. pseudostrobus.*

BIOLOGY.— Specimens were taken from deformed cones and from twigs.

NOTES.— The above treatment was based on the syntypes of *schwerdtfergi*, on the holotypes of *islasi* Wood and *islasi* Schedl, and on 32 other specimens.

### 46. *Pityophthorus pulicarius* (Zimmermann)

*Crypturgus pulicarius* Zimmermann, 1868, Trans. Amer. Ent. Soc. 2:144 (Lectotype, sex?; Lake Superior, as indicated by small blue card on pin of type; Mus. Comp. Zool., designated by Bright, 1976, Coleopt. Bull. 30:187)

*Cryphalus pulicarius*: LeConte, 1868, Trans. Amer. Ent. Soc. 2:155

*Pityophthorus pulicarius*: LeConte, 1876, Proc. Amer. Philos. Soc. 15:353

*Pityophthorus cubensis* Schedl, 1972, Koleopt. Rundsch. 50:65 (Holotype, male; Vinales, Pinar del Río Prov., Cuba; Schedl Coll.); Wood, 1977, Great Basin Nat. 37:210. *Synonymy*

DIAGNOSIS.— This species is distinguished by the coarse, deep, confused punctures on the elytral disc, by the evenly convex male frons that lacks a carina, and by the coarsely punctured declivital striae 1 and 2, with interstriae 2 equal in width to 1.

FEMALE.— Length 1.5–2.2 mm, 2.4 times as long as wide; color dark reddish brown.

Frons broadly, transversely convex, very shallowly, transversely impressed between epistoma and upper level of eyes; surface shining, punctures rather coarse, deep, close except finer on median area of lower half, vestiture of rather sparse, fine, moderately long hair to slightly above upper level of eyes.

Pronotum 1.1–1.2 times as long as wide; widest at base, sides feebly arcuate and converging very slightly on basal half, rather broadly rounded in front; anterior margin armed by about 10–12 low serrations; summit not well defined, slightly in front of middle; posterior areas smooth, shining, with numerous impressed points (occasional specimens subreticulate), punctures coarse, very close, deep. Hairlike vestiture confined to margins, short.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; sides subparallel, very feebly arcuate on basal two-thirds, very broadly rounded behind; striae not impressed; surface smooth, brightly shining, punctures coarse, deep, strongly confused, mostly spaced by distances less than diameter of a puncture. Declivity very steep, broadly convex; punctures of striae 1 and 2 in rows, rather coarse, deep, those in lateral areas often in indistinct rows; interstriae 1 distinctly elevated, with a row of fine punctures, 2 smooth, shining, impunctate, as wide as 1, moderately impressed, 3 and lateral areas broadly rounded, as high as 1, punctured, without granules. Vestiture usually confined to sides and declivity, rather sparse, short.

MALE.— Similar to female except frons rather strongly, uniformly convex, more coarsely punctured; glabrous.

DISTRIBUTION.— Minnesota and Nova Scotia to Texas, Florida, and Cuba.

CANADA: Ontario, Quebec, Nova Scotia. USA: Alabama, Arkansas, Connecticut, Florida, Georgia, Illinois, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Texas, Virginia, West Virginia, Wisconsin. CUBA: Pinar del Río.

HOSTS.— *Pinus caribaea, P. echinata, P. palustris, P. resinosa, P. rigida, P. strobus, P. sylvestris, P. taeda, P. virginiana.*

BIOLOGY.— This species breeds in the pith of small twigs.

NOTES.— The original description does not specify a locality or type. Of 10 presumed syntypes in the LeConte collection, the first, a male, is color coded for Lake Superior, the second is for the southern states, specimens 3–6 are labeled Tampa, Florida, 8–9 are labeled Maryland, and 10 is from Illinois. These syntypes and 534 other specimens were used as a basis for the above treatment.

### 47. *Pityophthorus solus* Blackman

*Pityophthorus solus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:64 (Holotype, male?; Pinal Mountains, Arizona; U.S. Nat. Mus., 41283)

*Pityophthorus cribratus* Blackman, 1942, Proc. U.S. Nat. Mus., 92:216 (Holotype, female; Mexico, Distrito Federal, Mexico; U.S. Nat. Mus., 55990); Bright, 1977, Canadian Ent. 109:518. *Synonymy*

DIAGNOSIS.— This species superficially resembles *pulicarius* (Zimmermann), but is distinguished by the more slender form, by the distinct pronotal summit, by the very different elytral declivity, and by other characters.

FEMALE.— Length 1.5–2.6 mm, 2.7 times as long as wide; color reddish brown.

Frons broadly convex, a slight transverse impression between summit and upper level of eyes, epistoma slightly elevated at median line; surface shining and rather coarsely, closely punctured to upper level of eyes; vestiture of sparse, rather long hair below upper level of eyes.

Pronotum 1.1 times as long as wide; outline about as in *pulicarius* except anterior margin more broadly rounded and more coarsely serrate; summit slightly in front of middle, with a distinct posterior impression, posterior areas with surface smooth, shining, impressed points very obscure, moderately coarse, deep, spaced approximately by diameter of a puncture. Vestiture absent on disc, of short hair.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; disc with coarse, confused punctures as in *pulicarius*. Declivity steep, broadly convex; striae 1 and 2 coarsely, deeply punctured; interstriae 1 distinctly, gradually elevated, 2 much wider than 1, shallowly sulcate, smooth, shining, coarsely, deeply punctured, punctures confused, 3 with a few very obscure, rounded minute granules. Vestiture of fine, erect, moderately long hair on disc and sides, distinctly longer and coarser on declivital interstriae 3 and lateral areas.

MALE.— Similar to female except frons rather strongly, transversely impressed from epistoma to well above eyes, coarsely punctured, aciculate near epistoma.

DISTRIBUTION.— Arizona and New Mexico to Chiapas.

USA: **Arizona**: Pinal Mts., Wickham, 147. **New Mexico**: Cloudcroft, Hopk. 34218-E2, Peñasco, 2-IV-70, 14-VII-70, in flight, J. R. McClellan. MEXICO: **Chiapas**: San Cristóbal, Yerba Buena. **Distrito Federal**: Mexico City. **Durango**: El Salto, El Palmito. **Mexico**: Iztaccihuatl-Popocatepetl N.P. **Oaxaca**: Oaxaca, Suchixtepec, Valle Nacional.

HOSTS.— *Pinus* spp.

NOTES.— The above treatment was based on the holotypes of *solus* and *cribratus* and on 141 other specimens.

## 48. *Pityophthorus aciculatus* Bright

*Pityophthorus aciculatus* Bright, 1976, Canadian Ent. 109:519 (Holotype, female; San Cristóbal, Huehuetenango, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *solus* Blackman by the larger size, by the smaller elytral punctures, by the deeper declivital sulcus, and by the very different frons.

FEMALE.— Length 1.9–2.5 mm, 2.6 times as long as wide; color dark reddish brown.

Frons weakly convex; smooth, shining, coarsely, closely, deeply punctured, often obscurely aciculate, a distinct, short, median carina on lower third; vestiture moderately abundant, a few setae rather long, not forming a brush.

Pronotum as in *solus* except punctures on posterior half larger, closer.

Elytra as in *solus* except punctures on disc deeper, slightly smaller, declivity not as steep, sulcus more distinctly impressed, punctures on declivity distinctly smaller.

MALE.— Frons rather strongly, transversely impressed, aciculation much more conspicuous.

DISTRIBUTION.— Mexico to Guatemala.

MEXICO: **Mexico**: Ocoyoacac, 16-VII-69, *Pinus leiophylla*, D. E. Bright. GUATEMALA: San Cristóbal, Huehuetenango, 28-V-64, 2300 m, No. 637, *Pinus pseudostrobus*, S. L. Wood.

NOTES.— The above treatment was based on the type series of 46 specimens.

## 49. *Pityophthorus carmeli* Swaine

*Pityophthorus carmeli* Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):100 (Holotype, female; Carmel, California; Canadian Nat. Coll., 1372)

*Pityophthorus torreyanae* Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):101 (Holotype, female; San Diego, California; Canadian Nat. Coll., 1370); Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Bull. 25:98. *Synonymy*

DIAGNOSIS.— This species superficially resembles *solus* Blackman, from which it is distinguished by the very different frons, by the elytral punctures on the disc being in more or less definite rows, and by the impunctate declivital interstriae 2.

FEMALE.— Length 1.9–2.7 mm, 2.7 times as long as wide; color dark brown.

Frons shallowly concave from eye to eye from epistoma to well above upper level of eyes; surface smooth, shining, uniformly rather coarsely, closely punctured; vestiture of rather abundant, fine hair, rather short in

central area, very long on lateral and dorsal margins.

Pronotum 1.1 times as long as wide; outline essentially as in *solus* except median teeth on anterior margin distinctly larger; posterior areas smooth to subreticulate, with numerous, minute, impressed points, punctures deep, moderately coarse, rather close. Vestiture of fine, short hair.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; outline as in *solus*; striae 1 weakly, others not impressed, punctures moderately large, deep, mostly in rows; interstriae almost smooth, shining, with many transverse lines emanating from strial punctures, punctures distinctly smaller than those of striae; rather widely spaced. Declivity steep, broadly convex; punctures on striae 1 and 2 very fine, a few of them evidently replaced by granules; interstriae 1 distinctly elevated, with a row of very minute granules, 2 about twice as wide as 1, moderately impressed on mesal side, weakly on lateral side, surface smooth, shining, with impressed points, 3 with a row of very fine granules. Vestiture of minute strial hair and moderately long interstrial hair, not longer on declivity.

MALE.— Similar to female except frons broadly convex, rather coarsely, more closely punctured, a distinct median callus (often subcarinate) near upper level of eyes, vestiture sparse, inconspicuous.

DISTRIBUTION.— California.

USA: **California**: Alameda, Lake, Marin, Monterey, San Diego, San Luis Obispo, Santa Clara, Santa Cruz, and Sonoma Counties.

HOSTS.— *Pinus attenuata, P. coulteri, P. muricata, P. radiata, P. torreyana.*

BIOLOGY.— These beetles breed in small twigs and produce at least two overlapping generations each year.

NOTES.— The above treatment was based on the holotypes of *carmeli* and *torreyanae* and on 251 other specimens.

### 50. *Pityophthorus scabridus* Schedl

*Pityophthorus scabridus* Schedl, 1955, Zeitschr. angew. Ent. 38:24 (Lectotype, female; Quezaltenango, Guatemala; Schedl Coll., designated by Bright, 1976, Coleopt. Bull. 30:186)

DIAGNOSIS.— This species is distinguished from the remotely allied *carmeli* Swaine by the stouter body form, by the very different frons, by the subreticulate pronotum, by the coarsely punctured elytra, and by the very different elytral declivity.

FEMALE.— Length 1.9–2.4 mm, 2.4 times as long as wide; color dark reddish brown.

Frons broadly flattened to well above eyes, epistoma ascending toward margin; surface smooth, shining, finely, very closely punctured; vestiture rather abundant, uniformly distributed, moderately long, only slightly longer at margins.

Pronotum 1.1 times as long as wide; outline about as in *carmeli*; posterior areas subreticulate, impressed points evident, punctures rather coarse, moderately close, deep. Glabrous except for short hair at margins.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal two-thirds, very broadly rounded behind; striae not impressed, surface subreticulate, shining, punctures from suture to interstriae 3 strongly confused, in recognizable rows in lateral areas, punctures coarse, deep, close. Declivity very steep, shallowly bisulcate; striae 1 and 2 distinct, punctures rather fine; interstriae 1 convex, distinctly elevated, armed by a row of fine tubercles, 2 strongly impressed, subreticulate, slightly wider than 1, 3 distinctly elevated, higher than 1, armed by a row of about nine rather fine tubercles. Vestiture of minute strial hair and moderately long, coarser interstrial hair, rather stout on declivital interstriae 3.

MALE.— Similar to female except frons broadly convex, rather coarsely, closely punctured, a subcarinate median callus on upper half, vestiture sparse, fine, rather short.

DISTRIBUTION.— Nayarit to Honduras.

MEXICO: **Chiapas**: 6 km N Bochil, 10-V-69, *Pinus*, D. E. Bright; Lagos des Colores, 17-V-69, *P. oocarpa*, D. E. Bright; San Cristóbal, 26-V-69, *Pinus*, D. E. Bright. **Jalisco**: 24 km W Guadalajara, 19-VII-52, *Pinus*, S. L. Wood. **Mexico**: 32 km N Cuernavaca, 15-VII-69, *Pinus*, D. E. Bright. **Nayarit**: Laguna Santa María, 6-VII-65, 1000 m, No. 204, *Pinus*, S. L. Wood. **Oaxaca**: 41 km SE Nochixtlán, 17-VI-67, No. 56, *Pinus*, S. L. Wood. **Veracruz**: Las Vigas, 5-VI-62, *Pinus*, R. Coronado. GUATEMALA: Quezaltenango, 26-V-64, 1600 m, No. 622, *P. pseudostrobus*, S. L. Wood; Volcán de Agua, 19-V-64, 1000 m, No. 596, *P. pseudostrobus*, S. L. Wood; San Juan. HONDURAS: Tegucigalpa, 9-III-66, *P. oocarpa*; Yuscarán, 23-IV-64, 800 m, No. 518, *P. caribaea*, S. L. Wood.

HOSTS.— *Pinus caribaea, P. oocarpa, P. pseudostrobus.*

BIOLOGY.— Specimens were taken from small branches.

NOTES.— The above treatment was based on the Schedl syntypes and on 215 other specimens.

### 51. *Pityophthorus leechi* Wood

*Pityophthorus leechi* Wood, 1977, Great Basin Nat. 37:215 (Holotype, female; 3 km NNE Angwin on N side of Howell Mt., Napa Co., California; California Acad. Sci.)

DIAGNOSIS.— This species is distinguished from *scalptor* Blackman by conspicuous characters of the female frons as indicated below.

FEMALE.— Length 2.0–2.5 mm, 2.8 times as long as wide; color reddish brown.

Frons transversely impressed on area below upper level of eyes, very feebly concave on median half of impressed area; surface smooth, shining, punctures moderately coarse, almost uniformly distributed, interspaces about equal to diameter of a puncture; a weak epistomal process clearly indicated; vestiture much less abundant than in *scalptor*, almost uniformly distributed, rather short, only slightly longer in marginal areas, longest setae about equal to one-third distance between eyes.

Pronotum and elytra as in *scalptor*, perhaps less brightly shining and elytral vestiture very slightly longer.

MALE.— Similar to male *scalptor* except transverse frontal impression not as strong, median carina less strongly elevated.

DISTRIBUTION.— California.

USA: California: 3 km NNE Angwin on N side of Howell Mt., Napa Co., 5-VI-77, *Pinus ponderosa*, H. B. Leech.

BIOLOGY.— Specimens were reared from small, shaded-out branches on a living host tree.

NOTES.— The above treatment was based on the type series of 29 specimens.

### 52. *Pityophthorus scalptor* Blackman

*Pityophthorus scalptor* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:30 (Holotype, female; Julian, California; U.S. Nat. Mus., 41265)

DIAGNOSIS.— This speech is distinguished from *borealis* Swaine and its allies by the absence of small granules on the lateral margins of discal punctures on the pronotum, by the reticulate elytra, and by the shallowly concave female frons.

FEMALE.— Length 2.2–2.7 mm, 2.7 times as long as wide; color dark reddish brown.

Frons impressed from eye to eye, from epistoma to well above eyes, central half shallowly concave, ascending toward epistoma; epistomal process not indicated; surface smooth, rather dull, punctures rather fine, close, dense along lateral and dorsal margins; vestiture of fine, yellow hair, rather short in central area, very long on margins, longest setae equal in length to two-thirds distance between eyes.

Pronotum 1.1 times as long as wide; widest one-third pronotum length from base, sides moderately arcuate on basal two-thirds, distinctly constricted on anterior third, rather narrowly rounded in front; anterior margin armed by about 10 teeth, median pair rather coarse, rapidly decreasing in size laterally; summit slightly anterior to middle, with a slight posterior impression; disc smooth, shining, impressed points indicated; punctures rather fine, circular, with margins unarmed, moderately close. Glabrous except at margins.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; striae not impressed except 1 near declivity, punctures rather small, in definite rows except slightly irregular on basal two-thirds; surface reticulate, moderately shining, interstrial punctures fine, more widely spaced than those of striae, slightly confused on basal half, present on all interstriae. Declivity steep, convex, shallowly bisulcate; striae 1 impressed, punctures on 1 and 2 minute but visible; interstriae 1 distinctly elevated, armed by a row of fine granules, 2 almost one and one-half times as wide as 1, impunctate, flat but ascending laterally, 3 rounded, higher than 1, armed by a row of minute granules similar to those on 1. Usually glabrous except at sides, occasional minute strial or interstrial hair on disc and declivity, without longer setae on declivity.

MALE.— Similar to female except frons rather strongly convex on upper two-thirds, a shallow, transverse impression below, lower two-thirds with a fine, uniformly, sharply

elevated, low, median carina, surface coarsely punctured, subglabrous.

DISTRIBUTION.— British Columbia to California.

CANADA: **British Columbia**: Elko. USA: **California**: Ebbetts Pass, Hat Creek, Mt. Julian, Laguna in Mariposa Co., McCloud, Mt. Wilson, Northfork, Palomar Mountain, Ventura Co., Yosemite Valley.

HOSTS.— *Pinus contorta, P. coulteri, P. jeffreyi, P. ponderosa.*

BIOLOGY.— Specimens were taken from small branches of young trees. Apparently it is rather uncommon.

NOTES.— The above treatment was based on the holotype and on 60 other specimens.

## 53. *Pityophthorus scalptus* Bright

*Pityophthorus scalptus* Bright, 1978, Great Basin Nat. 38:82 (Holotype, female; Aspen Grove, British Columbia; Canadian Nat. Coll., 15486)

DIAGNOSIS.— This species is distinguished from *scalptor* Blackman by the more shallowly concave, more sparsely punctured female frons, by the tuberculate punctures on the pronotal disc, by the absence of elytral reticulation, by the absence of punctures on the even-numbered discal interstriae, and by the different declivity as described below.

FEMALE.— Length 2.3–2.8 mm, 2.7 times as long as wide; color very dark brown.

Frons similar to *scalptor* except more evenly, more shallowly concave, punctures smaller, more widely spaced, separated by two to four diameters of a puncture, marginal row of long setae less dense.

Pronotum as in *scalptor* except all punctures armed or replaced by a small granule.

Elytra as in *scalptor* except surface smooth, shining, discal interstriae 2 and 4 impunctate, declivital interstriae 2 at least twice as wide as 1, slightly more strongly impressed, tubercles on interstriae distinctly larger.

DISTRIBUTION.— British Columbia to Colorado.

CANADA: **British Columbia**: Aspen Grove, 9-VI-31, 17357 Lot 31, *Pinus ponderosa*, H. Richmond. USA: **Colorado**: Estes Park, 31-VIII-38, *P. ponderosa*, Hopk. US 31541-V. **Montana**: Stevensville, 31-VIII-67, *P. ponderosa*, Hopk. 51945. R. McEwan, M. McGregor.

HOST.— *Pinus ponderosa.*

NOTES.— The above treatment was based on 46 specimens.

## 54. *Pityophthorus nitidus* Swaine

Fig. 209

*Pityophthorus nitidus* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):25 (Lectotype, female; Tullochgoram, Quebec; Canadian Nat. Coll., 3151, designated by Bright, 1967, Canadian Ent. 99:678)

*Pityophthorus borealis* Swaine, 1925, Canadian Ent. 57:195 (Holotype, female; Coppermine River, Northwest Territories; Canadian Nat. Coll., 1368); Bright, 1977, Canadian Ent. 109:516. *Synonymy*

*Pityophthorus anceps* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:31 (Holotype, female; Clyde, Colorado; U.S. Nat. Mus., 41266); Bright, 1977, Canadian Ent. 109:516. *Synonymy*

*Pityophthorus varians* Schedl, 1930, Canadian Ent. 62:196 (Holotype, female; Truro, Nova Scotia; Canadian Nat. Coll., 3133); Wood, 1957, Canadian Ent. 89:401. *Synonymy*

*Pityophthorus aquilonius* Bright, 1968, Canadian Ent. 100:604 (Holotype, female; Rampart House, Yukon Territory; Canadian Nat. Coll., 9733); Bright, 1977, Canadian Ent. 109:516. *Synonymy*

DIAGNOSIS.— This species is distinguished from *toralis* Wood by the smaller average size, by the more strongly convex frons in both sexes, but with the transverse impression above the epistoma in the male much weaker, by the more finely punctured male frons, by the less abundant, shorter (variable) vestiture on the female frons, and by the near absence of punctures on the posterior two-thirds of discal interstriae 2 and 4.

FEMALE.— Length 1.6–2.4 mm, 2.9 times as long as wide; color very dark reddish brown.

Frons variable, plano-convex over broad area to moderately convex, margins rounded, not specially marked by marginal punctures, puncture fine to moderately coarse, usually finer on lower half, rather close, deep; glabrous to moderately covered by fine, short setae of uniform length to more abundant, with marginal setae much longer (longest setae equal in length to one-third distance between eyes).

Pronotum 1.1 times as long as wide; outline as in *scalptor* Blackman; 10 serrations on anterior margin rather small, only slightly longer toward median line; posterior areas smooth, shining, with numerous impressed points, discal punctures lateral to median line oval, most with a granule on lateral margin.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; outline as in *scalptor*; striae not impressed except 1 near declivity;

interstriae shining, varying from smooth to moderately wrinkled, three times as wide as striae, odd-numbered interstriae sparsely punctured throughout, even-numbered interstriae usually impunctate except on basal third. Declivity essentially as in *scalptor* except surface almost smooth, interstriae 2 at least twice as wide as 1, more broadly impressed, ascending on lateral half only. Vestiture as in *scalptor*.

MALE.— Similar to female except frons more strongly convex, more coarsely punctured, transverse impression weak, limited to lower fourth, vestiture short, sparse, inconspicuous.

DISTRIBUTION.— Alaska and Newfoundland to Oregon and Nova Scotia.

ALASKA: Fort Yukon, Hope, Lawing, Seward Highway at mile 60. CANADA: **Alberta**: Highwood Pass, Smith. **New Brunswick**: Parkers Ridge, Kedwick Portage. **Newfoundland**: Birch Lake near White Bay, Deer Lake, Middlebrook. **Northwest Territories**: Aklavik, Coppermine River, Tununuk. **Ontario**: Beardmore. **Quebec**: Ste. Anne's, Tullochgoram. **Yukon**: Rampart House, Johnson's Crossing. USA: **Colorado**: Clyde, Dolores. **Oregon**: Dixie Pass, Willamette Pass.

HOSTS.— *Picea engelmannii, P. glauca, P. mariana, Pinus resinosa, P. strobus,* rare in other *Pinus*.

NOTES.— The above treatment was based on the lectotype of *nitidus*, on the holotype and a topotypic female of *borealis* taken with the type series, on the holotypes of *anceps*, *varians*, and *aquilonius*, and on 428 other specimens.

This species is somewhat variable, particularly the female frons, but the material presently at hand is inadequate to properly evaluate that variation. This species is easily confused with *alpinensis* G. Hopping and *toralis*. The near absence of punctures on discal interstriae 2 and 4 and the host serve to distinguish this species.

### 55. *Pityophthorus indigus* Wood

*Pityophthorus indigens* Wood, 1977 (nec Wood, 1976), Great Basin Nat. 37:214 (Holotype, female; Gould, Colorado; Wood Coll.)

*Pityophthorus indigus* Wood, 1978, Great Basin Nat. 38:398. *Replacement name*

DIAGNOSIS.— This species is distinguished from *nitidus* Swaine by the replacement of punctures on the pronotal disc by rounded granules, by the minute strial punctures, and by the regularly punctured discal interstriae.

FEMALE.— Length 2.0–2.3 mm, 2.8 times as long as wide; color very dark brown.

Frons shining, rather strongly convex, rather coarsely, very closely punctured, upper margins of many punctures obscurely granulate; lower fourth marked by a blunt median carina, with its summit at its ventral end; vestiture sparse, very short, inconspicuous.

Pronotum as in *nitidus* except all discal punctures entirely replaced by rounded granules.

Elytra essentially as in *nitidus* except surface smooth, brightly shining, strial punctures minute, spaced within a row by three to five diameters of a puncture; interstriae about eight times as wide as striae, punctures more or less regular on all interstriae, minute, similar to those of striae. Declivity about as in *nitidus* except sulcus conspicuously deeper, granules on interstriae 1 and 3 distinctly larger.

DISTRIBUTION.— Colorado.

USA: **Colorado**: 3 km E Gould, Jackson Co., 12-VI-69, *Pinus contorta* branch, S. L. Wood.

NOTES.— The above treatment was based on the type series of six specimens.

### 56. *Pityophthorus fuscus* Blackman

*Pityophthorus fuscus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:32 (Holotype, female; Glacier National Park, Montana; U.S. Nat. Mus., 41267)

*Pityophthorus smithi* Schedl, 1931, Canadian Ent. 63:163 (Holotype, female; Copper Mountain, British Columbia; Canadian Nat. Coll., 3168); Wood, 1977, Great Basin Nat. 37:515. *Synonymy*

DIAGNOSIS.— This species is distinguished from *indigus* Wood by the much more coarsely punctured elytral disc, by the very slightly deeper declivital sulcus with the lateral granules very slightly larger, and by the more abundant, longer elytral vestiture.

FEMALE.— Length 2.0–2.2 mm, 2.6 times as long as wide; color very dark brown.

Frons as in *indigus* except very slightly less strongly convex, punctures slightly smaller, slightly closer, vestiture slightly longer, slightly more abundant.

Pronotum as in *indigus*.

Elytral disc about as in *indigus* except impressed points obsolete, strial punctures

slightly larger, interstriae 1 and 3 each with about eight punctures only slightly smaller than those of striae; declivity as in *indigus* except very slightly steeper, sulcus very slightly deeper, tubercles on interstriae 3 very slightly larger, interstrial setae slightly longer and more consistently present on sides and declivital interstriae 1 and 3, length of longest setae equal to two-thirds width of a discal interstriae.

MALE.— Similar to female except frons with a very weak to moderate median carina on lower half.

DISTRIBUTION.— British Columbia to Montana.

CANADA: **British Columbia**: Copper Mt., 29-X-29, 18-III-30, *P. contorta*, G. S. Smith. USA: **Montana**: Glacier N.P., Hopk. 16968a, reared, 30-VIII-23, *Pinus contorta*, J. C. Evenden.

NOTES.— The above treatment was based on the holotypes of *fuscus* and *smithi* and on 16 other specimens.

### 57. *Pityophthorus alpinensis* G. Hopping
Fig. 205

*Pityophthorus alpinensis* G. Hopping, 1960, Canadian Ent. 92:865 (Holotype, female; Highwood Pass, Alberta; Canadian Nat. Coll., 7291)

DIAGNOSIS.— This species is distinguished from *toralis* Wood by the much more finely punctured female frons, by the more gradually impressed male frons on its lower half, by the more strongly elevated male frontal carina, with its crest longitudinally convex, and by the hosts.

FEMALE.— Length 2.3–2.7 mm, 2.7 times as long as wide; color almost black.

Frons as in *toralis* except more extensively, more distinctly concave; surface dull, punctures usually finer, more widely spaced, interspaces about one to three times diameter of a puncture (less than diameter of a puncture in *toralis*), setae usually more abundant, longer, longest setae equal in length to more than half distance between eyes (equal to one-third, rarely one-half in *toralis*).

Pronotum and elytra as in *toralis* except declivital interstriae 3 usually more distinctly punctured.

MALE.— Similar to female except frons; frons similar to male *toralis* except lower half much less strongly impressed, crest of carina longitudinally convex, surface smoother, more finely punctured (differences most conspicuous in area of distributional sympatry).

DISTRIBUTION.— Alberta to Idaho.

CANADA: **Alberta**: Sunshine Lodge, Banff N.P., 1-VI-60, *Larix lyallii*, 59A1247-01, G. R. Hopping; Highwood Pass, 24-IX-56; Seebe, 1-X-65. USA: **Idaho**: Salmon Mountain, Bitterroot N.F., 8-VIII-74, *L. lyallii*, Hopk. 58695-A, M. M. Furniss.

HOST.— *Larix lyallii*.

BIOLOGY.— Reared from a broken top.

NOTES.— The above treatment was based on the holotype and on 102 other specimens. Bright (1977:516) treated this species as a synonym of *nitidus* Swaine; however, this species has the even-numbered discal interstriae punctured, differences in the frons of both sexes, and other minute differences.

### 58. *Pityophthorus toralis* Wood

*Pityophthorus toralis* Wood, 1964, Great Basin Nat. 24:59 (Holotype, female; Beaver Creek, Logan Canyon, Utah; Wood Coll.)

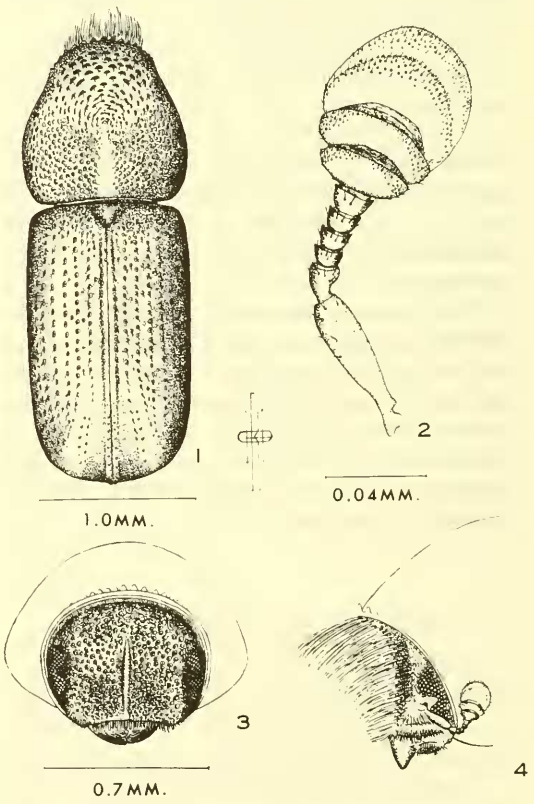



Fig. 205. *Pityophthorus alpinensis*: 1, dorsal aspect of female; 2, antenna; 3, head of male; 4, head of female. (After G. Hopping 1960:866.)

*Myeloborus confusus* Bright, 1966, Pan Pacific Ent. 42:295 (Holotype, female; Mt. Tallac, Eldorado Co., California; Ohio State Univ. Coll.); Bright and Stark, 1973, Bull. California Ins. Surv. 16:105. *Synonymy*

*Pityophthorus collinus* Bright, 1968, Canadian Ent. 100:605 (Holotype, female; Terrace Mountain, 15 miles W Nahun, Osoyoos District, British Columbia; Canadian Nat. Coll.); Bright, 1977, Canadian Ent. 109:518. *Synonymy*

DIAGNOSIS.— This species is distinguished from *nitidus* Swaine as indicated in the diagnosis of that species and, in addition, by the longitudinally concave crest of the male carina. It is distinguished from *alpinensis* G. Hopping as indicated in the diagnosis of that species.

FEMALE.— Length 2.1–2.7 mm, 2.7 times as long as wide; color very dark brown, almost black.

Frons impressed from eye to eye, from epistoma to well above eyes, shallowly concave on central half, ascending slightly toward epistoma; margins abruptly angled near eyes; surface shining, densely, closely, rather coarsely punctured, punctures separated by distances less than diameter of a puncture in central area; vestiture of fine, rather short hair in central area, of subplumose, very long setae on lateral and dorsal margins, longest setae at least equal in length to one-third distance between eyes.

Pronotum as in *scalptor* Blackman except punctures on discal area armed on their lateral margins by granules often as large or larger in diameter than adjacent puncture. Discal area with moderately abundant, semirecumbent hair.

Elytral disc as in *nitidus* except interstriae 2 and 4 with punctures on posterior third or more. Declivity as in *nitidus* except sulcus slightly deeper, granules slightly larger, punctures on interstriae 1 and 2 usually obsolete (minute punctures sometimes present).

MALE.— Similar to female except upper frons strongly convex, lower third occupied by a rather strong, transverse impression, surface very coarsely, closely, deeply, almost subgranulately punctured, median carina on lower two-thirds of area below upper margins of eyes, its longitudinal crest concave, rather weakly developed above impressed area.

DISTRIBUTION.— Alberta and British Columbia to California and Utah.

CANADA: **Alberta**: Burmis, Calgary, Cowley. **British Columbia**: Anahim Lake, Terrace Mountain near Nahun. USA: **California**: Ebbetts Pass in Alpine Co., Mt. Tallac in Eldorado Co., Onion Valley, Yosemite N.P. **Idaho**: Salmon Mountain in Bitterroot N.F. **Oregon**: Hood River. **Utah**: Logan Canyon. **Wyoming**: Laramie.

HOSTS.— *Pinus albicaulis*, *P. contorta* (rare), *P. flexilis*.

BIOLOGY.— Specimens were taken from the phloem of branches about 2–3 cm in diameter.

NOTES.— The above treatment was based on the holotypes of *toralis*, *confusus*, and *collinus* and on 173 other specimens.

Three specimens from 13 miles N and 12 miles E Dolores, Colorado, from *Picea engelmannii*, and one male from 9 miles SE Aspen, Colorado, from *Abies lasiocarpa*, are tentatively assigned to this species. The females of the former and the latter male are typical of *toralis*; the male frons of the former is more nearly like *nitidus*. Obviously, much more remains to be learned about this complex of species.

### 59. *Pityophthorus litos* Bright

*Pityophthorus litos* Bright, 1976, Great Basin Nat. 36:435 (Holotype, female; 25 miles or 40 km W Orizaba, Veracruz, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— Apparently allied to *glabratulus* (Schedl), but it is distinguished by the different frons and declivity as described below.

FEMALE.— Length 1.5–1.6 mm, 2.6 times as long as wide; color dark brown.

Frons plano-convex on central two-thirds; surface shining, moderately, rather finely punctured; frontal vestiture moderately sparse, rather short in central area, long on margins, longest setae equal in length to half distance between eyes.

Pronotum about as in *glabratulus* except six serrations on anterior margin much smaller and discal area smooth, shining, with a few impressed points.

Elytral disc much as in *glabratulus* except surface more nearly reticulate, declivital interstriae 2 ascending rather strongly from striae 1, interstriae 3 more broadly rounded, setae on declivital interstriae 3 much longer.

MALE.— Male similar to female except frons rather strongly convex, coarsely, closely punctured, a low, sometimes obscure median

carina from epistomal margin half distance to upper level of eyes.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: 40 km W Orizaba, 29-IV-69, *Pinus*, D. E. Bright.

NOTES.— The above treatment was based on the type series of eight specimens.

### 60. *Pityophthorus sapineus* Bright

*Pityophthorus sapineus* Bright, 1981, Ent. Soc. Canada Mem. 118:194 (Holotype, female; Atenquique, Jalisco, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *litos* Bright by the very different frons and declivity, as described below, and by the much finer discal striae.

FEMALE.— Length 1.7–1.8 mm, 2.6 times as long as wide; color very dark brown.

Frons broadly flattened to well above eyes, with central third weakly, subconcavely impressed; surface smooth, shining, uniformly, finely punctured, width of interspaces about one to two diameters of a puncture; vestiture of a rather dense marginal fringe of very long setae, longest setae equal in length to half distance between eyes, much shorter in central area.

Pronotum and elytra as in *litos* except strial punctures smaller, strial vestiture shorter, interstrial setae obsolete on 8, several setae present on 9.

MALE.— Similar to female except frons broadly convex, a distinct transverse impression on lower third, shining, coarsely punctured, carina absent, vestiture short, sparse, inconspicuous; declivity with four interstrial setae of moderate length on 3, three on 8, and several on 9.

DISTRIBUTION.— Jalisco.

MEXICO: Jalisco: Atenquique, *Pinus*.

NOTES.— The above treatment was based on four paratypes.

### 61. *Pityophthorus glabratulus* (Schedl)

*Ctenyophthorus glabratulus* Schedl, 1955 (1956), Zeitschr. angew. Ent. 38:26 (Lectotype, female; Quezaltenango, Guatemala; Schedl Coll., designated by Bright, 1976, Coleopt. Bull. 30:186)

*Neodryocoetes glabratulus*: Schedl, 1963, Ent. Arb. Mus. Frey 14:162

*Pityophthorus glabratulus*: Bright, 1976, Coleopt. Bull. 30:186

DIAGNOSIS.— This species is distinguished from *diglyphus* Blandford by the smaller size, by the minutely punctured female frons, with less abundant, shorter vestiture, by the more evenly convex male frons, with the carina not dentate, more strongly elevated on dorsal half, and by the short declivital setae.

FEMALE.— Length 1.7–2.1 mm, 2.6 times as long as wide; color very dark brown.

Frons plano-convex from epistoma to well above eyes, lateral margins extending to three diameters of a facet from margin to eye, epistoma slightly raised; surface smooth, shining, central two-thirds rather sparsely, minutely punctured, punctures slightly larger toward margins; vestiture of fine, rather sparse, yellow hair of moderate length, distinctly longer at margins, longest setae equal to less than half distance between eyes. Antennal club with suture 1 moderately procurved and septate, 2 rather strongly procurved, slightly septate at extreme margins, not attaining middle of club.

Pronotum 1.06 times as long as wide; widest on basal third, sides feebly arcuate on basal half, distinctly constricted on anterior half, rather broadly rounded in front; anterior margin armed by 10 serrations, slightly larger toward middle; summit slightly anterior to middle, a distinct transverse impression behind summit; posterior areas almost smooth to rather strongly reticulate, punctures rather fine, not round, median line broadly impunctate. Vestiture of fine, short hair.

Elytra 1.6 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed except 1 slightly near declivity, punctures moderately course, rows becoming slightly irregular on basal fourth; interstriae almost smooth, shining, odd-numbered with sparse punctures similar to those of striae, 2 and 4 impunctate. Declivity steep, narrowly, rather shallowly bisulcate; punctures on striae 1 and 2 impressed, half as large as on disc; interstriae 1 distinctly elevated, armed by a row of fine granules, 2 as wide as 1, flat, smooth, impunctate, 3 rather abruptly, modestly elevated, slightly higher than 1, elevation extended to junction with 8 and on apex of 8, 3 armed by a row of 8–10 small granules. Vestiture of minute strial and short, sparse interstrial hair, almost obsolete on disc, not longer on declivity.

MALE.— Similar to female except frons slightly more strongly convex, punctures slightly larger, closer, median carina extending from slightly above epistoma to slightly above eyes, its longitudinal crest evenly convex, its greatest height at upper level of eyes; serrations on anterior margin of pronotum larger.

DISTRIBUTION.— Oaxaca to Guatemala.

MEXICO: **Chiapas**: 13 km E San Cristóbal, 6-VI-69, *Pinus ayacauite*, *P. ochoternal*, D. E. Bright. **Oaxaca**: 51 km SE Nochixtlán, 14-VII-69, *P. pringlei*, D. E. Bright. GUATEMALA: Guatemala City, 30-V-64, 1300 m, No. 650, *P. pseudostrobus*, S. L. Wood; Quezaltenango, 26-V-64, 1600 m, No. 622, *P. pseudostrobus* S. L. Wood.

## 62. *Pityophthorus ineditus* Bright

*Pityophthorus ineditus* Bright, 1976, Great Basin Nat. 36:434 (Holotype, female; 32 miles or 51 km S Valle Nacional, Oaxaca, Mexico; Canadian Nat. Coll., 15084)

DIAGNOSIS.— This species is distinguished from *diglyphus* Blandford and *leiophyllae* Blackman by the absence or near absence of a median carina in the male and by the very different declivity.

FEMALE.— Length 1.7–2.0 mm, 2.6 times as long as wide; color dark brown.

Frons broadly plano-convex to well above eyes except plano-concave on central third; surface smooth, very brightly shining, punctures small, very sparse; vestiture sparse, moderately long in central area, very long on margins, much longer than in *diglyphus* or *leiophyllae*.

Pronotum and elytra as in *diglyphus* except for declivity. Declivity convex, steep; striae 1 strongly impressed, 2 not impressed, punctures reduced; interstriae 1 distinctly elevated, armed by a row of fine granules, 2 as wide as 1 or 3, ascending laterally, 3 broadly rounded, armed by about three rather coarse tubercles. Vestiture largely confined to declivital interstriae, short on 1, absent on 2, 4, and 6, very long on 3, moderately long on 5 and 7.

MALE.— Similar to female except frons rather strongly, transversely impressed from epistoma to upper level of eyes, smooth, shining, punctures fine, sparse, vestiture in impressed area rather abundant, moderately long, carina very short, near epistoma, or absent; tubercles on declivity much smaller.

DISTRIBUTION.— Oaxaca to Veracruz.

MEXICO: **Oaxaca**: 51 km S Valle Nacional, 21-V-71, *Pinus*, D. E. Bright. **Veracruz**: Las Vigas, 5-VII-67, No. 156, *Pinus* branches, S. L. Wood; 11 km SE Las Vigas, 15-XII-48, H. B. Leech.

NOTES.— The above treatment was based on the type series of 35 specimens.

## 63. *Pityophthorus leiophyllae* Blackman

Fig. 200

*Pityophthorus leiophyllae* Blackman, 1942, Proc. U.S. Nat. Mus. 92:205 (Holotype, female; Chalco, Mexico, Mexico; U.S. Nat. Mus., 55981)

*Pityophthorus auctor* Blackman, 1942, Proc. U.S. Nat. Mus. 92:214 (Holotype, female; Perote, Veracruz, Mexico; U.S. National Mus., 55988); Bright, 1977, Canadian Ent. 109:514. *Synonymy*

DIAGNOSIS.— This species is distinguished from *diglyphus* Blandford by the subreticulate surfaces of the pronotum and elytra, by the conspicuous median glabrous line from epistoma to vertex on the female frons, by the less strongly impressed male frons with the carina much higher, and by the short declivital setae.

FEMALE.— Length 1.9–2.3 mm, 2.6 times as long as wide; color very dark reddish brown, elytra usually at least partly lighter.

Frons as in *glabratulus* (Schedl) except median sixth from epistoma to vertex impunctate and glabrous; vestiture as in *glabratulus* except absent on median sixth.

Pronotum and elytra as in *glabratulus* and *diglyphus* except surfaces on both subreticulate to reticulate, punctures on both slightly larger. Vestiture on declivity as on disc and sides, not longer.

MALE.— Similar to female except surface reticulate, coarsely punctured, distinctly, shallowly, abruptly impressed below upper level of eyes, a very strong, subdentate, laterally compressed carina on central two-thirds of median line between epistoma and upper level of eyes.

DISTRIBUTION.— Michoacán to Veracruz and Oaxaca.

MEXICO: **Hidalgo**: 6 km E Zacatlan, 12-VI-67, 2500 m, No. 18, *Pinus*, S. L. Wood. **Mexico**: Km 20 Texcoco, 5-II-62, *Pinus*, R. Coronado. **Michoacán**: Parácuraro, 10-IX-61, *Pinus*, R. Coronado. **Oaxaca**: 41 km SE Nochixtlán, 17-VI-67, No. 56, *Pinus*, S. L. Wood. **Veracruz**: Las Vigas, 5-VII-67, No. 157, *Pinus*, S. L. Wood.

HOSTS.— *Pinus* sp.

BIOLOGY.— Specimens were taken from twigs and small branches.

NOTES.— The above treatment was based on the holotypes of *leiophyllae* and *auctor* and on three other specimens. Bright (1977:514) placed this species under *diglyphus* Blandford; however, the two are quite different.

### 64. *Pityophthorus diglyphus* Blandford

*Pityophthorus diglyphus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):240 (Syntypes; Quiché Mts. and Balheu in Verapaz, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *glabratulus* (Schedl) by the more coarsely punctured female frons, with longer more abundant vestiture, by the impressed male frons, with a dentate carina, and by the very long, fine, declivital setae.

FEMALE.— Length 2.3–2.5 mm, 2.6 times as long as wide; color very dark brown.

Frons plano-convex, as in *glabratulus* except punctures moderately coarse, not larger toward margins, vestiture more abundant, much longer at margins; margin of flattened area separated from margin of eye by distance equal to diameter of one facet.

Pronotum as in *glabratulus* except rarely with any reticulation, punctures distinctly larger.

Elytra as in *glabratulus*.

MALE.— Similar to female except frons abruptly, moderately impressed below upper level of eyes, carina dentate, at center of lower half, a weak (longitudinally concave) crest extending to above upper level of impressed area.

DISTRIBUTION.— Guatemala.

GUATEMALA: San Cristóbal in Huehuetenango, 28-V-64, 2300 m, No. 632, *Pinus pseudostrobus*, S. L. Wood; Balheu and Quiché Mountains in Verapaz.

HOST.— *Pinus pseudostrobus*.

BIOLOGY.— Specimens were taken from twigs 1 cm in diameter.

NOTES.— The above treatment was based on Blandford's 4 syntypes and on 10 other specimens.

### 65. *Pityophthorus vespertinus* Bright

*Pityophthorus vespertinus* Bright, 1978, Great Basin Nat. 38:83 (Holotype, female; 37 km or 23 miles W Durango, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *diglyphus* Blandford by the smaller size, by the reticulate or subreticulate pronotal disc, and by the short declivital setae.

FEMALE.— Length 1.7–1.8 mm, 2.5 times as long as wide; color dark brown.

Frons as in *diglyphus* except punctures slightly smaller, more numerous, more evenly distributed, vestiture finer, shorter.

Pronotum essentially as in *diglyphus* except posterior areas reticulate.

Elytra as in *diglyphus* except declivity slightly steeper, less strongly sulcate, setae all short, none longer than distance equal to width of one interstriae (mostly less than one-fourth this distance).

DISTRIBUTION.— Durango.

MEXICO: Durango: 37 km W Durango, 4-VI-65, 2000 m, No. 6, *Pinus*, S. L. Wood.

NOTES.— The above treatment was based on the type series of four specimens.

### 66. *Pityophthorus rudis* Blackman

Fig. 200

*Pityophthorus rudis* Blackman, 1942, Proc. U.S. Nat. Mus. 92:212 (Holotype, female; Amecameca, Distrito Federal, Mexico; U.S. Nat. Mus., 55987)

DIAGNOSIS.— This species is distinguished by the moderately large size, slender form, impunctate interstriae, reticulate elytral surface, and the very long declivital setae.

FEMALE.— Length 2.3–2.7 mm, 2.8 times as long as wide; color dark reddish brown.

Frons broadly flattened, plano-concave on median half below upper level of eyes; surface smooth, shining, punctures moderately coarse, rather close in marginal areas, almost impunctate on median sixth of lower half; vestiture sparse but moderately long in central area, a rather dense row on margins, longest setae equal in length to two-thirds distance between eyes.

Pronotum 1.0 times as long as wide; as in *diglyphus* Blandford except disc more nearly reticulate.

Elytra 1.9 times as long as wide, 2.1 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather broadly rounded behind; striae not impressed except 1 near declivity, punctures in rows, moderately coarse, deep; interstriae about one and one-half times as wide as striae, surface subreticulate, shining, impunctate except near declivity and on 1 to middle of disc. Declivity steep, rather strongly sulcate; striae 1 obsolete, 2 rather finely, shallowly punctured;

interstriae 1 slightly elevated, armed by a few very minute granules, 2 rather strongly impressed, three times as wide as 1, ascending on lateral third to striae 2, 3 rather strongly elevated and armed by 6–8 coarse tubercles, much higher than suture (much like *durus* Blackman, but not nearly as steep). Vestiture largely confined to declivity on interstriae 3 and lateral areas; consisting of very long hair on odd-numbered interstriae, longest equal in length to distance from suture to discal striae 4.

MALE.— Similar to female except frons as in male *diglyphus* Blandford.

DISTRIBUTION.— Mexico.

MEXICO: Mexico: Amecameca, 28-I-36, *Pinus*, 669. D. DeLeon.

NOTES.— The above treatment was based on the holotype, allotype, and seven paratypes.

### 67. *Pityophthorus venustus* Blackman

*Pityophthorus venustus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:75 (Holotype, female; Kaibab National Forest, Arizona: U.S. Nat. Mus., 41290)

*Pityophthorus artifex* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:76 (Holotype, female; Meyers, California; U.S. Nat. Mus., 41291); Bright, 1977, Canadian Ent. 109:518. *Synonymy*

DIAGNOSIS.— This species is distinguished from the *diglyphus* group of species by the absence of an elevation toward the apex of declivital interstriae 3 and 8, and by the presence of tubercles at the base of declivital interstriae 2.

FEMALE.— Length 1.7–2.1 mm, 2.8 times as long as wide; color very dark brown.

Frons plano-convex from epistoma to well above eyes, lateral margins abruptly subangulate, separated from margin of eye by distance equal to diameter of one facet; surface smooth, shining, uniformly, closely, rather coarsely punctured; vestiture uniformly distributed, rather long, slightly longer at margins, longest setae equal in length to about half distance between eyes. Antennal club rather similar to *glabratulus* (Schedl).

Pronotum 1.03 times as long as wide; outline as in *glabratulus* except anterior margin slightly more narrowly rounded; posterior areas smooth, shining, punctures round, rather coarse, deep, close. Vestiture of fine, short hair.

Elytra 1.8 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather broadly rounded behind; striae not impressed except 1 near declivity, punctures rather coarse, close, deep, in rows except partly confused on basal fifth; interstriae slightly wider than striae, surface subreticulate, shining, punctures irregularly spaced, often absent on 2 and 4, subequal in size with those of striae, often confused with them, basal area near scutellum usually wrinkled. Declivity steep, rather shallowly, narrowly sulcate; striae 1 and 2 finely, distinctly punctured; interstriae 1 abruptly, rather weakly elevated, 2 impressed, as wide as 1, smooth, shining, impunctate except a row of about four fine granules at base, 3 gradually, moderately elevated on upper two-thirds, much higher than 1, armed by a row of 8–10 fine tubercles. Vestiture of fine, short hair on disc and declivity, slightly longer on sides.

MALE.— Similar to female except frons more strongly convex, shining, coarsely punctured, median carina from epistoma to above eyes sharply, moderately to very strongly elevated, highest on lower third; serrations on anterior margin of pronotum usually larger.

DISTRIBUTION.— British Columbia and South Dakota to California and W Texas.

CANADA: **British Columbia**: Creston. USA: **Arizona**: Chiricahua Mts., Huachuca Ms., Kaibab N.F., Pinalino Mts., Santa Catalina Mts., Williams. **California**: Blanco's Corral in White Mts. of Mono Co., Carrville, Hat Creek, Julian, Junipero Serra Peak in Monterrey Co., Lake Arrowhead, Lake Tahoe, Meyers, Mill Creek Camp near Strawberry, Mt. Laguna, Mt. Palomar. **Colorado**: Breckenridge, Longmont. **Idaho**: Clarkis. **Nebraska**: Halsey, Norden. **New Mexico**: Lake Roberts. **South Dakota**: Black Hills. **Texas**: Guadeloupe Mts. N.P. in Culberson Co. **Utah**: Kamas, La Sal Mts.

HOSTS.— *Pinus aristata, P. contorta, P. coulteri, P. jeffreyi, P. leiophylla, P. monticola, P. ponderosa, P. strobiformis.*

BIOLOGY.— Specimens were taken from small branches.

NOTES.— The above treatment was based on the holotypes of *venustus* and *artifex* and on 110 other specimens.

### 68. *Pityophthorus durus* Blackman

*Pityophthorus durus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:70 (Holotype, female; Paradise, Arizona; U.S. Nat. Mus., 41287)

DIAGNOSIS.— This variable species is usually distinguished by the rather large, stout body, by the weakly to moderately confused, coarse elytral punctures, by the variable male median carina, and by the deeply sulcate, very steep, distinctive elytral declivity.

FEMALE.— Length 1.9–2.6 mm, 2.5–2.6 times as long as wide; color dark reddish brown.

Frons flat to plano-convex from epistoma to well above upper level of eyes, lateral margins abruptly subangulate, slightly more than diameter of one facet from margin of eye; surface shining, closely, deeply, rather finely punctured, punctures spaced by about one to two diameters of a puncture, uniformly distributed; vestiture rather abundant, moderately long, distinctly longer at margins, longest setae almost equal to half distance between eyes. Antennal club comparatively small, 1.2 times as long as wide, suture 1 weakly, 2 moderately procurved, 2 extending slightly beyond middle of club.

Pronotum 1.03 times as long as wide; widest at base, rather weakly arcuate on slightly more than basal half, then distinctly constricted, rather narrowly rounded in front; anterior margin armed by 8–10 serrations, median ones distinctly larger; summit at middle, a distinct transverse impression behind summit; posterior areas smooth, shining, with numerous impressed points, punctures rather coarse, deep, moderately close. Vestiture of fine, rather short hair.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal three-fourths, very broadly rounded behind; striae not impressed except 1 near declivity, punctures coarse, deep, close, varying from definite rows to moderately confused; interstriae almost smooth, shining, as wide as striae, somewhat regularly punctured (often almost impunctate on 2 and 4), punctures fine to entirely confused with those of striae. Declivity very steep, strongly bisulcate; punctures on striae 1 and 2 less than half as large as on disc to very small; interstriae 1 distinctly elevated, almost half as wide, varying from unarmed to a row of fine tubercles, 2 slightly wider than 1, almost flat from striae 1 to 2, armed at base by about three small tubercles, 3 strongly elevated on upper two-thirds, much higher than 1, summit rounded to lateral areas, armed by 8–10 rather coarse tubercles. Vestiture of minute strial hair and longer interstrial hair; interstrial setae on disc sparse, rather short, long and coarse on lateral elevations of declivity and vicinity.

MALE.— Similar to female except frons broadly convex (slightly impressed in occasional specimens), shining, closely, rather coarsely punctured, vestiture inconspicuous, short, either entirely without a carina or with a variable low median carina of uniform height from epistoma to vertex; serrations on anterior margins of pronotum usually larger.

DISTRIBUTION.— Arizona to Oaxaca.

USA: **Arizona**: Chiricahua Mts., Paradise, Santa Rita Mts. MEXICO: **Chihuahua**: La Laja. **Durango**: El Salto, 16, 38, and 96 km W Durango. **Hidalgo**: Durango, Jacala, Tulancingo. **Mexico**: Chalco. **Michoacán**: Carapan, 25 km E Morelia, Quiroga, Volcan Parícutin. **Mexico**: Cuernavaca. **Oaxaca**: Nochixtlán, Oaxaca. **Puebla**: Texmelucan. **Veracruz**: Las Vigas.

HOSTS.— *Pinus leiophylla, P. strobiformis, P. spp.*

BIOLOGY.— Specimens were taken from limbs and branches.

NOTES.— The above treatment was based on the holotype and on 143 other specimens.

### 69. *Pityophthorus laticeps* Bright

*Pityophthorus laticeps* Bright, 1978, Great Basin Nat. 38:78. (Holotype, male; 20.5 km N Oaxaca, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *ciliatus* Blackman by the larger size, by the smoother pronotum and elytra, by the longer female frontal vestiture, and by the very different elytral declivity.

FEMALE.— Length 2.1–2.8 mm, 2.8 times as long as wide; color dark brown.

Frons as in *ciliatus* except more uniformly, perhaps more closely punctured, vestiture distinctly longer, longest setae equal to 0.67 times distance between eyes (0.4 in *ciliatus*).

Pronotum and elytra about as in *ciliatus* except surfaces smoother, all discal interstriae sparsely punctured, declivity not as steep, slightly more broadly sulcate, lower third somewhat more nearly flattened.

MALE.— Similar to female except frons as in male *ciliatus* (including a long, feebly elevated median carina); upper half of declivity very similar to male *ciliatus*, lower half with areas lateral to interstriae 3 much more broadly rounded (subinflated), lower third somewhat broadly flattened (much more conspicuously than in female).

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 20.5 km N Oaxaca, 6-VI-71, 3000 m, *Pinus*, D. E. Bright.

NOTES.— The above treatment was based on the holotype and allotype.

### 70. *Pityophthorus orarius* Bright

*Pityophthorus orarius* Bright, 1968, Canadian Ent. 100:607 (Holotype, female; Colwood, Esquimalt District, British Columbia; Canadian Nat. Coll., 9735)

DIAGNOSIS.— This species is distinguished by the irregularly convex female frons, with short, sparse vestiture, by the reticulate-granulate pronotal disc, and by the distinctive elytra. It is unique and cannot be associated with any species group.

FEMALE.— Length 2.0–2.2 mm, 2.7 times as long as wide; color black.

Frons convex above eyes, lower area transversely, broadly convex, longitudinally, shallowly concave on central half, epistomal area slightly elevated, a distinct, low, subcarinate, median tubercle immediately above epistomal margin; surface shining, with impressed points, punctures fine, moderately abundant, spaced by one to three diameters of a puncture; vestiture short, rather sparse, longest equal to about one-tenth distance between eyes.

Pronotum 1.08 times as long as wide; widest on basal third, sides on basal half feebly arcuate, converging very slightly, constriction on anterior half indistinct, rather broadly rounded in front; anterior margin armed by 12 low serrations; summit in front of middle, transverse impression behind summit distinct; posterior areas reticulate-subgranulate, punctures close, rather coarse, deep, spaced by distances equal to less than half diameter of a puncture. Vestiture short, suberect, moderately abundant.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind on median half; striae not impressed except 1 weakly, punctures moderately coarse, close, deep, in slightly irregular rows; interstriae about twice as wide as striae, almost smooth, shining, punctures slightly smaller than those of striae, irregularly spaced on all interstriae. Declivity steep, rather broadly convex; striae 1 and 2 minutely, distinctly, regularly punctured; interstriae 1 rather narrowly, distinctly elevated, armed by a row of fine granules, 2 shallowly, broadly sulcate, three times as wide as 1, almost smooth, with obscure points and indefinite lines, 3 feebly elevated, armed by a row of fine, rounded granules. Vestiture of moderately abundant, minute, erect, strial hair and slightly longer interstrial hair on disc and declivity, except absent on declivital interstriae 2, not longer on declivity.

MALE.— Similar to female except frons less strongly impressed, more coarsely punctured, with an acutely, rather strongly elevated median carina from epistoma to upper level of eyes, highest on lower half.

DISTRIBUTION.— British Columbia.

CANADA: **British Columbia**: Colwood, Esquimalt District, 9-I-68, Douglas fir twigs, D. Ruth, also 28-VII-65, A. F. Hedlin; Langley, 22-IV-59, Douglas fir twigs, K. Graham.

HOST.— *Pseudotsuga menziesii.*

NOTES.— The above treatment was based on the holotype, on 39 paratypes, and on 6 other specimens.

### 71. *Pityophthorus recens* Bright

*Pityophthorus recens* Bright, 1977, Great Basin Nat. 36:438 (Holotype, female; Pine Pass, British Columbia; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *fuscus* Blackman by the very different frons and pronotal disc as described below.

FEMALE.— Length 1.8–2.0 mm, 2.8 times as long as wide; color dark reddish brown.

Frons strongly convex, densely, finely punctured, and glabrous much as in some *nitidus* Swaine.

Pronotum about as in *nitidus* except discal punctures not armed by tubercles or granules.

Elytra as in *fuscus* except smoother, more brightly shining.

MALE.— Similar to female except frons more coarsely punctured, a short, very weak median carina on lower fifth.

DISTRIBUTION.— British Columbia.

CANADA: British Columbia: Pine Pass, 11-VII-72, *Picea*, D. E. Bright.

NOTES.— The above treatment was based on the type series of eight specimens.

### 72. *Pityophthorus amoenus* Blandford

*Pityophthorus amoenus* Blandford, 1904, Biol. Centr. Amer., Coleop. 4(6):237 (Holotype, female; Dueñas, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished by the rather short, uniformly distributed female frontal vestiture, by the reticulate pronotal disc, by the absence of interstrial punctures on the elytral disc except on 2 near declivity, and by the moderately impressed declivital sulcus with tubercles on 1 and 3. It is apparently allied to *declivisetosus* Bright.

FEMALE.— Length 2.0 mm, 2.7 times as long as wide; color yellowish brown.

Frons weakly convex on a rather narrow area, slightly, transversely impressed on middle half, margins separated from eye by at least four diameters of a facet; surface shining, closely, rather coarsely punctured; vestiture uniformly distributed, moderately abundant, of almost uniform length, setae about equal in length to one-fifth distance between eyes. Antennal club 1.7 times as long as wide; suture 1 straight, mostly septate, 2 feebly procurved, evidently septate only at margins.

Pronotum 1.07 times as long as wide; widest at base, sides very feebly arcuate and converging very slightly on basal half; anterior margin broadly rounded, armed by 14 low, subcontiguous serrations; summit at middle; serrations on anterior slope somewhat concentric (at least laterally); posterior areas mostly reticulate, punctures rather coarse, not close; impressed points not evident. Discal area glabrous.

Elytra about 1.7 times as long as wide (half of right elytron missing from type), 1.7 times as long as pronotum; sides almost straight and parallel on basal three-fourths, then broadly rounded, obtusely pointed at apex (not at all acuminate); disc shining, almost smooth; striae 1 weakly, others not impressed, punctures coarse, close, deep; interstriae slightly wider than striae, 1–4 with a few punctures on posterior fourth, 2 with three fine granules at base of declivity. Declivity steep, moderately bisulcate; striae 1 and 2 punctured to apex, punctures less than half as large as on disc; interstriae 1 distinctly elevated, armed by about eight rather small, pointed tubercles, 2 rather strongly impressed, smooth, shining, impunctate, almost three times as wide as 1, ascending laterally, lateral areas very slightly higher than suture, 3 armed by four tubercles slightly larger than those on 1. Vestiture confined to declivity, rows on all interstriae except 2 on face, rather coarse and long, half as long on 1.

DISTRIBUTION.— Guatemala.

GUATEMALA: Dueñas (6–8 km SW Antigua), G. C. Champion.

NOTES.— The above treatment was based on the holotype.

This unique species appears to combine the characters of several widely separated groups. Superficially it more nearly resembles *nigricans* Blandford, but it may not be closely related.

### 73. *Pityophthorus declivisetosus* Bright

*Pityophthorus declivisetosus* Bright, 1977, Canadian Ent. 109:525 (Holotype, female; 51 km or 32 miles SE Nochixtlán, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This unique species is characterized by the frontal and declivital characters cited below, particularly by the coarse declivital setae on the female.

FEMALE.— Length 1.4–1.7 mm, 2.4 times as long as wide; color dark brown.

Frons very weakly convex to upper level of eyes, margins rounded; surface smooth, shining, punctures fine to rather coarse, rather shallow; vestiture sparse, rather short, uniformly distributed.

Pronotum essentially as in *venustus*, posterior areas subreticulate, punctures rather coarse, deep.

Elytra 1.5 times as long as wide; sides straight and parallel on basal half, distinctly narrowed, then broadly rounded behind; striae not impressed, punctures rather coarse, deep, in slightly irregular rows; interstriae obscurely subreticulate, shining, distinctly wider than striae, punctures sparse, similar to those of striae. Declivity steep, rather strongly, broadly sulcate; punctures on striae 1 and 2 reduced, distinct; interstriae slightly elevated, fine punctures obscure, 2 twice as

wide as 1, ascending slightly laterally, 3 distinctly higher than 1, summit abrupt, armed by about eight rather coarse tubercles, 1 and 3 with a few smaller tubercles near base. Vestiture of minute strial setae and interstrial setae; interstrial setae fine and rather short on disc, those on declivity long and very coarse, small on 1, absent on 2.

MALE.— Similar to female except frons distinctly convex, more coarsely punctured, a weak median carina on lower half; vestiture on declivity fine and shorter, as on disc.

DISTRIBUTION.— Oaxaca to Veracruz.

MEXICO: Oaxaca: 41 km SE Nochixtlán, 17-VI-67, No. 56, *Pinus*, S. L. Wood; 51 km SE Nochixtlán, 14-VII-69, *P. pringlei*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 31 specimens.

### 74. *Pityophthorus tumidus* Blackman

*Pityophthorus tumidus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:58 (Holotype, female; Eureka, California; U.S. Nat. Mus., 41282)

DIAGNOSIS.— This species is distinguished by the absence of female frontal setae and a strong male frontal carina, by the rather long strial hair, by the impunctate discal interstriae, and by the steep, unique declivity.

FEMALE.— Length 2.1–2.2 mm, 2.8 times as long as wide; color brown.

Frons rather weakly convex to slightly above upper level of eyes; surface smooth, shining, punctures rather coarse, shallow, moderately close; vestiture short, sparse, inconspicuous, length of longest setae about equal to three diameters of a facet.

Pronotum 1.02 times as long as wide; outline about as in *toralis* Wood; posterior area coarsely, deeply, very closely punctured, interspaces equal to about one-third diameter of a puncture, some obscure subreticulation evident in and between punctures. Vestiture fine, short.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal three-fourths, broadly rounded behind; striae 1 weakly, others not impressed, punctures in definite rows, rather coarse; interstriae one and one-half times as wide as striae, shining, almost smooth, impunctate except 1 and 3 each with about two punctures on posterior half. Declivity on posterior fourth, very steep, shallowly bisulcate; striae 1 impressed, 1 and 2 distinctly, rather finely punctured, those on 3 each with a minute granule on rim; interstriae 1 moderately elevated, with a row of very fine granules, 2 twice as wide as 1, moderately impressed on median side, gradually ascending laterally, 3 rounded, not quite as high as 1, with about six small, setiferous granules. Strial setae extend to base, each almost as long as distance between rows; setae on odd-numbered interstriae largely confined to declivity, rather sparse, long.

MALE.— Similar to female except frons with a strong, subdentate median carina on lower two-thirds.

DISTRIBUTION.— California.

USA: California: Eureka, 25-V and 1-VI, H. S. Barber; Little River, 31-V-03.

NOTES.— The above treatment was based on the holotype, allotype, and three paratypes. A male that possibly may represent this species is from Carmel, California, 4-XII-13.

### 75. *Pityophthorus sierrensis* Bright

*Pityophthorus sierrensis* Bright, 1971, Pan Pacific Ent. 47:64 (Holotype, female; 1 mile S Onion Valley, Inyo Co., California; Canadian Nat. Coll.)

DIAGNOSIS.— This species may be a geographical race of *nitidus* Swaine. It is distinguished from the Oregon population of *nitidus* by the absence of granules on punctures of the pronotal disc, by the subreticulate elytral disc, and by the slightly different elytral declivity.

FEMALE.— Length 2.0–2.5 mm, 2.7 times as long as wide; color very dark brown.

Frons plano-convex on upper two-thirds, a distinct transverse impression just below middle, then ascending slightly toward epistoma; margins abrupt, separated from margin of eye by distance equal to two to three diameters of a facet; surface shining, densely, rather finely, uniformly punctured; vestiture of fine, abundant, uniformly distributed long hair, only slightly longer at margins, longest setae equal to one-third distance between eyes.

Pronotum as in *nitidus* except surface subreticulate, discal punctures with lateral margins feebly or not at all armed by granules.

Elytra as in *nitidus* except surface obscurely reticulate, odd-numbered discal interstriae evidently more sparsely punctured, 2 and 4 without punctures; declivity as in Oregon population of *nitidus*.

MALE.— Similar to female except frons as in some male *nitidus*.

DISTRIBUTION.— British Columbia to California and Wyoming.

CANADA: **British Columbia**: Kooteney Pass 32 km W Creston, 22-IX-67, *Pinus albicaulis*, D. E. Bright. USA: **California**: Onion Valley in Inyo Co., 4-IX-68, *Pinus balfouriana*, and *P. flexilis*, D. E. Bright. **Colorado**: Uray, 11-VII-35, *Abies lasiocarpa*. **Nevada**: Wheeler Peak, 8-IX-68, *P. aristata*, D. E. Bright. **Wyoming**: Bighorn Mts., 7-VII-75, *P. balfouriana*, D. E. Bright.

HOSTS.— *Pinus albicaulis*, *P. balfouriana*, *P. flexilis*.

NOTES.— The above treatment was based on 46 paratypes and on 102 other specimens.

### 76. *Pityophthorus aquilus* Blackman

*Pityophthorus aquilus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:33 (Holotype, female; Kaibab National Forest, Arizona; U.S. Nat. Mus., 41268)

*Pityophthorus caelator* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:78 (Holotype, female; Black Hills, South Dakota; U.S. Nat. Mus., 41293); Bright, 1977, Canadian Ent. 109:514. *Synonymy*

*Pityophthorus aristatae* Bright, 1964, Pan Pacific Ent. 40:166 (Holotype, female; Crooked Creek, White Mountains, Mono Co., California; California Acad. Sci.); Bright, 1971, Pan Pacific Ent. 47:67. *Synonymy*

DIAGNOSIS.— This species is distinguished from the remotely related *sierraensis* Bright by the strong male frontal carina, by the less extensively, more sparsely pubescent female frons, by the reduced elytral vestiture, and by the more coarsely tuberculate elytral declivity. It is much more likely to be confused with *carinulatus*, but *aquilus* is smaller and has the smooth and shining male head and other distinguishing characters.

FEMALE.— Length 1.9–2.2 mm, 2.6 times as long as wide; color very dark brown.

Frons flattened on a semicircular area from epistoma to very slightly above eyes, margin near eye abruptly subangulate, separated from eye by distance equal to or greater than three times diameter of a facet; surface shining, smooth, finely, rather sparsely punctured in central area, more coarsely punctured at margins; vestiture rather sparse, short to moderately long in central area, conspicuously longer at margins, longest setae equal to one-fourth distance between eyes.

Pronotum 1.1 times as long as wide; outline as in *sierraensis* Bright; anterior margin armed by about eight rather coarse serrations; posterior areas smooth, shining, punctures rather small, spaced by two to four diameters of a puncture, median line impunctate; vestiture fine, short, sparse, usually absent on disc.

Elytra 1.7 times as long as wide, 1.8 times as long as pronotum; outline as in *sierraensis*; striae not impressed except 1 near declivity, punctures rather small, spaced by one to two diameters of a puncture, rows often slightly irregular; interstriae about three times as wide as striae, surface almost smooth to obscurely reticulate, odd-numbered interstriae sparsely punctured, even-numbered interstriae usually impunctate. Declivity as in *sierraensis* except tubercles on declivital interstriae 1 and 3 distinctly larger. Vestiture of minute strial hair, each about equal in length to diameter of a puncture (frequently abraded on disc) and very sparse interstrial hair of about equal length, little if any longer on declivity.

MALE.— Similar to female except frons more coarsely punctured, often with a slight impression, median carina sharply elevated from just above epistoma to upper level of eyes (sometimes shorter or longer), usually strongly subdentate on lower half.

DISTRIBUTION.— California and Alberta to New Mexico.

CANADA: **Alberta**: Nanton. USA: **Arizona**: Kaibab N.F. **California**: Blanco's Corral and Crooked Creek in White Mountains of Mono Co., 16 km N Westgard Pass in Inyo Co., Mt. Lassen. **Colorado**: Clyde, Colorado N.F., Gould, Larkspur, La Veta Pass, Manitou Mountain, Poudre Canyon, Woodland Park. **New Mexico**: Capitan Mts., Mimbres, Vermego. **South Dakota**: Black Hills, Cheyenne Crossing, Custer. **Utah**: Kamas, Logan Canyon, Yellowstone R.S. in Ashley N.F., White Rocks. **Wyoming**: Buffalo, Lusk, Tensleep.

HOSTS.— *Picea engelmannii* (rare), *Pinus albicaulis*, *P. aristata*, *P. contorta*, *P. flexilis*, *P. ponderosa*.

BIOLOGY.— This species breeds in twigs and small branches of felled or standing trees.

NOTES.— The above treatment was based on the holotypes of *aquilis* and *caelator* and on 418 other specimens.

### 77. *Pityophthorus lecontei* Bright

*Pityophthorus lecontei* Bright, 1977, Canadian Ent. 109:525 (Holotype, female; Kitt Peak, Pima Co., Arizona; Canadian Nat. Coll.)

DIAGNOSIS.— This species resembles superficially *barberi*, but is not related. It is distinguished by the strongly convex frons and median carina in both sexes and by the unique declivity. It is more closely related to *jeffreyi* Blackman.

FEMALE.— Length 1.7–2.2 mm, 2.6 times as long as wide; color rather dark reddish brown.

Frons strongly convex, closely, coarsely punctured, a distinct median carina on lower half.

Pronotum essentially as in *blandus* Blackman.

Elytral disc much as in *blandus* except punctures usually more nearly confused. Declivity rather steep, almost flat, a feeble, broad impression from striae 1 to middle of interstriae 3; striae 1 and 2 obsolete, punctures of 3 minute; interstriae 1 weakly elevated, with a few very feeble granules, 2 about three times as wide as 1, upper half of 3 with a row of very minute granules; surface shining, with dense, obscure, subimpressed points. Vestiture very short, mostly obsolete on declivity.

MALE.— Similar to female except frontal carina more strongly elevated, particularly on its upper half.

DISTRIBUTION.— Arizona and New Mexico to Chihuahua.

USA: **Arizona**: Kitt Peak in Pima Co., 2-VIII-68, *Pinus cembroides*, D. E. Bright. **New Mexico**: Aragon, Kingston, Las Vegas Hot Springs, Magdalena, Mimbres, Nogal Lake. MEXICO: **Chihuahua**: 5 km S La Pinta, 5-V-77, Pinyon, M. M. Furniss.

HOST.— *Pinus edulis*, *P. cembroides*.

NOTES.— The above treatment was based on the type series of 162 specimens and on one other specimen.

### 78. *Pityophthorus brevis* Blackman

*Pityophthorus brevis* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:81 (Holotype, female; Kaibab National Forest, Arizona; U.S. Nat. Mus., 41295)

DIAGNOSIS.— In some respects this species is variable and difficult to characterize. The male frons is either without a carina or with a weak median carina having its greatest height on the upper half; the female frons is usually plano-convex anth 1.6–2.1 mm, 2.6 times as long as wide; color dark brown.

Frons basically convex, central half plano-convex, epistomal margin distinctly elevated; surface shining, punctures at margins coarse, close, becoming finer on central half, usually impunctate on lower fifth in median area; margins near eye rounded; vestiture fine, short, sparse, longest setae equal to about one-fifth distance between eyes.

Pronotum 1.0 times as long as wide; widest on basal third, sides weakly arcuate on basal two-thirds, constriction on anterior half very weak, rather broadly rounded in front; anterior margin armed by about six, small, basally separate serrations; posterior areas shining, very obscurely subreticulate in most specimens, punctures moderately fine, mostly spaced by distances equal to one to two diameters of a puncture. Vestiture of fine, rather short hair, absent on median area of disc.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures moderately coarse, rows varying from straight to slightly staggered; interstriae almost smooth, slightly wider than striae, punctures similar to those of striae, moderately spaced, on all interstriae, usually confused with those of striae. Declivity steep, moderately to rather strongly sulcate; striae 1 and 2 obsolete, an occasional puncture sometimes present; interstriae 1 distinctly elevated, armed by a few widely spaced, fine granules, 2 three times as wide as 1, broadly, rather strongly impressed, smooth, shining, impunctate, 3 rounded, distinctly higher than 1, armed by a row of about eight small tubercles. Vestiture of fine, short, semi-recumbent strial hair and erect interstrial setae; interstrial setae on disc twice as long as those of striae, about six or more times as long on base and sides of declivity, 2 and usually 1 on declivity glabrous.

MALE.— Similar to female except frons more strongly convex, with punctures much larger, median carina present or absent, sometimes extending from epistoma to above eyes, usually with upper half more strongly elevated; declivital sulcus averaging slightly deeper.

DISTRIBUTION.— Colorado to Durango.

USA: **Arizona**: Carr Canyon in Huachuca Mountains, Chiricahua Mts., Jacob's Lake, Kaibab N.F., Mt. Lemmon, Pinalino Mts., San Francisco, Santa Catalina Mountains, Walker, Williams. **Colorado**: Estes Park, Ft. Collins, Pagosa Springs. **New Mexico**: Capitan Mountains, Cloudcroft, Las Vegas, Luna in Catron Co., Ruidoso, Sandia Mountains, Sapollo. MEXICO: **Durango**: 96 km W Durango, El Salto.

HOSTS.— *Pinus ayacahuite*, *P. edulis*, *P. ponderosa*, *P. strobiformis*.

BIOLOGY.— Specimens were taken from shaded-out branches about 2–5 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 161 other specimens.

### 79. *Pityophthorus electus* Blackman

*Pityophthorus electus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Bull. 25:140 (Holotype, female; Ashland, Oregon; U.S. Nat. Mus., 41324)

DIAGNOSIS.— This species is distinguished from *solers* Blackman by the very different female frons, by the row of sparse, fine punctures on discal interstriae 1, and by the lateral convexities on the declivity being slightly higher than the suture. It differs from *blandus* by the finely punctured female frons, by the more finely punctured pronotal disc, and by having the punctures on the discal striae in more nearly regular rows.

FEMALE.— Length 2.2 mm, 2.8 times as long as wide; color reddish brown.

Frons plano-convex to slightly above upper level of eyes, lateral margins obtusely angulate, spaced from margin of eye by distance equal to diameters of two facets; surface shining, very closely, rather coarsely punctured; vestiture of fine, moderately abundant hair of moderate length in central area, twice as long on margins, particularly above, longest setae equal in length to almost half distance between eyes.

Pronotum as in *solers* except discal punctures slightly smaller and armed on their lateral margins by a small granule; four median serrations on anterior margin slightly larger.

Elytra as in *solers* except interstriae 1 with a sparse row of fine punctures on posterior half and lateral convexities on declivity slightly higher than suture.

MALE.— Similar to female except frons convex, rather coarsely punctured, a weak median carina usually present from epistoma to upper level of eyes.

DISTRIBUTION.— Oregon to California.

USA: **California**: Mt. Hawkins, 23-VI-40, *Pinus ponderosa*, C. R. Bruck; Mt. Laguna Rec. Area in San Diego Co., 25-VIII-68, *P. jeffreyi*, D. E. Bright. **Oregon**: Ashland, 16-X-14, *P. ponderosa*, F. P. Keen.

NOTES.— The above treatment was based on the holotype and on 26 other specimens.

### 80. *Pityophthorus blandus* Blackman

*Pityophthorus blandus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:107 (Holotype, female; Argus Mountains, California; U.S. Nat. Mus., 41309)

*Pityophthorus singularis* Bright, 1966, Pan Pacific Ent. 42:300 (Holotype, female; 12 miles or 19 km W Lone Pine, Inyo Co., California; California Acad. Sci.); Bright, 1977, Canadian Ent. 109:513. *Synonymy*

DIAGNOSIS.— This species is remotely allied to *brevis* Blackman, but it is distinguished by the very different frons in both sexes, by the wrinkled surface on the elytral disc, by the finer elytral punctures, and by other characters cited below.

FEMALE.— Length 1.8–2.0 mm, 2.8 times as long as wide; color very dark brown.

Frons plano-convex from eye to eye, from near epistoma to well above eyes, epistomal margin slightly elevated; surface smooth, shining, punctures coarse, close in marginal areas, distinctly smaller (but still rather coarse) toward central area on lower half, spaced on median area of lower half by about one to two diameters of a puncture; vestiture moderately abundant, almost uniformly distributed, moderately long in central area, becoming very long toward margins, longest setae equal to half distance between eyes.

Pronotum 1.1 times as long as wide; outline about as in *brevis* except sides almost straight on basal half; posterior areas shining, almost smooth, subobsolete impressed points

visible, punctures fine, spaced by one to two diameters of a puncture. Vestiture obsolete on disc, of minute setae on sides.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; outline as in *brevis*; striae not impressed except 1 slightly near declivity, punctures small, moderately close, rows slightly confused particularly toward base; interstriae at least twice as wide as striae, surface slightly to strongly wrinkled, punctures on all interstriae, similar to those of striae and slightly to moderately confused with them. Declivity steep, rather strongly sulcate; similar to *brevis* except interstriae 2 four times as wide as 1, tubercles on 1 and 3 more numerous, two or three supplemental tubercles lateral to 3 near middle of declivity. Discal vestiture of minute strial and interstrial hair of equal length; interstrial setae on lateral areas of declivity conspicuously longer (about half as long as in *brevis*).

MALE.— Similar to female except frons slightly, transversely impressed on lower half, a short, weak median carina in impressed area in most specimens, surface shining, irregular, very coarsely punctured; serrations on anterior margin of pronotum rather long, slender.

DISTRIBUTION.— California to Colorado and Arizona.

USA: **Arizona**: Bright Angel Point in Grand Canyon N.P., Flagstaff, Jacob's Lake, Kaibab N.F., Prescott, Santa Catalina Mts., Williams. **California**: Argus Mountains, Bear Lake, Big Bear Lake, Cajon, Doble, Frazier Mountain in Ventura Co., Lone Pine in Inyo Co., Westgard Pass in Inyo Co. **Colorado**: Glade Park, Colorado N.F. **Nevada**: Baker. **Utah**: Beaver, Iron Mountain in Iron County, Dead Horse Point, Gooseberry area in Fishlake N.F., Monticello, Mercur, Panguitch Lake.

HOSTS.— *Pinus edulis*, *P. monophylla*, one pair from *P. ponderosa* (accidental?).

BIOLOGY.— Specimens were taken from branches and tops about 3–8 cm in diameter.

NOTES.— The above treatment was based on the holotype of *blandus*, on 6 paratypes of *singularis*, and on 120 other specimens.

### 81. *Pityophthorus cristatus* Wood

*Pityophthorus cristatus* Wood, 1964, Great Basin Nat. 24:68 (Holotype, female; 14 km or 9 miles N Perote, Veracruz, Mexico; Wood Coll.)

DIAGNOSIS.— This unique species is distinguished by the very strongly, broadly excavated declivity, with the lateral convexities rather spectacularly, subacutely elevated from base to apex.

FEMALE.— Length 1.8–2.2 mm, 2.6 times as long as wide; color dark brown.

Frons convex, somewhat flattened, surface coarsely punctured above and at sides, somewhat more finely punctured below on median half; vestiture inconspicuous, consisting of a few scattered hairs of medium length. Antennal club widest through segment 2, sutures 1 and 2 weakly procurved.

Pronotum 1.05 times as long as wide; sides almost straight and subparallel on basal half, weakly constricted one-third from broadly rounded anterior margin; asperities confused, summit at middle, transverse impression behind summit rather well developed; anterior margin armed by a row of about ten low teeth (somewhat irregular in size); posterior areas subshining, reticulate, punctures deep, close, rather coarse. Vestiture confined to marginal areas.

Elytra 1.7 times as long as wide; sides straight and subparallel on basal two-thirds, then converging very slightly to declivital margin, very broadly rounded behind (median portion almost straight); strial and interstrial punctures confused, punctures moderately large and deep; surface subshining, indistinctly reticulate. Declivity oblique, excavated; an acutely, very strongly elevated subserrulate margin extending above from interstriae 2 to apex, area encompassed approximately obovate; broad excavated area with strial punctures indistinct but evident, in rows, sutural interstriae moderately elevated and bearing a row of close, rounded granules. Vestiture on sides and particularly on declivital margin moderately long and abundant; minute in declivital excavation.

MALE.— Similar to female except frons slightly more strongly convex, more coarsely punctured, subglabrous.

DISTRIBUTION.— Arizona to Michoacán and Veracruz.

USA: **Arizona**: Chiricahua Mountains, Huachuca Mountains, Santa Rita Mountains. MEXICO: **Durango**: 37 km W Durango, El Palmito, El Salto. **Hidalgo**: Tulancingo, Zacatlán. **Michoacán**: Carapan, 25 km E Morelia, Quiroga. **Oaxaca**: Oaxaca. **Veracruz**: Las Vigas, Orizaba, Perote.

HOSTS.— *Pinus* spp.

BIOLOGY.— Specimens were taken from broken branches in living trees.

NOTES.— The above treatment was based on the type series of 14 specimens and on 45 other specimens.

### 82. *Pityophthorus carinulatus* Swaine

*Pityophthorus carinulatus* Swaine, 1925, Canadian Ent. 57:193 (Holotype, male; Tres Ritos, New Mexico; Canadian Nat. Coll., 1369)

*Pityophthorus opimus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:80 (Holotype, female; Capitan Mts., New Mexico; U.S. Nat. Mus., 41294); Bright, 1977, Canadian Ent. 109:514. *Synonymy*

DIAGNOSIS.— This species is probably allied to the *nitidus* complex, but it is distinguished by the absence of granules on the margins of the punctures on the pronotal disc, by the absence of punctures on declivital striae 1 and 2, and by other characters. It is more likely to be confused with *aquilus* Blackman, but it is distinguished by the larger size, by the strongly reticulate male head, and by other characters.

FEMALE.— Length 2.1–2.4 mm, 2.4 times as long as wide; color almost black.

Frons plano-convex, a low, distinct, obtuse, subcarinate summit on lower fourth to epistomal margin; margins rounded; surface smooth, shining, punctures moderately coarse, close, deep, except less abundant in central area; concealed above upper level of eyes; vestiture of fine hair, rather short in central area, about twice as long at margins, longest setae equal to about one-third distance between eyes.

Pronotum 1.0 times as long as wide; sides almost straight and subparallel on basal third, constriction not evident, rather broadly rounded in front; anterior margin armed by about 10 low serrations; posterior areas finely reticulate, punctures moderately coarse, spaced by one to two diameters of a puncture. Vetiture of fine, short hair.

Elytra 1.6 times as long as wide, 1.7 times as long as pronotum; outline as in *borealis*; striae not impressed except 1 on posterior half, punctures rather small, mostly in rows; interstriae subshining, obscurely subreticulate at least on basal half, at least twice as wide as striae, punctures absent on 2 and 4, fine and rather sparse on odd-numbered interstriae, a few transverse lines on basal half. Declivity rather steep, moderately sulcate; striae 1 and 2 obsolete; interstriae 1 distinctly elevated, sparse granules very fine, poorly formed, 2 almost three times as wide as 1, smooth with very minute, shallow points, 3 as high as 1, armed by a row of about six small tubercles. Vestiture of minute, very short strial hair; interstrial hair on declivity short, equal in length to about half width of interstriae.

MALE.— Similar to female except frons most strongly convex, more coarsely punctured, carina acutely, strongly elevated on lower half, almost subdentate, vestiture sparse, inconspicuous; declivital tubercles smaller.

DISTRIBUTION.— Alaska to Arizona and New Mexico.

ALASKA: Juneau, 26-V-59, *Pinus contorta*, D. E. Bright. USA: **Arizona**: San Francisco Mts., 18-VIII-68, *Picea engelmannii*, D. E. Bright. **Colorado**: Clyde, 14-VII-06, Hopk. 6116, and 6117-b (bred 13-IV-06), *Picea engelmannii*, A. D. Hopkins, Newcastle, Hopk. 31408-J-20, *P. engelmannii*, C. L. Massey. **New Mexico**: Capitan Mts., Hopk. 5489, *P. engelmannii*, J. L. Webb.; Tres Ritos. **Utah**: Huntington Canyon, 1-IX-76, *Picea pungens*, S. L. Wood.

HOST.— *Picea engelmannii*, *P. pungens*, two Alaskan males from *Pinus contorta*.

BIOLOGY.— Specimens were reared from shaded out branches 2–7 cm in diameter.

NOTES.— The above treatment was based on the holotypes of *carinulatus* and *opimus* and on 24 other specimens.

### 83. *Pityophthorus blandulus* Schedl

*Pityophthorus blandulus* Schedl, 1955, Zeitschr. angew. Ent. 38:19 (Syntypes, female; Las Trojades, Guatemala; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *ciliatus* Blackman by characters of the frons and declivity as described below.

FEMALE.— Length 1.9–2.2 mm, 2.6 times as long as wide; color dark brown.

Frons essentially as in *ciliatus* except punctures at margins not enlarged, vestiture not longer at sides, only slightly longer above.

Pronotum as in *ciliatus* except declivity slightly more deeply impressed, much narrower, ascending from striae 1, declivital setae apparently finer, shorter.

MALE.— Similar to female except frons more strongly convex than in *ciliatus*, a feeble median carina present or absent; declivital sulcus much stronger, lateral convexities higher, their lateral slope much more broadly rounded than in *ciliatus* male.

DISTRIBUTION.— Chiapas to Guatemala.

MEXICO: Chiapas: 13 km E San Cristóbal, 6-VI-69, *Pinus ochoternai*, D. E. Bright. GUATEMALA: Las Trojades.

NOTES.— The above treatment was based on Bright's homotype and on 27 other specimens.

### 84. *Pityophthorus ciliatus* Blackman

Fig. 200

*Pityophthorus ciliatus* Blackman, 1942, Proc. U.S. Nat. Mus. 92:211 (Holotype, female; Jalapa, Veracruz, Mexico; U.S. Nat. Mus., 55986)

DIAGNOSIS.— This species is distinguished from *nigricans* Blandford by the smaller size, by the less deeply impressed declivital sulcus, and by the greater distance between the female frontal pubescence and the eye.

FEMALE.— Length 1.7–2.1 mm, 2.6 times as long as wide; color very dark brown, elytra usually reddish brown.

Frons plano-convex almost from eye to eye from epistoma to vertex; surface smooth, shining, punctures very fine, close, uniformly distributed; vestiture of abundant yellow hair, moderately long in central area, very long on lateral and particularly dorsal margins, longest setae equal to half distance between eyes.

Pronotum 1.1 times as long as wide; outline as in *brevis* Blackman, anterior margin armed by about 12 serrations; posterior areas smooth, shining, with numerous impressed points, almost subreticulate in some places, punctures rather small, widely spaced on disc. Glabrous except at margins.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; outline as in *brevis*; striae not impressed, punctures rather fine, in rows, sometimes slightly confused; interstriae smooth, shining, with numerous impressed points, about twice as wide as striae, even-numbered interstriae usually impunctate, odd-numbered interstriae varying from almost impunctate to regularly punctured. Declivity steep, moderately to rather strongly sulcate; as in *brevis* except disc glabrous.

MALE.— Similar to female except frons broadly convex, rather coarsely, closely punctured, a feeble median carina sometimes present, usually absent, vestiture short, sparse, inconspicuous; declivity of some specimens more deeply impressed.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: Jalapa, 9-II-36, *Pinus patula* D. DeLeon; Las Vigas, 5-VII-67, No. 157, *Pinus*, S. L. Wood.

HOST.— *Pinus patula*.

BIOLOGY.— Specimens were taken from branches.

NOTES.— The above treatment was based on the holotype and on 53 other specimens.

### 85. *Pityophthorus californicus* Bright

*Pityophthorus deleoni* Bright, 1966 (nec Blackman, 1942) Pan Pacific Ent. 42:302 (Holotype, female; Bonnie Doone in Santa Cruz Co., California; U.S. Nat. Mus.)

*Pityophthorus californicus* Bright, 1976, Great Basin Nat. 36:427. Replacement name for *deleoni* Bright

DIAGNOSIS.— This species is distinguished from *nigricans* Blandford by the smaller size, by the more narrowly rounded anterior margin of the pronotum, and by the less strongly sculptured declivity.

FEMALE.— Length 1.7 mm, 2.7 times as long as wide; color dark brown.

Frons somewhat plano-convex to well above upper level of eyes, a slight transverse impression evident near middle, epistoma weakly elevated on median half; surface smooth, shining, punctures rather fine, moderately close in upper median area, rather sparse on lower fourth; vestiture of fine, long hair on margins and punctured area, conspicuously longer on margins, length of longest exceeds half distance between eyes.

Pronotum 1.14 times as long as wide; outline about as in *nigricans* except anterior margin more narrowly rounded, armed by about eight irregularly spaced serrations, posterior area strongly reticulate (obscurely reticulate in allotype), punctures rather coarse, moderately close. Inconspicuous vestiture confined to margins and asperate area.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; outline and disc about as in *nigricans*; declivity similar to *nigricans* except less strongly impressed, lateral convexities not as high and armed by much finer tubercles, punctures at base on interstriae 2 feebly granulate (not granulate in allotype). Vestiture confined to declivity, similar to *nigricans*.

MALE.— Similar to female except frons more distinctly convex, rather coarsely, more uniformly punctured, with a low, fine, uniform carina extending from epistoma to upper level of eyes; declivity with lateral margins much more strongly elevated (but less so than male *nigricans*), summit armed by 4–5 fine tubercles, interstrial punctures on 2 at base not tuberculate.

DISTRIBUTION.— California.

USA: **California**: Bonnie Doone in Santa Cruz Co., 21-V-41, *Pinus attenuata*, Hopk. 33689, D. DeLeon.

NOTES.— The above treatment was based on the holotype, allotype, and two female paratypes.

### 86. *Pityophthorus apachae* Bright

*Pityophthorus apachae* Bright, 1977, Canadian Ent. 109:520 (Holotype, female; Rustler's Camp, Chiricahua Mts., Arizona; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nigricans* Blandford by the slightly different frons and declivity as described below.

FEMALE.— Length 2.0–2.4 mm, 2.8 times as long as wide; color very dark brown.

Frons as in *nigricans* except punctures minute, separated by two to five or more diameters of a puncture.

Pronotum as in *nigricans*.

Elytra as in *nigricans* except declivity steeper, more evenly, more strongly arched.

MALE.— Similar to female except frons slightly more strongly convex, punctures fine, rather sparse, a distinct median callus at upper level of eyes.

DISTRIBUTION.— Arizona.

USA: **Arizona**: Rustler's Camp, Chiricahua Mts., 7-VI-69, 2600 m, No. 79, *Abies concolor*, S. L. Wood; Miller Canyon in Huachuca Mts., 23-VI-68, *A. concolor*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 28 specimens and on 29 other specimens.

### 87. *Pityophthorus blackmani* Bright

*Pityophthorus blackmani* Bright, 1977, Canadian Ent. 109:521 (Holotype, female; Amecameca, Mexico, Mexico; U.S. Nat. Mus.)

DIAGNOSIS.— Except for the male frons, this species strongly resembles *nitidulus* (Mannerheim). It is distinguished from the more closely related *apachae* Bright by the smooth, shining pronotum, by the flatter female frons, with different vestiture, by the more strongly sulcate male declivity, and by the more distinct male frontal carina.

FEMALE.— Length 2.0–2.5 mm, 2.6 times as long as wide; color dark brown.

Frons as in *apachae* except more distinctly, transversely impressed, vestiture on margins more abundant and much longer, tips of longest setae on vertex exceeding epistomal margin.

Pronotum as in *apachae* except posterior areas smooth, shining, puntures slightly larger, not distorted.

Elytra as in *apachae* except disc smoother, shining, strial punctures slightly larger, declivity slightly steeper, slightly narrower.

MALE.— Similar to female except frons broadly convex, rather coarsely punctured, smooth, shining, a low, obtuse carina from epistoma to upper level of eyes, elytral declivity more narrowly, much more strongly sulcate, a double or staggered row of tubercles at summit; lateral convexity rising abruptly from position of striae 1.

DISTRIBUTION.— Mexico.

MEXICO: **Mexico**: Amecameca, 28-I-36, 670, *Abies religiosa*, D. DeLeon.

NOTES.— The above treatment was based on the type series of five specimens. All these specimens were treated by Blackman as paratypes of *rudis* Blackman.

### 88. *Pityophthorus micans* Bright

*Pityophthorus micans* Bright, 1981, Ent. Soc. Canada Mem. 118:188 (Holotype, female; Chiltepec, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— Allied to *nigricans* Blandford except differing as described below.

FEMALE.— Length 2.2–2.4 mm, 3.0 times as long as wide; color very dark reddish brown.

Frons largely concealed by pronotum on type, but apparently similar to *nigricans*.

Pronotum about as in *nigricans*.

Elytral disc similar to *nigricans* except strial punctures slightly larger, with sparse punctures on interstriae more numerous (equal in size to those of striae). Declivity similar to *nigricans* but interstriae 2 slightly wider, much more broadly impressed, ascending rapidly on its lateral third, crest of 3 more abrupt, armed by eight similar denticles, setae almost absent on 2, distinctly longer on 3.

MALE.— Similar to male *nigricans* except frons more finely punctured, obscure median elevation on lower third only, without callus above; discal punctures on elytra slightly larger, more confused; declivital sulcus more strongly impressed on interstriae 2, particularly on its anterior third (superficially resembling male *nitidulus* Mannerheim), crest of 3 armed by 10 tubercles, vestiture almost obsolete on 1, long and conspicuous on 3.

DISTRIBUTION.— Oaxaca.

MEXICO: **Oaxaca**: Chiltepec, I-71, *Pinus montezumae*.

NOTES.— The above treatment was based on the holotype and allotype.

## 89. *Pityophthorus nigricans* Blandford

*Pityophthorus nigricans* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):236 (Lectotype, male; Quiché Mountains, Guatemala; British Mus. Nat. Hist., designated by Bright, 1976, Coleopt. Bull. 30:184)

*Pityophthorus chiapensis* Bright, 1977, Canadian Ent. 109:522 (Holotype, female; 13 km or 8 mi E San Cristóbal, Chiapas, Mexico; Canadian Nat. Coll.); Bright, 1978, Great Basin Nat. 38:72. *Synonymy*

DIAGNOSIS.— This species is distinguished from *nigricans* Blandford by the larger size, by the much more deeply impressed declivital sulcus, and by the narrower distance between the female frontal pubescent area and the eye.

FEMALE.— Length 2.2–2.4 mm, 2.8 times as long as wide; color very dark brown, elytra usually reddish brown.

Frons as in *ciliatus* except lateral margin of impressed area in contact with margin of eye or separated by a distance equal to less than diameter of a facet.

Pronotum and elytral disc as in *ciliatus*. Elytral declivity as in *ciliatus* except sulcus deeper, lateral convexities slightly to much higher, summit sometimes almost subacuminate, tubercles on summit usually larger.

MALE.— Similar to female except frons as in male *ciliatus* except with a distinct, transverse impression near middle, median carina more strongly elevated; declivital sulcus usually deeper, lateral convexities higher.

DISTRIBUTION.— Durango to Guatemala and El Salvador.

MEXICO: **Chiapas**: 13 km E San Cristóbal, 8-VII-69, *Pinus ayacauite*, D. E. Bright. **Durango**: 5 km W El Salto, 7-VI-65, 2500 m, No. 40, *Pinus*, S. L. Wood. GUATEMALA: Quiché Mountains; San Cristobal in Huehuetenango, 28-V-64, 2300 m, Nos. 633, 635, *Pinus pseudostrobus*, S. L. Wood; Schedl (1955:22) listed Cuchumatanes, Las Trojadas; Quezaltenango, Sierra María Tecum, Totonicapan. EL SALVADOR; Las Pilas, 1976, *P. ayacauite*.

BIOLOGY.— Specimens were taken in branches 2–8 cm in diameter.

NOTES.— The above treatment was based on Blandford's 3 syntypes of *nigricans*, on the holotype of *chiapensis*, and on 103 other specimens.

## 90. *Pityophthorus lepidus* Bright

*Pityophthorus lepidus* Bright, 1977, Canadian Ent. 109:526 (Holotype, female; 5.6 km or 3.5 mi S Suchixtepec on Highway 175, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *nigricans* Blandford by the different frons and declivity as described below.

FEMALE.— Length 1.6–2.5 mm, 2.7 times as long as wide; color dark reddish brown.

Frons as in *nigricans* except setae slightly less numerous, slightly shorter, longest setae equal in length to almost one-third distance between eyes.

Pronotum and elytra as in *nigricans* except elytral declivity slightly steeper, more evenly arched, sulcus slightly wider, not quite as deep.

MALE.— Similar to female except frons more strongly convex, rather coarsely, closely punctured, a distinct, low, median carina from epistomal margin to upper level of eyes.

DISTRIBUTION.— Veracruz to Oaxaca.

MEXICO: **Oaxaca**: 184 km S Oaxaca on Highway 131, 27-30-X-71, 2000 m, *Pinus lawsonii*, D. E. Bright; 20 km N Oaxaca, 31-V-71, 3000 m, *Pinus*, D. E. Bright; 5.6 km S Suchixtepec, 2-VI-71, 2600 m, *Pinus*, D. E. Bright. **Veracruz**: Las Vigas, 5-VII-67, No. 157, *Pinus*, S. L. Wood.

NOTES.— The above treatment was based on the type series of 73 specimens.

### 91. *Pityophthorus elatinus* Wood

*Pityophthorus elatinus* Wood, 1964, Great Basin Nat. 24:66 (Holotype, female; 5 miles W Ciudad Hidalgo, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the unique elytral declivity and by the plano-concave female frons that is ornamented by unusually long reddish brown hair.

FEMALE.— Length 1.8–2.5 mm, 2.9 times as long as wide; color dark brown, elytra usually yellowish brown.

Frons plano-concavely flattened from eye to eye from epistoma to well above eyes; surface smooth with sparse, very fine punctures; vestiture rather short and sparse in central area, long and abundant at margins, longest setae slightly longer than distance between eyes.

Pronotum 1.03 times as long as wide; sides almost parallel on basal half, moderately constricted on anterior half, broadly rounded in front; anterior margin armed by about 12 low serrations; posterior areas irregular, evidently subreticulate with numerous points intermixed, most punctures replaced by small, rounded, isolated granules behind summit, finely and irregularly punctured in lateral areas. Vestiture of fine, short, inconspicuous hair except longer at margins.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; outline about as in *brevis* Blackman; striae not impressed except 1 weakly, punctures small, close, shallow, in definite rows; interstriae about twice as wide as striae, smooth, impunctate except at margin of declivity. Declivity steep, narrowly sulcate; striae 1 and 2 obsolete; interstriae 1 abruptly, moderately elevated, more strongly below, armed by about 10 minute granules (some may take form of punctures), 2 strongly impressed, smooth, at least twice as wide as 1, 3 strongly elevated on upper half, higher than 1, forming a small hump near middle of declivity causing sulcus to narrow above; wider below, some punctures on elevated portion minutely, indefinitely granulate. Glabrous except at sides.

MALE.— Similar to female except frons convex, rather finely punctured, with a fine, low, acute median carina on lower half; declivital convexities much more strongly elevated, unarmed, interstriae 1 bearing a row of moderately long, stout, semirecumbent setae directed laterad, 3 with a row of short, stout setae on upper third of declivity.

DISTRIBUTION.— Michoacán to Tlaxcala.

MEXICO: **Mexico**: Salazor, 16-VII-69, D. E. Bright; Iztaccihuatl-Popocatepetl N.P., 7-V-71, D. E. Bright. **Michoacán**: 40 km W Ciudad Hidaldo, 16-VII-53, 2800 m, 51 km E Morelia, 14-VI-65, 2900 m, No. 48. **Tlaxcala**: 17 km N Tlaxco, 9-VII-67, 2800 m. All were taken from *Abies religiosa* by me, except as noted.

HOST.— *Abies religiosa*.

BIOLOGY.— Specimens were taken from limbs and tops 4–25 cm in diameter.

NOTES.— The above treatment was based on the type series of 7 specimens and on 114 other specimens.

### 92. *Pityophthorus speculum* Bright

*Pityophthorus speculum* Bright, 1976, Great Basin Nat. 36:440 (Holotype, female; Cerro Potosí, Nuevo León, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *elatinus* Wood by the larger size, by the darker color, and by the elytral declivity as described below.

FEMALE.— Length 1.9–2.7 mm, 2.6 times as long as wide; color very dark brown.

Frons and pronotum as in *elatinus* except disc without granules.

Elytra as in *elatinus* except declivity much less strongly impressed, declivital interstriae 1 and 3 each armed by a row of small tubercles, each interstriae on posterior half with a row of rather long, erect setae, most of them twice as long as distance between rows.

MALE.— Similar to female except frons as in male *elatinus*; declivity similar to but more deeply impressed than in female.

DISTRIBUTION.— Nuevo León.

MEXICO: **Nuevo León**: Cerro Potosí, 3-V-71, 3600 m, *Abies*, *Pseudotsuga menziesii*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 41 specimens.

### 93. *Pityophthorus dentifrons* Blackman

Fig. 206

*Pityophthorus dentifrons* Blackman, 1922, New York St. Coll. For., Syracuse, Tech. Pub. 16:125 (Holotype, female; Orono, Maine; U.S. Nat. Mus.)

DIAGNOSIS.— This species superficially resembles *ciliatus* Blackman but is distinguished by the very different frons in both sexes, by the finer elytral punctures, and by the declivity.

FEMALE.— Length 1.9–2.2 mm, 2.5 times as long as wide; color dark brown.

Frons broadly plano-convex from epistoma to well above eyes, lateral margins subangulate, separated from eye by distance equal to three times diameter of a facet; surface smooth, shining, punctures very fine, moderately close, uniformly distributed except absent on small median area above epistoma; vestiture of fine, moderately abundant hair, rather short in central area, moderately long at margins, longest setae equal in length to about one-third distance between eyes.

Pronotum 1.0 times as long as wide; about as in *ciliatus* except anterior margin more narrowly rounded, armed by 12 low serrations.

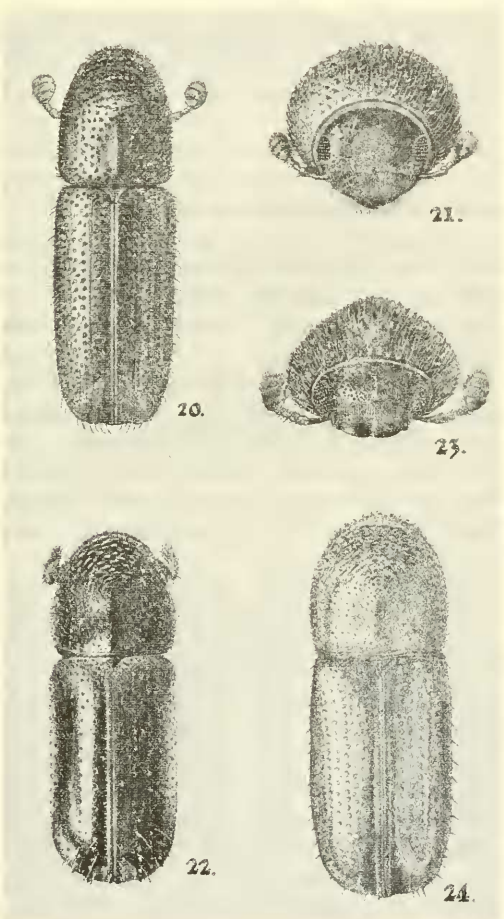



Fig. 206. *Pityophthorus* spp.: 20–21, *balsameus* (=*patchi*), dorsal aspect and head of female; 22–23, *dentifrons*, dorsal aspect and head of male; 24, *intextus*, dorsal aspect of male. (After Blackman 1922:136.)

Elytra 1.6 times as long as wide, 1.7 times as long as pronotum; outline about as in *ciliatus*; striae not impressed except 1 narrowly almost to base, punctures in rows to base, fine, spaced by one to two diameters of a puncture; interstriae almost smooth, with a few fine, transverse lines, almost three times as wide as striae, odd-numbered interstriae with a few punctures. Declivity steep, moderately sulcate; striae 1 and 2 obsolete, a few punctures often visible near apex; interstriae 1 abruptly, rather narrowly, moderately elevated, armed by a row of about 10 fine tubercles, 2 two and one-half times as wide as 1, rather strongly, broadly sulcate, surface smooth and shining, minute, impressed points abundant, impunctate, 3 as high as 1, rather broadly rounded, armed by a row of about seven moderately coarse tubercles, a small tubercle usually present at junction of 5 and 7. Vestiture of minute strial hair (usually abraded), and on and near declivity rows of hair on odd-numbered interstriae, longest setae equal in length to width of an interstriae.

MALE.— Similar to female except frons abruptly, rather strongly impressed from epistoma to upper level of eyes, impression divided by an acutely elevated median carina, subdentate near its lower end, surface rather coarsely punctured, vestiture short, inconspicuous.

DISTRIBUTION.— Alberta and Nova Scotia to North Carolina.

CANADA: **Alberta**: Cypress Hills. **New Brunswick**: Portage Vale. **Nova Scotia**: Halifax. **Ontario**: Dryden. **Quebec**: Gaspé Co. **Prince Edward Island**: Dalway. USA: **Maine**: Camp Caribou, Orono, Peak Island. **Maryland**: Plummers Island. **Minnesota**: Cass Lake. **New Hampshire**: Littleton, Mt. Washington. **New York**: Cranberry Lake. **North Carolina**: Black Mountains, Pisgah Ridge. **West Virginia**: Davis, Randolph Co., Spruce Mt.

HOST.— *Picea glauca*, *P. rubra*.

BIOLOGY.— Specimens were taken from seedlings and small branches.

NOTES.— The above treatment was based on the holotype and on 188 other specimens.

### 94. *Pityophthorus setosus* Blackman

*Pityophthorus setosus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:77 (Holotype, female; Monterey, California; U.S. Nat. Mus., 41292)

DIAGNOSIS.— This unique species is distinguished by the tuft of hair on the lower declivity of the female and by other declivital characters.

FEMALE.— Length 1.8–2.0 mm, 2.8 times as long as wide; color brown, elytra slightly lighter.

Frons broadly convex, shining and rather finely, closely, uniformly punctured to slightly above eyes, lateral margins rounded; vestiture rather abundant, uniformly distributed, moderately long, longest setae above, their length equal to half distance between eyes.

Pronotum 1.08 times as long as wide; outline basically as in *dentifrons* Blackman except summit distinctly in front of middle; posterior areas smooth, shining, punctures rather coarse, close, shallow. Vestiture short, semirecumbent.

Elytra 1.8 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather broadly rounded behind; striae not impressed except 1 narrowly on posterior third of disc, punctures moderately coarse, deep; interstriae smooth, shining, as wide as striae, 2 and 4 impunctate, odd-numbered interstriae usually sparsely punctured at least on posterior half. Declivity steep, moderately sulcate; striae 1 and 2 obsolete or punctures replaced by fine granules; interstriae 1 moderately elevated, armed by a row of closely spaced fine granules, 2 twice as wide as 1, moderately sulcate, smooth, shining, with numerous, minute, impressed points, 3 as high as 1, 3 and summit of lateral areas armed by numerous (about 30) confused, fine granules, each bearing a conspicuous, long, yellow hair (usually appearing on lower third as a tuft). Vestiture confined to sides and declivity.

MALE.— Similar to female except frons abruptly, rather shallowly impressed below upper level of eyes, surface of impressed area more coarsely punctured and armed by an acutely elevated median carina, almost subdentate on its lower half; serrations on anterior margin of pronotum distinctly larger; declivital setae short, inconspicuous.

DISTRIBUTION.— California.

USA: **California**: Carmel, Del Monte, Inverness, Monterey, Pacific Grove, Pt. Reyes, San Francisco, Sharp Peak and Tunitas in San Mateo Co.

HOSTS.— *Pinus radiata*, one series from *P. muricata*.

NOTES.— The above treatment was based on the holotype and on 149 other specimens.

### 95. *Pityophthorus biovalis* Blackman

*Pityophthorus biovalis* Blackman, 1922, New York St. Coll. For., Syracuse, Tech. Pub. 16:122 (Holotype, female; Brunswick, Maine; U.S. Nat. Mus., 56916)

DIAGNOSIS.— This species is distinguished by the female frons, described below, and by the rather normal declivity.

FEMALE.— Length 1.7–2.0 mm, 3.1 times as long as wide; color dark brown.

Frons rather strongly biconcave, concavity on each half extending from epistoma to slightly above upper level of eyes, its surface smooth, brightly shining, dorsal and lateral margins with a fringe of long hair, median line subacutely elevated (but its crest sometimes longitudinally concave) and ornamented by a few short setae; spongy areas entirely absent; longest setae equal to about one-third distance between eyes.

Pronotum 1.2 times as long as wide; widest near base, sides straight on basal half, converging very slightly, constriction not evident, rather broadly rounded in front; anterior margin armed by about 10 low serrations; summit slightly in front of middle, with a distinct posterior impression; posterior areas smooth, shining, obscurely subreticulate, punctures rather fine, spaced on disc by two to three diameters of a puncture. Disc glabrous, short, sparse hair in lateral areas.

Elytra 1.9 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal three-fourths, then converging slightly, very broadly rounded behind; striae 1 slightly, others not impressed, punctures rather coarse, close, deep; interstriae twice as wide as striae, almost smooth, punctures similar to those of striae, rather sparse on all interstriae. Declivity very steep, rather shallowly sulcate; striae 1 and 2 obsolete except a few minute punctures near apex; interstriae 1 distinctly elevated, unarmed, 2 almost three times as wide as 1, moderately impressed on median half, ascending laterally, with some impressed points, 3 distinctly higher than 1, its summit

armed near middle by three conspicuous tubercles, two or three much smaller granules usually above or below major tubercles. Vestiture usually absent on disc, minute strial and short interstrial rows of hair present on declivity and sides except declivital interstriae glabrous.

MALE.— Similar to female except lower two-thirds of frons moderately, transversely impressed, with an acute median carina on impressed area, surface smooth, shining, coarsely, closely punctured, vestiture short, inconspicuous; pronotal disc more strongly reticulate; lateral summits on elytral declivity more subacutely elevated.

DISTRIBUTION.— Ontario to Maine and New York.

CANADA: **Ontario**: Huron, 9-VIII-63, R. Bowser; Kakabeca Falls, 27-V-64, *Pinus strobus*; Waskesin, 26-VIII-53, *Picea glauca*. USA: **Maine**: Brunswick, 29-VI-19, *Picea rubens*, M. W. Blackman; Orono, 19-VIII-19, M. W. Blackman; Peak Island, Hopk. U.S. 406, *P. rubens*, A. D. Hopkins. **New York**: Adirondacks, 20-XII-16, *Pinus strobus*, E. P. Felt.

HOSTS.— *Picea glauca, P. rubens, Pinus strobus.*

BIOLOGY.— Specimens were taken from twigs.

NOTES.— The above treatment was based on the holotype and on eight other specimens.

## 96. *Pityophthorus cavatus* Bright

*Pityophthorus cavatus* Bright, 1978, Great Basin Nat. 38:74 (Holotype, female; Canoe Lake, Saskatchewan, Canada; Canadian Nat. Coll., 15492)

DIAGNOSIS.— This species differs from *biovalis* Blackman by characters of the female frons as described below.

FEMALE.— Length 1.8–2.1 mm, 3.1 times as long as wide; color very dark brown.

Frons concavely impressed (variable), much as in *biovalis* except median partition entirely absent; margins fringed by setae as in *biovalis* specimens, with reduced concave area sometimes with a profusion of hair, others almost glabrous.

Pronotum, elytra, and male as in *biovalis*.

DISTRIBUTION.— Saskatchewan to Manitoba.

CANADA: **Manitoba**: Charlottetown, 13-VIII-54, *Pinus resinosa*. **Saskatchewan**: Canoe Lake, 21-VII-72, *Pinus banksiana*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 12 specimens.

## 97. *Pityophthorus concavus* Blackman

*Pityophthorus concavus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:85 (Holotype, female; Seney, Michigan, U.S. Nat. Mus., 41297)

*Pityophthorus hesperius* Bright, 1978, Great Basin Nat. 38:76 (Holotype, female; Hudson Hope, British Columbia; Canadian Nat. Coll. 15491). Possible synonym or subspecies

DIAGNOSIS.— This species is distinguished from *biovalis* Blackman by characters of the female frons and male declivity as described below.

FEMALE.— Length 1.8–2.0 mm, 3.0 times as long as wide; color dark brown.

Frons variable; shallowly concave on median half to very strongly concave on median three-fourths; lateral areas of concavity and crest spongy, median area smooth, shining, with abundant minute punctures (or impressed points?); vestiture not evident except for spongy texture.

Pronotum and elytral disc as in *biovalis* except punctures slightly finer, not as deep. Elytral declivity as in *biovalis* except tubercles on lateral convexities much finer.

MALE.— Similar to female except frons as in male *biovalis*; elytral declivity devoid of granules, lateral convexities at middle displaced mesad, forming a submammiform enlargement on lateral two-thirds of space normally occupied by interstriae 3, this enlargement very narrowly separated from interstriae 1 (in allotype elevation extending mesad almost to suture).

DISTRIBUTION.— (British Columbia?) Ontario and Wisconsin to New Brunswick and Maine.

CANADA: **New Brunswick**: Fredricton, 13-VIII-35, L. J. Simpson; one female bears Swaine's field number 2497 (origin?). **Ontario**: Ottawa, 10-VIII-72, *Picea glauca*, A. Davies. **Quebec**: Kazabazua, 24-VIII-66, *Pinus banksiana*, D. E. Bright. USA: **Maine**: Peak Island, Hopk. U.S. 406a, *Picea*; Topsfield, 4-VIII-70, *Picea*, D. E. Bright. **Michigan**: Seney, *Pinus resinosa*, W. F. Fiske. **Wisconsin**: Boulder Junction; Vilas Co., 19-VII-55, *P. resinosa*, R. D. Shenefelt.

HOSTS.— *Pinus banksiana, P. resinosa, Picea glauca.*

NOTES.— The above treatment was based on the holotype and allotype and on 42 other specimens.

The extreme variability of the female frons in *cariniceps* LeConte suggests similar variability in the *biovalis-balsameus* complex. Much more material, particularly long series, are needed before a meaningful evaluation of these species can be made.

Two series from British Columbia (13 specimens from Hudson Hope, 21-VIII-74 to 6-IX-74, 14-XI-72, *Pinus contorta*, and one specimen from Hixon, 9-VIII-72, *Pinus contorta*, D. E. Bright) look like *concavus* but are darker and the female frons is more polished in the lateral areas. Bright (1978:76) designated these specimens as *hesperius* Bright. More material from other localities must be studied before the status of his name can be determined.

### 98. *Pityophthorus briscoei* Blackman

*Pityophthorus briscoei* Blackman, 1922, New York St. Coll. For., Syracuse, Tech. Pub. 16:123 (Holotype, female; Brunswick, Maine; U.S. Nat. Mus., 56915)

*Pityophthorus mundus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:86 (Holotype, female; Littleton, New Hampshire; U.S. Nat. Mus.); Wood, 1977, Great Basin Nat. 37:514. *Synonymy*

DIAGNOSIS.— This species is distinguished from *biovalis* Blackman by characters of the female frons as indicated below.

FEMALE.— Length 1.6–1.9 mm, 3.0 times as long as wide; color dark brown.

Frons variable; basically weakly convex to flattened, area from epistoma to upper level of eyes somewhat irregularly, transversely impressed, oval areas on lateral thirds dull, spongy to finely pilose (spongy areas flat to strongly protuberant, occasionally meeting on median line), remaining areas smooth, shining, with upper areas rather coarsely punctured, median third (between spongy areas) moderately to deeply sulcate, a pair of small tubercles sometimes mark margins of sulcus at either dorsal or ventral end or both; glabrous except for texture of spongy areas.

Pronotum and elytra as in *biovalis* except granules on lateral margins of elytral declivity very fine.

MALE.— Similar to male *biovalis* except carina on frons greatly reduced, conspicuous only at ventral, subtuberculate end; declivity devoid of granules.

DISTRIBUTION.— Ontario and Minnesota to New Brunswick and Pennsylvania.

CANADA: **New Brunswick**: Riley Brook, 6-VII-70, *Pinus strobus*, D. E. Bright. **Ontario**: Manitouwadge, 26-V-64, *Pinus banksiana*. USA: **Maine**: Brunswick, 29-VI-29, M. W. Blackman. **Minnesota**: Cloquet, 8-IX-36, Norway pine, H. R. Dodge. **New Hampshire**: Crawford Notch, 7-VIII-70, *Picea*, D. E. Bright; Littleton, 2-VI-22. **New York**: Cranberry Lake, 5-VII-23, M. W. Blackman. **Pennsylvania**: Mildred 14-VII-32, *Picea mariana*, J. N. Knull; Sulivan Co., 10-VIII, J. N. Knull; Ricketts, 31-VII-31, J. N. Knull.

HOST.— "Norway pine," *Picea rubens*, *Pinus banksiana*, *P. strobus*.

NOTES.— The above treatment was based on the holotypes of *briscoei* and *mundus* and on 145 other specimens.

### 99. *Pityophthorus balsameus* Blackman

Fig. 206

*Pityophthorus balsameus* Blackman, 1922, New York St. Coll. For., Syracuse, Tech. Pub. 16:199 (Holotype, female; Orono, Maine; U.S. Nat. Mus.)

*Pityophthorus patchi* Blackman, 1922, New York St. Coll. For., Syracuse, Tech. Pub. 16:120 (Holotype, female; Orono, Maine; U.S. Nat. Mus.) Wood, 1977, Great Basin Nat. 37:514. *Synonymy*

DIAGNOSIS.— This species is distinguished from *mundus* Blackman by the female frons described below and by the male declivity.

FEMALE.— Length 1.6–1.8 mm, 3.0 times as long as wide; color dark brown.

Frons variable; basically broadly convex, area below upper level of eyes weakly impressed on lateral fourths, occasionally with a feeble impression in central area; a conspicuous median tubercle or summit on epistoma; median half to three-fourths spongy, usually extending from epistoma to upper level of eyes (variable).

Pronotum and elytra as in *biovalis* Blackman.

MALE.— Similar to male *concavus* except enlarged protuberances on declivity more strongly displaced toward suture.

DISTRIBUTION.— Michigan and Nova Scotia to North Carolina.

CANADA: **New Brunswick**: Bass River Road, Jemseg, Portage Vale. **Nova Scotia**: Halifax. USA: **Maine**: Chemo Lake, Eastmont, Orono. **Michigan**: Gibb City, Shingleton. **New Hampshire**: Crawford Notch. **New York**: Cranberry Lake. **North Carolina**: Tryon. **West Virginia**: Cranesville, Morgantown.

HOSTS.— *Abies balsamea*, *Picea glauca*, *P.* sp., *Pinus banksiana*, *P. resinosa*, *P. strobus*.

BIOLOGY.— Specimens were taken from twigs.

NOTES.— The above treatment was based on the holotypes of *balsameus* and *patchi* and on 108 other specimens.

The form represented by this species appears to represent the basic structure from which all others in the *biovalis-balsameus* complex were derived. It is very doubtful that all represent valid species. It is not improbable that only one genetically unstable species is represented that is comparable to *cariniceps* LeConte.

### 100. *Pityophthorus angustus* Blackman

*Pityophthorus angustus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:83 (Holotype, female; Cranberry Lake, New York; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from *balsameus* Blackman by the female frons described below and by the male declivity.

FEMALE.— Length 2.0–2.1 mm, 2.9 times as long as wide; color dark brown.

Frons moderately, biconcavely impressed from epistoma to upper level of eyes, with an obtusely compressed, moderately elevated median partition, its ventral end forming an almost beaklike process above epistoma (variable); median half spongy; vestiture absent.

Pronotum and elytra as in *biovalis* Blackman.

MALE.— Similar to male *biovalis* except declivity with processes comparable to *concavus* Blackman except more extensive (longitudinally) and displaced across interstriae 1 to suture, almost touching one another.

DISTRIBUTION.— Ontario and Nova Scotia to North Carolina.

CANADA: **New Brunswick**: Bass River, 12-VIII-66, *Pinus strobus*. **Nova Scotia**: Halifax, No. 22. **Ontario**: Huron, 9-VIII-63, R. Bowser. USA: **New York**: Adirondacks, 20-XII-16, *Pinus strobus*, E. P. Felt; Cranberry Lake, 5–17-VII-23, *Picea rubens, Abies balsamea*, M. W. Blackman. **North Carolina**: Black Mountains, 18-V; Tryon, Hopk. 3154.

HOSTS.— *Picea rubens, Abies balsamea, Pinus strobus.*

NOTES.— The above treatment was based on the holotype and on 53 other specimens.

### 101. *Pityophthorus carinatus carinatus* Bright

*Pityophthorus carinatus* Bright, 1978, Great Basin Nat. 38:73 (Holotype, female; Sevey, New York; Canadian Nat. Coll., 15489)

DIAGNOSIS.— This species is distinguished from *angustus* Blackman by the sculpture of the female frons as described below.

FEMALE.— Length 1.8–2.0 mm, 2.9 times as long as wide; color very dark brown.

Frons somewhat similar to *angustus* except median partition very strongly, acutely elevated, partition very thin; lateral concavities deeply, rather extensively impressed; median partition partly or entirely spongy, glabrous.

Pronotum and elytra as in *angustus*.

MALE.— As in male *angustus*.

DISTRIBUTION.— New Brunswick to New York.

CANADA: **New Brunswick**: 3 km or 2 miles E Wemsea, Queen's Co., 21-VI-65, *Pinus strobus* branch, F.I.S. 64-1340-01. USA: **New York**: Sevey, 8-VIII-70, *Picea*, D. E. Bright.

NOTES.— The above treatment was based on the type series of five specimens.

### 102. *Pityophthorus carinatus monticolae* Bright

*Pityophthorus carinatus monticolae* Bright, 1978, Great Basin Nat. 38:74 (Holotype, female; Hazelton, British Columbia; Canadian Nat. Coll., 15490)

DIAGNOSIS.— This form is distinguished from *carinatus carinatus* Bright by characters of the female frons as described below.

FEMALE.— Length 1.9–2.1 mm, 2.9 times as long as wide; color very dark brown.

Frons as in *c. carinatus* except median partition twice as thick, its crest pubescent.

MALE.— As in male *c. carinatus*.

DISTRIBUTION.— British Columbia to Alberta.

CANADA: **Alberta**: Edmonton, 5-VII-24, F. S. Carr (four of these lack the name of the collector and have the additional label, A. T. McClay Collection). **British Columbia**: Hazelton, 11-VI-70, *Pinus contorta*, F.I.S. 70-569-01.

NOTES.— The above treatment was based on 11 specimens, including the type series.

### 103. *Pityophthorus cariniceps LeConte*

*Pityophthorus cariniceps* LeConte, 1876, Proc. Amer. Philos. Soc. 15:353 (Holotype, female; Detroit, Michigan; Mus. Comp. Zool.)

*Pityophthorus canadensis* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):24 (Lectotype, female; Ste. Anne de Bellevue, Quebec; Canadian Nat. Coll., 9319, designated by Bright, 1967, Canadian Ent. 99:678); Blackman, 1928, New York St. Coll., For., Syracuse, Tech. Pub. 25:72. *Synonymy*

*Pityophthorus cognatus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:69 (Holotype, female; Davidson's R., North Carolina; U.S. Nat. Mus., 41286), Wood, 1977, Great Basin Nat. 37:514. *Synonymy.* Subspecies?

DIAGNOSIS.— This species is distinguished from the *biovalis-balsameus* complex of species by the larger size, by the more confused, more coarsely punctured elytra, and by other characters.

FEMALE.— Length 2.1–2.5 mm, 2.8 times as long as wide; color dark reddish brown.

Frons variable; from broadly, weakly convex, with a slight median impression or moderate protuberance on median half to rather strongly biconcave from epistoma to upper level of eyes, with a laterally compressed, strongly elevated median elevation, with or without a median tubercle in any of these variations; part or most of surface spongy or not; pubescence from minute velvet pile to short abundant hair.

Pronotum 1.05 times as long as wide; basically as in *biovalis* except punctures in posterior areas coarser, closer.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; outline and sculpture about as in *biovalis* except discal punctures coarser, slightly confused, sulcus slightly deeper, narrower, tubercles on lateral convexities larger.

MALE.— Similar to female except frons about as in *biovalis*; declivity as in *concavus* male except processes at middle more strongly projecting, almost attaining suture in some specimens (variable).

DISTRIBUTION.— Manitoba and Nova Scotia to Kentucky and North Carolina.

CANADA: **Alberta?**: Edmonton (1 male). **Manitoba**: Whiteshell Prov. Pk. **New Brunswick**: Berwick, Fredricton, Jemseg, McGraw Brook, Oak Bay. **Nova Scotia**: Kejimkujik N.P., Kingston, Welmot. **Ontario**: Beardmore, Bourget, Carp, Cedar Bay, Geralton, Kakabeka Falls, Longlac, Nestor Falls, Ottawa, Parry Sound, Toronto, Wabigoon. **Quebec**: Ile Perrot, Old Chelsea, Quebec, Ste. Anne's, St. Hilaire. **Saskatchewan**: Meadow Lake Prov. Pk. USA: **Kentucky**: Hazard. **Maine**: Orono. **Massachusetts**: Southboro. **Michigan**: Charlevoix Co., Detroit, Grand Island, Munising. **Minnesota**: Cloquet, Crow Wing Co., Washington Co. **New Hampshire**: Crawford Notch, Deerfield. **New York**: Bear Mountains, Cranberry Lake, Ithaca, Syracuse. **North Carolina**: Asheville, Tryon. **Ohio**: Hocking Co. **Pennsylvania**: Milford. **Wisconsin**: "Wisconsin."

HOSTS.— *Abies balsamea, Picea glauca, Pinus banksiana, P. resinosa, P. strobus.*

BIOLOGY.— Specimens were taken from twigs and small branches.

NOTES.— The above treatment was based on the holotypes of *cariniceps, cognatus,* and *vibrissus* on the lectotype of *canadensis,* and on 1103 other specimens.

The variability of the female frons and the male elytral declivity in this species is unusually great. The female frons, in a series from North Carolina (type series of *cognatus*), is plano-convex to well above the upper level of the eyes, with the surface somewhat coarsely, closely punctured and bearing uniformly distributed, fine, rather long hair (longest equal in length to one-fourth distance between eyes). Females in series from Marian, North Carolina, Kentucky, Virginia, and northward usually contain a mixture of extreme and intermediate variants between (1) those with the contours as described above for the female and very minutely punctured and either glabrous or with dense, minute pile on this punctured area, or (2) those with the punctured area protuberant, the lateral areas variously impressed or not, sometimes so extensively impressed that only a strong carinalike median partition remains, the surface is minutely punctured and glabrous or with minute pile.

The male declivity, in specimens from North Carolina, is much as in *crassus* Blackman, with the sulcus narrower and appearing deeper (30 percent of elytral width or less; 40 percent or more in *crassus*). Males in the southern half of the remaining distribution (excluding North Carolina) tend to have the declivity as in the North Carolina material, except, as the point of geographical origin moves northward, the crest tends to peak or come to a summit at or just below the middle; the crest of this peak bears tubercles. Exclusively in the northern half of the range and less commonly southward to Virginia, the declivital peak loses the tubercles and becomes displaced and turned toward the suture as a blunt horn, often almost touching at the suture.

Series from localities north of Virginia may contain most of the variations described above for both sexes. The only possible division for a geographical race appears to be based on the female frons of the North Carolina population (*cognatus*), but more material

should be studied before formal recognition is given.

### 104. *Pityophthorus confinis* LeConte
Fig. 201

*Pityophthorus confinis* LeConte, 1876, Proc. Amer. Philos. Soc. 15:354 (Lectotype, female; Mojave region, California; Mus. Comp. Zool., designated by Bright, 1976, Coleopt. Bull. 30:185)

DIAGNOSIS.— This species is distinguished by the rather large size and stout body, by the coarse, deep, strongly confused punctures of the elytral disc, and by characters of the frons and declivity described below.

FEMALE.— Length 2.2–2.9 mm, 2.4 times as long as wide; color dark brown to dark reddish brown.

Frons shallowly, transversely impressed (almost flat on median half) from epistoma to upper level of eyes, rounded at lateral margins; surface shining, rather finely, closely, uniformly punctured on impressed area, more coarsely punctured at lateral and dorsal margins; vestiture moderately abundant and of uniform distribution and length on impressed area, not extending above upper level of eyes, longest setae equal to one-third distance between eyes.

Pronotum 1.0 times as long as wide; widest near base, sides on basal half moderately arcuate, converging anteriorly to slight constriction just before rather narrowly rounded anterior margin; anterior margin armed by about eight low serrations; summit at middle, with a distinct transverse, posterior impression; posterior areas smooth, shining, with numerous impressed points (sometimes obscure), punctures rather coarse, deep, moderately close. Glabrous except at margins and on asperate area.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds then converging slightly, very broadly rounded behind; disc smooth, shining, striae discernable on some specimens, punctures coarse, deep, strongly confused. Declivity very steep, broadly, rather strongly sulcate; striae 1 obsolete, 2 with a row of minute punctures completely or incompletely present; interstriae 1 rather narrow, distinctly elevated, armed by a row of fine tubercles, 2 at middle three times as wide as 1, somewhat narrower above and below, rather strongly, broadly sulcate, surface smooth, shining, with minute impressed points, 3 slightly higher than 1, armed by a row of about four to eight fine tubercles. Disc glabrous; sides and lateral convexities of declivity with sparse, short hair.

MALE.— Similar to female except frons rather strongly convex, coarsely punctured, armed just below upper level of eyes by a conspicuous, short, blunt, median carina, feeble extensions of carina may extend longitudinally or laterally, vestiture short, inconspicuous; serrations on anterior margin of pronotum larger.

DISTRIBUTION.— British Columbia and Montana to California and New Mexico.

CANADA: **British Columbia**: Aspen Grove, Clinton, Copper Mt., Grand Forks, Merritt, Nicola. USA: **Arizona**: Alpine in Apache Co., Carr Canyon in Huachuca Mts., Chiricahua Mts., Flagstaff, Kaibab N.F., Prescott, Pinaleno Mts., Santa Rita Mts., Santa Catalina Mts., Williams, Walker. **California**: El Dorado, Fresno, Lake, Lassen, Los Angeles, Madera, Mariposa, Modoc, Mono, Plumas, Riverside, San Bernardino, San Diego, Shasta, Sonoma, Siskiyou, Tulare, Toulumne, and Ventura counties. **Colorado**: Ft. Garland, Veta Pass. **Idaho**: Centerville, Coeur d'Alene, Moscow. **Montana**: Clinton, Helena. **Nevada**: Baker, Lake Tahoe, Little Valley in Washoe Co. **New Mexico**: Cloudcroft, Las Vegas Hot Springs, San Lorenzo, Taigue in Apache Canyon. **Oregon**: Algoma, Ashland, Deschutes N.F., Prineville, Sisters, Paisley, 4-mile creek in Klamath Co. **Utah**: Beaver, La Sal Mts., Bryce Canyon N.P., Kamas, Pin Hollow in Fishlake N.F., Elk Park in Ashley N.F., Yellowstone R.S. in Ashley N.F. **Washington**: Buckeye. **Wyoming**: Lusk.

HOSTS.— *Pinus coulteri, P. jeffreyi, P. lambertiana, P. ponderosa, P. strobiformis.*

BIOLOGY.— This abundant species breeds in the leaf bearing portion of small branches.

NOTES.— The above treatment was based on the LeConte syntypes and on 763 other specimens.

### 105. *Pityophthorus montezumae* Bright

*Pityophthorus montezumae* Bright, 1978, Great Basin Nat. 38:81 (Holotype, female; 11 km or 7 miles E San Cristóbal, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *schwarzi* Blackman by the different frons and declivity as described below and by the reticulate pronotum.

FEMALE.— Length 2.3–2.5 mm, 2.5 times as long as wide; color brown.

Frons flat (not usually impressed as on type), more densely punctured than in *schwarzi*.

Pronotum as in *schwarzi* except anterior margin more finely serrate, posterior areas reticulate.

Elytra similar to *schwarzi* except declivital interstriae 1 armed by a row of fine granules and bearing setae as long as those on 3.

MALE.— Similar to female except frons convex, rather coarsely punctured, reticulate, median carina slightly longer than in male *schwarzi*.

DISTRIBUTION.— Chiapas.

MEXICO: **Chiapas**: 11 km E San Cristóbal, 13-V-69, *Pinus montezuma*, Bright.

NOTES.— The above treatment was based on the type series of 25 specimens.

### 106. *Pityophthorus schwarzi* Blackman

*Pityophthorus schwarzi* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:71 (Holotype, female; Las Vegas Hot Springs, New Mexico; U.S. Nat. Mus., 41288)

DIAGNOSIS.— This species is distinguished from *crassus* Blackman by the smaller size, by larger, more nearly circular outline of the antennal club, by the shorter, subdentate carina on the male frons, by the higher, shorter lateral summit on the male declivity, by the hosts, and by other characters.

FEMALE.— Length 1.8–2.5 mm, 2.5 times as long as wide; color dark brown.

Frons plano-convex to almost flat from eye to eye from epistoma to slightly above upper level of eyes; surface smooth and shining, punctures very fine, spaced in central area by two to four diameters of a puncture, more closely and more coarsely in marginal areas, lateral margins subabrupt; vestiture moderately abundant, almost uniformly distributed, only slightly longer on margins, longest setae equal to about one-third distance between eyes. Antennal club as long as scape, 1.12 times as long as wide.

Pronotum 1.0 times as long as wide; outline as in *confinis* LeConte; posterior areas smooth, shining, punctures rather fine, moderately close, median line broadly impunctate. Vestiture of fine, rather short hair on disc and sides.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; outline and disc about as in *confinis*. Declivity steep, rather narrowly sulcate; striae 1 and 2 obsolete; interstriae 1 distinctly elevated, usually unarmed, a few minute granules sometimes present on upper half, 2 two to three times as wide as 1, moderately impressed, ascending laterally from its median margin, surface shining, with numerous impressed points, 3 much higher than 1, armed by about six small tubercles, about two smaller tubercles in lateral areas. Interstrial setae on disc not longer than distance equal to width of an interstriae, up to twice as long on declivity.

MALE.— Similar to female except frons moderately, rather abruptly impressed from near epistoma to upper level of eyes, a strongly elevated, laterally compressed, short, dentate carina just below middle, without any indication of a dorsal continuation, vestiture sparse, short, inconspicuous; declivity with lateral convexities more strongly, subacutely elevated to middle, discontinued below middle, summit armed by about four tubercles, about two additional tubercles present in lateral areas of lower half, these not in line with tubercles on crest.

DISTRIBUTION.— Utah to Tlaxcala.

USA: **Arizona**: Jacob's Lake, Lake Roberts, Pinelino Mts., Santa Rita Mts. **New Mexico**: Clines Corners in Torrance Co., Emery Pass, Kingston, Lake Nogal, La Placita, Las Vegas, Magdalena, Mangano N.F., Mimbres, Quemado, Sandia Mts., San Lorenzo. **Texas**: Big Bend N.P., Davis Mts. **Utah**: Beaver, Duchesne, Gooseberry area in Fishlake N.F., Panguitch. MEXICO: **Coahuila**: Puesto de Flores, Saltillo. **Durango**: 37 km, 70 km, and 96 km W Durango, El Palmito. **Hidalgo**: Jacala, Tulancingo, Zimapán. **Nuevo León**: Cerro Potosí, Monterey, San Roberto. **Quertaro**: Landa de Matamores. **Tlaxcala**: Tlaxco. **State?**: Canada del Lobo (1969, pino negro, Islas).

HOSTS.— *Pinus cembroides, P. edulis, P. greggii, P. lumholtzii, P. montezuma, P. teocote.*

BIOLOGY.— This species was taken from small branches.

NOTES.— The above treatment was based on the holotype of *schwarzi* and on 446 other specimens.

Following my study of more than 380 specimens of *schwarzi* it became apparent that a division of the species cannot be based on the female frontal vestiture and body size. Although one series is slightly larger and the female vestiture is much longer and more abundant than normal, it must be recognized that both characters are variable within and between series and cannot be used to distinguish populations. Other characters such as punctation, details in sculpture of the frons and elytra, etc. also vary within and between populations without an apparent pattern.

### 107. *Pityophthorus crassus* Blackman

*Pityophthorus crassus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:67 (Holotype, female; Capitan, New Mexico; U.S. Nat. Mus., 41285)

DIAGNOSIS.— This species is distinguished from *schwarzi* Blackman by characters summarized in the above key and in the diagnosis of *schwarzi* and by other characters mentioned below.

FEMALE.— Length 2.5–2.9 mm, 2.4 times as long as wide; color very dark brown.

Frons as in *schwarzi* except punctures tend to average slightly larger and very slightly more abundant. Antennal club slightly shorter than scape, 1.25 times as long as wide.

Pronotum and elytra as in *schwarzi* except discal setae equal in length to one to three times width of an interstriae, those on declivity little if any longer.

MALE.— Similar to male *schwarzi* except male frontal carina usually with a weak continuation extending to upper level of eyes; declivity with lateral crests usually declining more gradually toward apex, usually with one or more tubercles on lower half in line with those on crest of upper half.

DISTRIBUTION.— Wyoming to Oaxaca and Veracruz.

USA: **Arizona**: Alpine, Chiricahua Mts., Flagstaff, San Francisco Mts., Santa Catalina Mts. **Colorado**: Colorado N.F., Breckenridge, Fort Collins, Halfway, Larkspur, Longmont, Manitou, Woodland Park. **New Mexico**: Boreal in the Sierra Blanca Mts., Capitan, Cloudcroft, Manzano N.F., Emery Pass, Meek, Sapollo. **Texas**: Guadeloupe Mts., N.P. **Wyoming**: Laramie, Lusk. MEXICO: **Durango**: 96 km W Durango, El Salto, La Ciudad. **Mexico**: Cuernavaca, Tequesquinahua. **Nuevo León**: Cerro Potosí. **Oaxaca**: Oaxaca, Valle Nacional. **Tlaxcala**: Tlaxco. **Veracruz**: Las Vigas, Orizaba, Texcoco.

HOSTS.— *Pinus ayacahuite*, *P. contorta* (rare), *P. leiophylla*, *P. ponderosa*, *P. strobiformis* (rare).

BIOLOGY.— Specimens were taken from twigs and small branches.

NOTES.— The above treatment was based on the holotype of *crassus* and on 655 other specimens.

Two series in the U.S. National Museum from (1) Key West, Florida, 1 Oct. 1903, Hopk. U.S. 288, *Pinus*, A. D. Hopkins, and (2) Tryon, North Carolina, *Castanea dentata*, Hopk. U.S. 3033, W. F. Fiske, are considered by me to be mislabeled series of *crassus* and do not record this species from the eastern half of the USA.

### 108. *Pityophthorus laetus* Wood

*Pityophthorus laetus* Wood, 1977, Great Basin Nat. 36:358 (Holotype, female; Volcán Poas, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the small, elongate, aseptate antennal club, by the pronotum which has asperities extending to near the basal margin, and by the simple elytra.

FEMALE.— Length 1.6–1.7 mm, 2.6 times as long as wide; color black.

Frons flat from eye to eye, from epistoma to above eyes (concealed by pronotum above eyes), epistomal margin narrowly, weakly elevated; surface smooth, shining, punctures very fine, shallow, very sparse on central two-thirds, more numerous toward margins, margins rounded; vestiture of fine long hair on margins, a few sparse, shorter hairs in central area, longest setae equal in length to about half distance between eyes. Antennal club slightly longer than scape, 1.6 times as long as wide, smooth, shining, glabrous on anterior face, not septate, suture 1 obsolete, 2 very feebly indicated on surface by a procurved line on apical half, sutural constrictions and setae confined to margins.

Pronotum 1.05 times as long as wide; widest on basal third, sides moderately arcuate on basal third, almost straight and converging on middle third, rather narrowly rounded in front, anterior margin armed by 10–14 rather coarse serrations; summit indefinite, at or slightly behind middle; asperities small, numerous, continuing in declining, subparallel, somewhat indistinct rows

almost to base; posterior areas shining, with numerous impressed points, punctures small, spaced by two to four or more diameters, those in lateral areas mostly associated with subasperate lines. Vestiture of short, sparse hair, glabrous on disc.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures very fine, shallow, spaced by two to four diameters of a puncture, in rows; interstriae three to four times as wide as striae, surface smooth, brightly shining, with many obscurely impressed points and irregular lines, a few fine punctures on odd-numbered interstriae on posterior half. Declivity steep, convex; striae not impressed, punctures slightly smaller than on disc; interstriae 1 very feebly elevated, higher than 3, 2 as wide as 1 or 3, very feebly impressed, impunctate, 1 and 3 with a row of minute granules. Minute strial setae on declivity, odd-numbered interstriae on disc with rather widely spaced, erect, moderately long, stout hair, declivity with all interstriae except 2 with similar setae.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Poas, Heredia, 19-XI-63, 2500 m, No. 261, tree branch, 8 cm in diameter, S. L. Wood.

NOTES.— The above treatment was based on the type series of three female specimens.

### 109. *Pityophthorus lenis* Wood

*Pityophthorus lenis* Wood, 1976, Great Basin Nat. 36:358 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the large, elongate, obovate antennal club with aseptate, rather obscure sutures, by the strongly reticulate pronotal disc, and by the simple elytral sculpture.

FEMALE.— Length 1.2–1.4 mm, 2.8 times as long as wide; color brown.

Frons transversely, broadly concave, transversely impressed from epistoma to upper level of eyes (longitudinally concave); surface reticulate, median third impunctate from epistoma to vertex, lateral areas rather coarsely, closely punctured; punctured areas ornamented by long, moderately abundant hair, longest setae equal in length to about two thirds distance between eyes. Antennal club 1.7 times as long as scape; club 1.3 times as long as wide, obovate, widest on apical third, anterior face shining, glabrous except for short setae along sutures, sutures aseptate, marked by a fine line and a row of short setae.

Pronotum 1.05 times as long as wide; sides on basal half subparallel, feebly arcuate, rather narrowly rounded in front; anterior margin subcostate, armed by 10–12 low, basally fused serrations; pronotum reticulate, punctures in posterior areas rather small, moderately close. Glabrous except in marginal areas.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel, rather broadly, irregularly rounded behind; striae 1 weakly impressed near declivity, others not impressed, punctures fine, becoming minute near declivity, in rows; interstriae almost smooth, shining, impressed points appearing as minute, confused punctures, punctures absent. Declivity steep, shallowly bisulcate; striae obsolete; interstriae 1 moderately, abruptly elevated, 2 almost twice as wide as 1, rather strongly, broadly impressed, smooth, shining, obscure points indicated, 3 as high as 1, rounded, armed by about four very fine tubercles. Vestiture confined to odd-numbered interstriae, of widely spaced, erect, rather short, slender bristles.

MALE.— Similar to female except frons broadly, evenly convex, coarsely, rather closely punctured, a weak median tubercle on epistoma, vestiture short, sparse, inconspicuous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 24-X-63, 1300 m, No. 244, liana, S. L. Wood.

NOTES.— The above treatment was based on the type series of 13 specimens.

### 110. *Pityophthorus parilis* Wood

*Pityophthorus parilis* Wood, 1976, Great Basin Nat. 36:359 (Holotype, female; Buenos Aires, Cortez, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *guatemalensis* Blandford by the more coarsely sculptured female frons, by the more coarsely punctured elytral striae, by the more shallowly sulcate elytral declivity, and by other characters.

FEMALE.— Length 1.6–1.7 mm, 2.8 times as long as wide; color very dark brown.

Frons flat from epistoma to vertex, from eye to eye, subangulate margin separated from margin of eye by distance equal to width of three facets; surface smooth, shining, rather coarsely, closely, uniformly, deeply punctured; vestiture rather abundant, uniformly distributed, distinctly longer at margins, longest setae about equal to one-third distance between eyes.

Pronotum 1.1 times as long as wide; outline as in *guatemalensis*; posterior areas weakly reticulate, punctures rather fine, moderately close. Glabrous except at margins.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; outline and disc as in *guatemalensis* except interstriae only slightly wider than striae. Declivity as in *guatemalensis* except steeper and much less strongly bisulcate. Vestiture confined to declivity, stouter than in *guatemalensis*.

DISTRIBUTION.— Honduras.

HONDURAS: Buenos Aires, Cortéz, 7-V-64, 2300 m, No. 578, *Quercus* S. L. Wood.

BIOLOGY.— Specimens were taken from a broken branch 4 cm in diameter.

NOTES.— The above treatment was based on the type series of three female specimens.

### 111. *Pityophthorus scitulus* Wood

*Pityophthorus scitulus* Wood, 1976, Great Basin Nat. 36:359 (Holotype, female; Volcán Chiriquí, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *guatemalensis* Blandford by the coarser strial punctures, by the steeper, more strongly sulcate declivity, and by the much more coarsely punctured declivital striae 1 and 2.

FEMALE.— Length 1.8–2.1 mm, 3.2 times as long as wide; color brown.

Frons essentially as in *guatemalensis* except more finely punctured, central area on lower half more extensively impunctate, lateral margins of flattened area separated from eye by distance equal to width of one facet, vestiture much more abundant on margins, shorter in central area, longest setae equal to more than half distance between eyes.

Pronotum 1.25 times as long as wide; outline basically similar to *guatemalensis*; posterior areas with surface smooth, shining, small and minute punctures intermixed. Glabrous except at margins.

Elytra 1.9 times as long as wide, 1.6 times as long as pronotum; sides straight and parallel on basal three-fourths, rather abruptly rounded, then subacuminate behind; striae not impressed except 1 near declivity; interstriae smooth, shining, punctures coarse, very close; interstriae smooth, shining, with obscure, fine transverse lines, impressed points appearing as fine, confused punctures, punctures absent. Declivity steep, rather strongly bisulcate, apex subacuminate; striae 1 and 2 very coarsely punctured, punctures appear confused on some specimens; interstriae slightly elevated, finely punctured, 2 strongly sulcate, narrowly above, broadly below, shining, space almost entirely occupied by strial punctures, 3 slightly higher than 1 and armed by two pairs of pointed denticles on upper half, an additional granule present on lower third, lateral areas rather coarsely punctured. Vestiture of moderately long interstrial hair on base and lateral areas of declivity.

MALE.— Similar to female except frons broadly convex, coarsely, closely punctured, vestiture short, sparse, inconspicuous; declivity more strongly impressed, lateral denticles distinctly larger.

DISTRIBUTION.— Costa Rica and Panama.

COSTA RICA: Tapantí, Cartago, 2-VII-63, 1300 m, No. 6, *Quercus* limb, S. L. Wood. PANAMA: Volcán Chiriquí, 11-I-64, 1600 m, *Quercus* limb, S. L. Wood.

NOTES.— The above treatment was based on the type series of 25 specimens.

### 112. *Pityophthorus conspectus* Wood

*Pityophthorus conspectus* Wood, 1976, Great Basin Nat. 36:360 (Holotype, female; Volcán Irazu, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *guatemalensis* Blandford by the less extensively flattened female frons, with the vestiture much shorter and less abundant, by the coarser pronotal punctures, and by the very different declivity described below.

FEMALE.— Length 1.6–1.8 mm, 2.8 times as long as wide; color very dark brown.

Frons as in *guatemalensis* except less extensively flattened, margin of flattened area separated from margin of eye by distance equal to width of five facets, not extending as

high on vertex; vestiture moderately abundant on smaller area, longest setae equal to about one-third distance between eyes. Antennal club larger and more nearly circular than in *guatemalensis*, sutures 1 and 2 rather strongly procurved (almost straight in *guatemalensis*).

Pronotum 1.1 times as long as wide; as in *guatemalensis* except punctures on posterior areas much coarser.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; outline and disc as in *guatemalensis*. Declivity steep, convex; striae 1 and 2 not impressed, punctures very fine; interstriae 1 feebly elevated, armed by two or three very fine granules, 2 flat, as wide as 1, not impressed, impunctate, 3 not elevated, armed by a row of about five small granules. Vestiture consisting of erect, short, interstrial setae on posterior third of disc and declivity except absent on declivital interstriae 2.

MALE.— Similar to female except frons weakly convex, a median callus on upper half, coarsely punctured, vestiture short, sparse, inconspicuous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Irazu, Cartago, 26-IX-63, 2300 m, No. 208, tree branch (probably *Quercus*), S. L. Wood.

NOTES.— The above treatment was based on the type series of three specimens.

### 113. *Pityophthorus medialis* Wood

*Pityophthorus medialis* Wood, 1976, Great Basin Nat. 36:361 (Holotype, female; Volcán Irazu, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *guatemalensis* Blandford by the moderately procurved sutures of the antennal club, by the more posterior position of the summit of the pronotum, by the punctured discal interstriae, by the steeper, less strongly sulcate elytral declivity, and by other characters, described below.

FEMALE.— Length 1.9–2.4 mm, 2.6 times as long as wide; color dark brown.

Frons similar to *guatemalensis* except more extensively flattened, pubescent area separated from margin of eye by distance equal to diameter of three facets, vestiture more abundant, slightly shorter. Antennal club with sutures 1 and 2 moderately procurved.

Pronotum 1.1 times as long as wide; similar to *guatemalensis* except summit distinctly behind middle, low crenulations extending to base on sides and lateral areas of disc, punctured area on disc about half as large as in *guatemalensis* (about one-third width of pronotum).

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; outline and disc as in *guatemalensis* except interstriae each with a sparse row of punctures, punctures about equal in size to those of striae. Declivity steep, convex; similar to *guatemalensis* but steeper, sulcus perhaps half as deep, tubercles on interstriae 1 and 3 slightly larger. Vestiture of minute strial hair and moderately long, erect, fine interstrial setae on disc and declivity, except largely absent on declivital interstriae 2.

MALE.— Similar to female except frons convex, a slight transverse impression above epistoma, surface shining, closely, deeply, rather coarsely punctured, vestiture short, sparse, inconspicuous; declivital sulcus deeper, broader, similar to female *guatemalensis*.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Cerro de la Muerte, 1-VIII-66, 3200 m, No. 45, *Quercus*, S. L. Wood; Volcán Irazu, Cartago, 26-IX-63, 2300 m, *Quercus* branch, S. L. Wood.

BIOLOGY.— Specimens were taken from broken *Quercus* branches less than 10 cm in diameter.

NOTES.— The above treatment was based on the type series of 63 specimens.

### 114. *Pityophthorus guatemalensis* Blandford

*Pityophthorus guatemalensis* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):239 (Syntypes: Guatemala City, Zapote, Calderas, Capetillo, and Quiché Mts. Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *quercinus* Wood by the smaller size and by the female frons as described below.

FEMALE.— Length 1.8–1.9 mm, 2.8 times as long as wide; color brown.

Frons as in *quercinus* except more distinctly convex, punctured only on median half below upper level of eyes, small, median, smooth, shining, area on lower third distinctly carinate (not at all carinate in *quercinus*), vestiture confined to median half of area below upper level of eyes (in *quercinus*

pubescence much more abundant and more widely distributed, occupying at least median two-thirds and at least one-third of setae are above upper level of eyes.)

DISTRIBUTION.— Guatemala, at the sites listed above.

NOTES.— The above was based on more than a dozen female syntypes. It appears necessary to recognize *quercinus* as a distinct species until clear evidence of intergradation is found rather than follow Bright's (1977:514) recommendation of synonymy. Although all females of *guatemalensis* do not have an acute frontal carina, all do have a median elevation that is at least subcarinate; the median summit seen in some *quercinus* females is quite different.

### 115. *Pityophthorus quercinus* Wood

*Pityophthorus quercinus* Wood, 1967, Great Basin Nat. 27:40 (Holotype, female; 3 miles W El Salto, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from other *Quercus* infesting representatives of the genus by the straight antennal sutures 1 and 2, by the minute declivital striae 1 and 2, and by the sculpture of the elytral declivity.

FEMALE.— Length 1.9–2.4 mm, 2.8 times as long as wide; color dark brown.

Frons broadly flattened from epistoma to well above eyes, lateral margins of pubescent area separated from eye by distance equal to diameter of six facets; surface smooth, shining, finely, closely, rather deeply punctured except almost impunctate on small median area on lower half; vestiture moderately abundant, rather long, longest setae slightly longer than one-third distance between eyes, at least one-third of setae above upper level of eyes. Antennal club comparatively small, 1.14 times as long as wide, sutures 1 and 2 almost straight, 2 at middle of club.

Pronotum 1.2 times as long as wide; widest on basal half, sides on more than basal half feebly arcuate, converging very slightly, rather broadly rounded in front; anterior margin costate, broadly, weakly serrate; summit slightly anterior to middle; low asperities extending to base in lateral areas, disc on median half of pronotum smooth, shining, with numerous impressed points, punctures rather small, moderately abundant, spaced by distances about equal to diameter of a puncture. Glabrous except at margins.

Elytra 1.7 times as long as wide; 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed except 1 moderately, punctures rather small, close, deep; interstriae twice as wide as striae, smooth, shining, with moderately abundant, confused impressed points resembling minute punctures, impunctate. Declivity rather steep, broadly, moderately sulcate; striae 1 and 2 not impressed, punctures distinct, about half as large as on disc; interstriae smooth, shining, with numerous impressed points, 1 moderately, abruptly elevated, armed by about four widely spaced moderately coarse, rounded tubercles, 2 as wide as 1, flat, rather strongly impressed, impunctate, 3 as high as 1, rounded, armed by about four tubercles similar to those on 1. Vestiture confined to base and sides of declivity and interstriae 1 almost to base, of minute strial hair and rather short, erect interstrial setae, absent on declivital interstriae 2.

MALE.— Similar to female except frons strongly convex on slightly more than upper half, lower area rather strongly, transversely impressed, surface smooth, shining, coarsely, very closely, deeply punctured, vestiture short, sparse, inconspicuous; declivital sulcus much more strongly impressed, tubercles on interstriae 1 and 3 much larger, pointed.

DISTRIBUTION.— Durango to Michoacán and Oaxaca.

MEXICO: **Durango**: 5 km W El Salto, 1-VII-65, 2500 m, Nos. 32, 33, *Quercus*, S. L. Wood. **Michoacán**: 53 km E Morelia, 14-VI-65, 3000 m, No. 51, *Quercus*, S. L. Wood. **Oaxaca**: 225 km S Oaxaca on Highway 131, 27–30-V-71, 2000 m, *Quercus*, D. E. Bright.

HOST.— *Quercus* spp.

BIOLOGY.— Specimens were taken from the lower bole of dying trees about 80 cm in diameter.

NOTES.— The above treatment was based on the holotype of *quercinus* and on 93 other specimens.

The Oaxaca series has the female frons less extensively pubescent than normal, but it lacks a median carina. Although this suggests an intermediate condition between this species and *guatemalensis*, it is too soon to

propose synonymy between these species, as was done by Bright (1977:514).

### 116. *Pityophthorus subopacus* Blackman
Fig. 200

*Pityophthorus subopacus* Blackman, 1942, Proc. U.S. Nat. Mus. 92:210 (Holotype, male?; Chalco, Mexico, Mexico; U.S. Nat. Mus., 55985)

?*Pityophthorus elimatus* Bright, 1976, Great Basin Nat. 36:432 (Holotype, female; 51 mi or 81 km NW Oaxaca, Oaxaca, Mexico; Canadian Nat. Coll.). *Probable synonymy*

DIAGNOSIS.— This species is distinguished by the elongate body, with the elytra more than twice as long as the pronotum, by the reticulate elytral disc, with impunctate interstriae, and by the simple frons and declivity as described below. It intergrades to a remarkable degree with *segnis* (see Notes under *segnis*).

FEMALE.— Length 1.6–2.0 mm, 2.9–3.0 times as long as wide; color brown.

Frons weakly convex on median three-fourths from near epistoma to slightly above eyes, a slight, median, epistomal tubercle or short, low, obscure carina usually present; surface reticulate, rather coarsely, closely, somewhat obscurely, uniformly punctured; vestiture fine, rather sparse, moderately long, not very conspicuous.

Pronotum 1.03 times as long as wide; widest on basal third, sides on basal half moderately arcuate, a feeble constriction on anterior half, rather broadly rounded in front; anterior margin armed by about eight moderately coarse, basally separate serrations, median ones distinctly larger; summit at or slightly in front of middle, high; posterior areas reticulate, coarsely, deeply, closely punctured. Vestiture fine, short.

Elytra 2.0 times as long as wide, 2.0 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather broadly rounded behind; striae not impressed, punctures coarse, deep, close; interstriae feebly to strongly reticulate, as wide as striae, impunctate except for an occasional puncture near declivity. Declivity steep, convex; striae 1 and 2 feebly impressed, punctures almost as coarse, as on disc; interstriae 2 usually feebly impressed, impunctate, as wide as 1, 1 and 3 feebly elevated and each armed by a row of about four to six rounded granules. Vestiture of fine, short strial hair on disc and declivity and on declivity of rather long, coarse hair on odd-numbered interstriae, shorter on 1.

MALE.— Similar to female except frons more distinctly convex, obtuse median carina usually slightly longer and higher, vestiture short, sparse, inconspicuous.

DISTRIBUTION.— Durango and Nuevo León to Michoacán and Veracruz.

MEXICO: **Durango**: 64 km W Durango; 9 km NE El Salto. **Nuevo León**: Cerro Potosí. **Michoacán**: 9 km E Volcán Parícutin. **Oaxaca**: 81 km NW Oaxaca. **Puebla**: 23 km W Texmelucan; Río Frío. Tlaxcala: 17 km N Tlaxco. **Veracruz**: Jalapa, 9-II-36, *P. montezuma*, D. DeLeon.

HOSTS.— *Pinus* spp.

BIOLOGY.— Specimens were taken from branches 5 cm in diameter.

NOTES.— The above treatment was based on the holotype of *subopacus* and on 36 other specimens. The type appears to be a male, not a female as indicated in the original description. The type series of *elimatus* consists of material slightly larger (2.0–2.2 mm) and very slightly stouter (2.9 times as long as wide) than most specimens. The frontal and pronotal characters are within the limits of variation of this species. It possibly might represent a distinct geographical race, but more material is needed to evaluate its status.

### 117. *Pityophthorus impexus* Bright

*Pityophthorus impexus* Bright, 1978, Great Basin Nat. 38:76 (Holotype, female; 10 km S Carapan, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *subopacus* Blackman by the more distinctly impressed declivital interstriae 2, by the differences in the frons noted below, and by the much longer vestiture on the elytral declivity.

FEMALE.— Length 1.5–2.0 mm, 2.5 times as long as wide; color rather dark brown.

Frons as in *subopacus* except less distinctly convex, surface shining, punctures smaller, more sharply defined, without indications of a median carina, vestiture much longer, at least twice as abundant.

Pronotum as in *subopacus* except disc less strongly reticulate.

Elytra as in *subopacus* except declivital striae 1 more strongly impressed, all or part

of declivital interstriae 2 more strongly sulcate, and declivital vestiture more abundant, coarser, much longer.

MALE.— Similar to female except frons. Frons much as in *subopacus* male except shining, more nearly flattened on lower half and with a short, acute carina on lower half (somewhat variable).

DISTRIBUTION.— Durango and Michoacán to Mexico.

MEXICO: **Durango**: 5 km W El Salto, 7-VI-65, 2500 m, No. 33, *Pinus ayacahuite*, S. L. Wood. **Mexico**: Tequesquinahua, III-62, *Pinus*, R. Coronado. **Michoacán**: 10 km S Carapan, 18-VI-65, 2300 m, No. 79, *Pinus*, S. L. Wood; 9 km E Volcán Parícutin, 19-VI-65, 2500 m, No. 89, *Pinus*, S. L. Wood.

HOSTS.— *Pinus ayacahuite*, *P.* sp.

BIOLOGY.— Specimens were taken from material 5–10 cm in diameter, in branches and in seedlings.

NOTES.— The above treatment was based on 20 specimens from the type series.

### 118. *Pityophthorus anthracinus* Bright

*Pityophthorus anthracinus* Bright, 1976, Great Basin Nat. 36:428 (Holotype, female; Cerro Potosí, Nuevo León, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nocturnus* Blandford by the different frons as described below, by the smaller strial punctures, by the more irregular interstriae, and by other characters.

FEMALE.— Length 1.6–1.7 mm, 2.9 times as long as wide; color almost black.

Frons flat, with epistomal margin slightly elevated; surface smooth, shining, coarsely, very closely punctured, interspaces averaging less than half diameter of a puncture; vestiture moderately abundant, moderately long, uniformly distributed, little if any longer on margins (not clear, hair matted in type series).

Pronotum essentially as in *nocturnus* except disc smooth, punctures larger.

Elytra about as in *nocturnus* except strial punctures smaller, interstriae more irregular, with more impressed lines, declivital sulcus not as deep, smoother, punctures smaller, apex more nearly subacuminate.

MALE.— Similar to female except frons weakly convex, obscure punctures rather coarse, carina absent.

DISTRIBUTION.— Nuevo León.

MEXICO: **Nuevo León**: Cerro Potosí, 21-III-74, Hopk. 58614, *Abies*, M. M. Furniss.

NOTES.— The above treatment was based on the type series of nine specimens.

### 119. *Pityophthorus nocturnus* Schedl

Fig. 200

*Pityophthorus nocturnus* Schedl, 1938, Archiv Naturgesch. 7:185 (Lectotype, male; San Geronimo, Verapaz, Guatemala; British Mus. Nat. Hist., designated by Bright, 1976, Coleopt. Bull. 30:186)

*Pityophthorus hidalgoensis* Blackman, 1942, Proc. U.S. Nat. Mus. 92:15 (Holotype, female; Jacala, Hidalgo, Mexico; U.S. Nat. Mus., 55989); Bright, 1977, Canadian Ent. 109:516. *Synonymy*

DIAGNOSIS.— This species is distinguished by the absence of discal interstrial punctures, by the shallowly sulcate elytral declivity, and by the weak longitudinal male carina.

FEMALE.— Length 1.5–1.9 mm, 2.6 times as long as wide; color dark brown.

Frons usually almost flat from eye to eye from vertex to near epistoma, ascending toward epistoma (some Guatemalan specimens partly concave); surface smooth, shining, very finely, uniformly, densely punctured, margin of pubescent area separated from margin of eye by distance equal to width of two facets; vestiture of fine, uniformly distributed hair, rather short in central area, longer on lower lateral margins, becoming very long on upper margin, longest setae equal to half distance between eyes. Posterior base of mandible ornamented by a small, distinctive tuft of setae.

Pronotum 1.1 times as long as wide; outline essentially as in *subopacus* Blackman; posterior areas reticulate, punctures rather fine, moderately close. Glabrous except at margins.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed except 1 narrowly near declivity, punctures rather small, deep, slightly smaller toward declivity; interstriae twice as wide as striae, smooth, shining, impunctate. Declivity steep, narrowly, shallowly sulcate; striae 1 and 2 not impressed, punctures minute but distinct; interstriae 1 narrowly, abruptly, distinctly elevated, armed by a few very fine granules, 2 almost twice as wide as 1, smooth, shining,

ascending from mesal margin in some specimens, more broadly impressed in others, 3 slightly higher than 1, rounded, armed by about six minute granules. Vestiture confined to sides and declivity, very sparse, short, mostly on odd-numbered interstriae; strial setae obsolete.

MALE.— Similar to female except frons distinctly impressed below upper level of eyes, an obtuse median carina extending from epistoma to upper level of eyes, surface smooth, shining, rather finely impressed, vestiture short, inconspicuous; serrations on anterior margin of pronotum much coarser; lateral convexities of elytral declivity distinctly higher.

DISTRIBUTION.— Hidalgo to Guatemala.

MEXICO: **Chiapas**: 8 km N Bochil, 3-VII-69, *Pinus strobus* var. *chiapensis*, D. E. Bright; 8 km SW El Bosque, 3-VII-69, *Pinus*, D. E. Bright, Lagos des Colores, 14-VI-69, *Pinus*, D. E. Bright. **Hidalgo**: Jacala, 18-I-36, *Pinus lawsoni*, D. DeLeon. **Veracruz**: Las Vigas, 5-VII-67, No. 156, *Pinus*, S. L. Wood. GUATEMALA: Guatemala City, 30-V-64, 1300 m, *Pinus pseudostrobus*, S. L. Wood; San Geronimo, Volcán de Agua, 19-V-64, 1000 m, No. 596, *P. pseudostrobus*, S. L. Wood.

HOSTS.— *Pinus lawsoni*, *P. pseudostrobus*, *P. strobus* var. *chiapensis*.

BIOLOGY.— Specimens were taken from branches.

NOTES.— The above treatment was based on the Schedl syntypes of *nocturnus*, on the holotype of *hidalgoensis*, and on 48 other specimens.

The type series of *hidalgoensis* consists of specimens smaller than normal and with the punctures on the pronotal disc much larger than seen in other specimens. The placement of this name in synonymy must be considered tentative until more material is examined.

## 120. *Pityophthorus mesembria* Bright

*Pityophthorus mesembria* Bright, 1978, Great Basin Nat. 38:80 (Holotype, female; Cerro Calel, Quezaltenango, Guatemala; Wood Coll.)

DIAGNOSIS.— This unique species is distinguished by the absence of discal interstrial punctures, by the evenly convex, coarsely punctured male frons that lacks a carina, by characters of the female frons described below, and by the rather strongly sulcate elytral declivity.

FEMALE.— Length 1.9–2.2 mm, 2.8 times as long as wide; color very dark brown.

Frons broadly flat from epistoma to well above eyes, a feeble transverse impression on lower half; surface smooth, shining, coarsely, closely, deeply, uniformly punctured, interspaces averaging slightly more than half diameter of a puncture in width; vestiture fine, minute, inconspicuous in central area, a dense row of very long setae on lateral and upper margins, tips of longest dorsal setae reach epistoma.

Pronotum essentially as in *pulchellus* Eichhoff except punctures on posterior half much smaller, less numerous, lateral margin of each puncture extended slightly mesad, giving punctures elongate shape.

Elytra about as in *pulchellus* except strial punctures distinctly smaller, interstrial punctures absent, declivity slightly steeper with sulcus slightly narrower, declivital striae 2 with fine punctures clearly impressed, interstriae 1 and 3 each with 8 to 10 fine tubercles, vestiture less abundant, slightly shorter.

MALE.— Similar to female except frons broadly convex, coarsely punctured, carina not indicated.

DISTRIBUTION.— Guatemala.

GUATEMALA: Quezaltenango: Cerro Calel, 26-V-64, 3300 m, No. 621, *Abies guatemalensis* branches, S. L. Wood.

NOTES.— The above treatment was based on the type series of seven specimens.

## 121. *Pityophthorus cascoensis* Blackman

*Pityophthorus cascoensis* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:99 (Holotype, female; Peak Island, Maine; U.S. Nat. Mus., 41303)

*Pityophthorus pilifer* Schedl, 1931, Canadian Ent. 63:166 (Holotype, female; Frater, Ontario; Canadian Nat. Coll., 3170); Bright, 1977, Canadian Ent. 109:515. *Synonymy*

DIAGNOSIS.— This species is distinguished from *intextus* Swaine by the convex male frons with a weak median carina on the lower half, by the presence of regularly spaced setae on declivital interstriae 1, by the sparsely punctured discal interstriae, and by characters on the female frons.

FEMALE.— Length 1.6–2.2 mm, 2.6 times as long as wide; color dark brown.

Frons variable, from weakly convex, rather coarsely, closely punctured and subglabrous

to flat on median three-fourths from epistoma to above eyes, punctures fine, dense, vestiture abundant, uniformly distributed, of uniform length, each equal to about one-third distance between eyes; short, recumbent, scalelike setae never present as in *intextus*.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on basal half, a feeble constriction on anterior half, rather broadly rounded in front; anterior margin armed by about 10 rather coarse serrations; summit at or slightly in front of middle; posterior areas smooth, shining, impressed points or obscure reticulation indicated in some specimens, punctures rather small, not close. Vestiture short, rather sparse, usually absent on disc.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; striae not impressed except 1 slightly near declivity, punctures rather small, close, in rows except sometimes slightly confused near base; interstriae twice as wide as striae, shining, almost smooth to obscurely subreticulate, sparsely punctured (occasional specimens impunctate). Declivity steep, rather strongly sulcate; striae 1 and 2 varying from almost obsolete to finely, irregularly punctured; interstriae 1 distinctly elevated, armed by about 10 almost regularly spaced setiferous granules, 2 about twice as wide as 1, rather strongly sulcate, shining, almost smooth, 3 slightly higher than 1, rounded, armed by about 7 moderately coarse, setiferous tubercles. Strial setae mostly obsolete, a few sometimes present on sides or declivity; interstrial setae mostly confined to declivity, largely on odd-numbered interstriae, their length mostly twice width of an interstriae except short on declivital interstriae 1.

MALE.— Similar to female except frons more strongly convex, a weak median carina of variable length usually on lower half, more coarsely punctured, usually glabrous.

DISTRIBUTION.— Northwest Territories to Newfoundland and New York.

CANADA: **Alberta**: Banff N.P. **Newfoundland**: "Newfoundland." **Northwest Territories**: Aklavik. **Ontario**: Frater. USA: **Maine**: Boil Mountain, Peak Island. **New York**: Cranberry Lake.

HOSTS.— *Picea glauca*.

NOTES.— The above treatment was based on the holotypes of *cascoensis* and *pilifer* and on 95 other specimens.

### 122. *Pityophthorus intextus* Swaine
Fig. 206

*Pityophthorus intextus* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):29 (Holotype, male; Athabasca Landing, Alberta; Canadian Nat. Coll., 3147)

*Pityophthorus shepardi* Blackman, 1922, New York St. Coll. For., Syracuse, Tech. Pub. 16:124 (Holotype, female; Chamberlin Lake region, Township 7 R12, Piscataquis, Maine; U.S. Nat. Mus.); Bright, 1977, Canadian Ent. 109:515. *Synonymy*

*Pityophthorus tonsus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:101 (Holotype, female; Grand Island, Michigan; U.S. Nat. Mus., 41304); Bright, 1977, Canadian Ent. 109:515. *Synonymy*

DIAGNOSIS.— This species is distinguished from *cascoensis* Blackman by the smaller average size, by the transverse impression on the lower half of the male frons, which also lacks a median carina, by the glabrous declivital interstriae 1, and by the impunctate discal interstriae.

FEMALE.— Length 1.4–2.0 mm, 2.6 times as long as wide; color brown to dark brown.

Frons variable as in *cascoensis* except always finely punctured on a somewhat smaller area, never completely flat or as very finely punctured as in some *cascoensis*; vestiture minute to moderately long, long setae of uniform length, but apparently always with moderately abundant, very short, recumbent, scalelike setae in addition to long setae (visible only under oblique light from a subdorsal source; this effect may result from an abrupt curve at base of each seta rather than from short scales, not clear with available equipment.)

Pronotum and elytra as in *cascoensis* except declivital interstriae 1 with granules minute and devoid of setae (occasional specimens with one or two setae, but never regularly placed); discal interstriae 2–5 usually impunctate, uncommonly with an occasional puncture on anterior three-fourths, normally with sparse punctures near declivity.

MALE.— Similar to female except lower half of frons rather strongly, transversely impressed, never with a median carina, surface smooth, shining, coarsely punctured, subglabrous.

DISTRIBUTION.— British Columbia and Wyoming to Newfoundland and West Virginia.

CANADA: **Alberta**: Athabasca Landing, Cypress Hills, Edmonton, Lesser Slave Lake, Peace River, Smith, Wabamun. **British Columbia**: Hixon, Pine Pass, Trinity Valley. **New Brunswick**: Portage Vale. **Newfoundland**: Middle Brook Prov. Park, Pasadena. **Nova Scotia**: Kejimkujik. **Ontario**: Chapleau, Ferndale, Frater, Kenora, Perry Sound, Thessalon. **Saskatchewan**: Canoe Lake, Cypress Hills. USA: **Maine**: Orono, Piscataquis, Topsfield, Wilson's Mills. **Michigan**: Grand Island, Seney. **New Hampshire**: Franconia, Webster. **New York**: Cranberry Lake. **West Virginia**: Randolph Co. **Wyoming**: Saratoga.

HOSTS.— *Picea engelmannii*, *P. glauca*, *P. rubens*.

NOTES.— The above treatment was based on the holotypes of *intextus*, *shepardi*, and *tonsus* and on 1026 other specimens. The paratypes of *kenti* from Sheridan, Wyoming, are of this species.

### 123. *Pityophthorus ornatus* Blackman

*Pityophthorus ornatus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:102 (Holotype, female; Manitou, Colorado; U.S. Nat. Mus., 41305)

*Pityophthorus kenti* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:141 (Holotype, female; Black Hills, Wyoming; U.S. Nat. Mus.); Wood, 1977, Great Basin Nat. 37:210. *Synonymy*

*Pityophthorus limatus* Wood, 1964, Great Basin Nat. 24:65 (Holotype, female; Sanford Canyon, Dixie Nat. Forest, Utah; Wood Coll.); Wood, 1977, Great Basin Nat. 37:516. *Synonymy*

DIAGNOSIS.— This species is distinguished from *intextus* Swaine by characters of the female frons, by lacking most or all of the elytral interstrial bristles, and by the host and distribution.

FEMALE.— Length 1.6–2.3 mm, 2.7 times as long as wide; color dark brown.

Frons plano-convex on median three-fourths from epistoma to vertex; surface smooth, shining, punctures very fine, very dense, uniformly distributed; vestiture of fine, dense, long hair, all setae equal to at least one-fifth distance between eyes (Colorado specimens with a few setae on dorsal margin equal to half distance between eyes); never with any short recumbent scales as in *intextus*.

Pronotum and elytra as in *intextus* except about half of specimens without any interstrial setae longer than those of striae, long interstrial setae when present confined to declivital interstriae 3 or 9, never on 4–8 (present in *intextus* at least on 5 and 7).

MALE.— Similar to female except frons much as in male *intextus* except a distinctly elevated, transverse carina almost always present.

DISTRIBUTION.— Utah to Wyoming and Colorado.

USA: **Colorado**: Manitou, *Pinus edulis* (accidental?); Ouray, 1–15-VII-97, 7500–8000 ft, H. F. Wickham; Pingree Creek, Larimer Co., 14-VI-68, *Picea pungens*, S. L. Wood; Poudre Canyon, Larimer Co., 9-VIII-67, *P. pungens*, S. L. Wood. **Utah**: Henry Mts., *Pinus ponderosa* (accidental?); McKee Draw in Ashley N.F., 16-VI-60, *P. pungens*, S. L. Wood; Parowan Canyon, 20-VI-60, *P. pungens*, S. L. Wood; Sanford Canyon in Dixie N.F., 22-VI-60, *P. pungens*, S. L. Wood. **Wyoming**: Saratoga, 8-X-38, *P. pungens*; Black Hills, Sheridan.

HOST.— *Picea pungens*, rare or accidental in *Pinus*.

BIOLOGY.— Specimens were taken from boles and branches 3–15 cm in diameter.

NOTES.— The above treatment was based on the holotypes of *ornatus*, *kenti*, and *limatus* and on 111 other specimens.

The female frontal vestiture on Utah specimens is of uniform length and equal in length to about one-fifth the distance between the eyes. In Colorado specimens setae on the dorsal margin may attain twice this length. Apparently the host of the type series of *ornatus* was accidental or erroneous, in that this species otherwise is unknown from *Pinus edulis*.

### 124. *Pityophthorus infulatus* Blackman

*Pityophthorus infulatus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Bull. 25:103 (Holotype, female; Sacramento Mountains, New Mexico; U.S. Nat. Mus., 41306)

*Pityophthorus mollis* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:104 (Holotype, female; Tortillo Canyon, New Mexico; U.S. Nat. Mus., 41307); Bright, 1977, Canadian Ent. 109:514. *Synonymy*

*Pityophthorus hubbardi* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:105 (Holotype, female; Chiricahua Mountains, Arizona; U.S. Nat. Mus., 41308); Bright, 1977, Canadian Ent. 109:514. *Synonymy*

DIAGNOSIS.— This species is distinguished from *ornatus* Blackman by the very long female frontal vestiture, by the more nearly reticulate pronotum, and by the less strongly impressed male frons.

FEMALE.— Length 1.5–2.0 mm, 2.6 times as long as wide; color dark brown.

Frons as in *ornatus* except more extensively flattened to within distance of one or two diameters of a facet from margin of eye and to vertex, surface shining, very finely, rather closely punctured; vestiture in central area uniformly distributed, some of moderate length, mostly short, almost scalelike, exceedingly long on margins, longest equal in length to four-fifths distance between eyes.

Pronotum as in *ornatus* except usually obscurely to strongly reticulate.

Elytra as in *ornatus* except punctures usually finer, surface usually very obscurely reticulate; vestiture sparse, usually confined to interstriae 3, 8, and 9, very short in most specimens as in *ornatus*.

MALE.— Similar to female except much as in male *ornatus*, but frons much less strongly impressed and without a transverse carina; sparse setae on declivital interstriae 3, 8, and 9 moderately long.

DISTRIBUTION.— Arizona and New Mexico.

USA: **Arizona**: Chiricahua Mts., 5-X, Hubbard and Schwarz. **New Mexico**: Sacramento Mts., *Pinus strobiformis*, J. L. Webb; Tortillo Canyon, *P. ponderosa*, J. L. Webb; White Mts., *P. ponderosa*, J. L. Webb.

HOSTS.— *Pinus ponderosa*, *P. strobiformis*.

NOTES.— The above treatment was based on the holotypes of *infulatus*, *mollis*, and *hubbardi*, on 2 paratypes of *infulatus*, on 12 of *mollis*, and on 14 of *hubbardi*, and on 3 other specimens.

### 125. *Pityophthorus novellus* Blackman

*Pityophthorus novellus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:96 (Holotype, female; Tehachipi, California; U.S. Nat. Mus., 41301)

DIAGNOSIS.— This species is doubtfully distinct from *infulatus* Blackman, but it apparently differs by the somewhat more densely punctured female frons, by the smooth, shining prontal disc having the margin of most discal punctures armed by a minute granule, and, apparently, by the slightly more abundant, longer vestiture on the female frons.

FEMALE.— Length 1.9 mm, 2.8 times as long as wide; color yellowish brown (reared, not fully mature).

As in *infulatus* except as noted above. In addition, median pair of serrations on anterior margin of pronotum larger (significance doubtful since some *infulatus* have some median serrations distincty larger). Declivital setae minute as in female *infulatus*.

DISTRIBUTION.— California.

USA: **California**: Tehachipi, 28-VI-27, *Pinus sabiniana*, M. W. Blackman.

NOTES.— The above treatment was based on the holotype. The male allotype and the female paratype reared with the holotype are of *tuberculalus* Eichhoff. The type localities of this species and of *infulatus* and its synonyms, the paucity of other records, and the variability of *infulatus* suggest that the type specimen of *novellus* could be no more than a variation of *infulatus*. Additional material is needed to resolve this problem.

### 126. *Pityophthorus pulchellus* Eichhoff

*Pityophthorus pulchellus* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:275 (Holotype, sex?; America septentr.; presumably lost with Hamburg Mus.; Neotype, female; Marquette, Michigan; U.S. Nat. Mus., designated by Bright, 1978, Great Basin Nat. 38:72)

*Pityophthorus hirticeps* LeConte, 1878, Proc. Amer. Philos. Soc. 17:623 (Lectotype, male; Marquette, Michigan; Mus. Comp. Zool. designated by Bright, 1977, Coleopt. Bull. 30:185); Eichhoff, and Schwarz, 1896, Proc. U.S. Nat. Mus. 18:609. *Synonymy*

*Pityophthorus pusio* LeConte, 1878, Proc. Amer. Philos. Soc. 17:623 (Holotype, male; Marquette, Michigan; Mus. Comp. Zool., 1281); Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:111. *Synonymy*

DIAGNOSIS.— This species is distinguished from *tuberculatus* Eichhoff by the female frons as described below, by the smooth, shining elytra, and by the coarse elytral punctures.

FEMALE.— Length 1.6–2.2 mm, 2.6 times as long as wide; color very dark brown.

Frons plano-convex except central third plano-concave, central area much as in *tuberculatus* except with sparse, fine punctures, lateral margins more broadly, more coarsely punctured, marginal setae less than half as abundant, longest setae equal to less than two-thirds distance between eyes.

Pronotum as in *tuberculatus* except punctures coarser, granules on their lateral margins reduced or absent.

Elytra as in *tuberculatus* except punctures averaging slightly larger. Surface smooth or with irregular lines, interstrial setae on all

odd-numbered interstriae, extending anteriorly to middle of disc.

MALE.— Similar to female except frons about as in *tuberculatus* except median elevation at upper level of eyes poorly developed to absent.

DISTRIBUTION.— NE British Columbia and New Brunswick to E Texas and Florida.

CANADA: **Alberta**: Smith. **British Columbia**: Chetwynd. **Manitoba**: Grass River, Menisino, Sandilands. **New Brunswick**: Big Cove Indian Res., McGraw Brook, Nepisquit. **Ontario**: Chapleau, Cochrane, Connaught, Constance Bay, Cree Lake, Dryden, Elmira, Ft. William, Gogama, Iroquis Falls, Kakabeka Falls, Kapuskasing, Longlac, Night Hawk Center, Stevens, Tarswell, Timmins, White River. **Quebec**: Kazabazua. **Saskatchewan**: Big River, Meadow Lake. USA: **District of Columbia**: Washington. **Florida**: Mayport, Punta Gorda, St. Augustine, Trenton. **Maine**: Brunswick, Orono, Peak Island. **Maryland**: Beltsville, Silver Springs. **Massachusetts**: "Massachusetts." **Michigan**: Marquette. **Minnesota**: Cloquet. **New Jersey**: "New Jersey." **New York**: Massapequa (Long Island). **North Carolina**: Asheville, Cherokee, Tryon. **Pennsylvania**: Chambersburg, Charter Oak, Fayetteville, Mt. Carmel. **Texas**: "Texas." **Virginia**: Carrsonville, Falls Church, Great Falls. **West Virginia**: Bladensburg, Cantwell, Hampshire Co., Hancock Co., Mineral Co., Rosslyn. **Wisconsin**: Lac du Flambeau.

HOSTS.— *Pinus banksiana*, *P. palustris*, *P. resinosa*, *P. rigida*, *P. strobus*, *P. virginiana*.

BIOLOGY.— Apparently as in *tuberculatus*.

NOTES.— The above treatment was based on the neotype of *pulchellus*, on the syntypes of *hirticeps*, on the holotype of *pusio*, and on 221 other specimens.

Although the principal hosts, *Pinus contorta* (*tuberculatus*) and *P. banksiana* (*pulchellus*), hybridize in Alberta, the intergradation between these species is almost nonexistent over most of their ranges. One series from 5 miles E Chetwynd, British Columbia, is much more like *pulchellus* than *tuberculatus*, but, except for it, I see no reason for reducing them to subspecies of one another. In view of their extensive distributions, the frequency of reference to them in the literature, and the virtual absence of intergradation, they are both retained as valid species.

### 127. *Pityophthorus tuberculatus* Eichhoff

*Pityophthorus tuberculatus* Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:498 (Stettiner Ent. Zeit. 39:388) (Syntypes?; California: lost with Hamburg Mus.; Neotype, female; Black Hills, South Dakota; U.S. Nat. Mus., designated by Bright, 1978, Great Basin Nat. 38:72)

*Pityophthorus rugicollis* Swaine, 1925, Canadian Ent. 57:193 (Holotype, female; Glen Alpine, California; Canadian Nat. Coll.); Bright, 1971, Pan Pacific Ent. 47:67. *Synonymy*

*Pityophthorus tuberculatus* var. *australis* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:94 (no status in nomenclature)

DIAGNOSIS.— This species is distinguished from *pulchellus* Eichhoff by the distinctive female frons, by the usually reticulate elytra, and by the smaller elytral punctures.

FEMALE.— Length 1.7–2.4 mm, 2.6 times as long as wide; color very dark brown.

Frons plano-convex from eye to eye from epistoma to vertex, central area mirror smooth, brightly shining, impunctate, often with a few very small punctures near margins, margin abruptly angulate, with a dense, confused marginal band of small setiferous punctures; vestiture confined to margins, very long, longest setae about equal to distance between eyes.

Pronotum 1.1 times as long as wide; widest at base, sides almost straight and subparallel on basal half, rather narrowly rounded in front; anterior margin armed by six serrations, median ones conspicuously larger; posterior areas smooth, shining, punctures moderately small, most of those on disc with a small granule on lateral margin; median line broadly impunctate. Vestiture fine, short.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; sides straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed except 1 slightly near declivity, punctures rather small, close, moderately deep, in rows except often slightly confused on basal third; interstriae slightly more than twice as wide as striae, odd-numbered interstriae usually with several small punctures, even-numbered more sparsely punctured, surface shining, usually partly to entirely reticulate. Declivity steep, broadly, moderately sulcate; striae 1 and 2 obsolete, sometimes indicated by minute granules; interstriae 1 distinctly elevated, armed by about 12 fine granules, 2 two and one-half times as wide as 1, moderately, broadly sulcate, brightly shining, impunctate, 3 very slightly higher than 1, rounded, armed by about 6 small tubercles. Vestiture restricted to sides and to interstrial bristles arising

from granules on declivital interstriae 1 and 3.

MALE.— Similar to female except frons convex above, moderately, transversely impressed on lower half, surface smooth, shining, subglabrous, with a short, transverse elevation at upper level of eyes (appearing as a short carina in some specimens, more nearly longitudinal in others).

DISTRIBUTION.— Alaska and Alberta to Baja California and Coahuila.

ALASKA: Juneau, Skagway. CANADA: **Alberta**: Burmis, Lake Louise, Nantan, Robb. **British Columbia**: Copper Mt., Creston, Mt. Benson on Vancouver Isl., Terrace. USA: Arizona, California, Colorado, Idaho, Montana, Nebraska (40 km W Halsey), Nevada, New Mexico, Oregon, South Dakota (Black Hills, Custer, Hill City), W Texas, Utah, Washington, Wyoming. MEXICO: **Baja California**: Laguna Hanson. **Durango**: Ciudad Madero. **Nuevo León**: San Roberto. **Coahuila**: 45 km SE Saltillo.

HOSTS.— *Pinus aristata*, *P. attenuata*, *P. cembroides*, *P. contorta*, *P. coulteri*, *P. edulis*, *P. flexilis*, *P. jeffreyi*, *P. monophylla*, *P. ponderosa*, *P. sabiniana*, *P. strobiformis*, rare in *Picea engelmannii*, *P. pungens*.

BIOLOGY.— This is one of the most abundant scolytid species in pine in western North America. It breeds in slash, supressed seedlings, broken branches, etc., mostly in material from about 2–10 cm in diameter.

NOTES.— The above treatment was based on the neotype of *tuberculatus*, the holotype of *rugicollis*, and on 2526 other specimens.

Although minor variations occur throughout the distribution, none of them appear to have taxonomic significance.

### 128. *Pityophthorus pseudotsugae* Swaine

*Pityophthorus pseudotsugae* Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):99 (Holotype, female; BX Mountain, Vernon District, British Columbia; Canadian Nat. Coll., 1373)

*Pityophthorus thatcheri* Bright, 1976, Great Basin Nat. 36:442 (Holotype, female; Big Sandy Meadow, S28 T5S R22E, California, Wood Coll.); Wood, 1977, Great Basin Nat. 37:516. *Synonymy*

DIAGNOSIS.— This species is distinguished by the small, slender body form, by the reticulate elytral surface with impunctate interstriae, and by the frons as described below.

FEMALE.— Length 1.6–2.0 mm, 3.1 times as long as wide; color very dark brown.

Frons broadly, subcircularly plano-convex, more than a third of flattened area above upper level of eyes; surface smooth, shining, punctures almost uniformly distributed, moderately fine, not close, spaced by about one to three diameters of a puncture except a dense row on margin; vestiture rather sparse and moderately long in central area, a rather dense row of very long setae on lateral and dorsal margins, longest setae equal to three-fifths distance between eyes.

Pronotum 1.13 times as long as wide; widest near base, sides on basal half almost straight, subparallel, converging very slightly, rather broadly rounded in front; anterior margin armed by 8–10 rather coarse serrations, descending in size laterally; summit at middle, distinctly elevated; posterior areas subshining, obscurely reticulate, punctures of moderate size, rather close, spaced by one to three diameters of a puncture. Glabrous except at margins and on asperate area.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed except 1 (usually) near declivity, punctures rather small, spaced by about two to three diameters of a puncture; interstriae weakly to strongly reticulate, two to three times as wide as striae, impunctate. Declivity steep, moderately bisulcate; striae 1 obsolete, 2 usually obsolete on middle third, minute punctures often present on upper and lower thirds; interstriae reticulate, 1 distinctly elevated and armed by a row of about 10 fine granules, 2 almost three times as wide as 1, moderately, broadly sulcate, 3 slightly higher than 1, rather broadly rounded, armed by about 5 moderately coarse granules. Vestiture largely confined to declivity, consisting of minute to short strial and interstrial hair, declivital interstriae 3 with granules bearing a row of long, moderately coarse setae.

MALE.— Similar to female except frons with a conspicuous transverse carina on median half at upper level of eyes, convex

above, shallowly, transversely impressed below carina, surface almost smooth, coarsely, closely punctured except punctures slightly smaller in impressed area, subglabrous; serrations on anterior margin of pronotum and tubercles on elytral declivity distinctly larger.

DISTRIBUTION.— British Columbia and Montana to California and Colorado.

CANADA: **British Columbia**: Nicomin Ridge, Terrace, Vernon. USA: **California**: Alameda Co., Big Sandy Meadows, Biggy Meadows, Del Norte Co., Denning Canyon in Napa Co., El Dorado Co., Fallen Leaf Lake, Hat Creek, Humboldt Co., Inyo Co., Kern Co., Lassen N.P., Loyalton, Madera Co., Marin Co., Mariposa Co., Mt. Raymond Trail, Mt. Shasta, Nelder's Grove, Nevada Falls, Northfork, Plumas N.P., Onion Valley, Porcupine Flat, Pyramid R.S., Riverside Co., San Bernardino Co., San Francisco, Shasta Co., Sierra Co., Siskiyou Co., Swarthout Valley, Yosemite N.P. **Colorado**: Aspen, Cochatopa N.F., Rabbit Ears Pass. **Idaho**: Big Creek in Potlatch Co., Coeur d'Alene, Lowell, Moscow Mt. **Montana**: Columbia Falls. **Nevada**: Kyle Canyon near Las Vegas. **Oregon**: Hood River, Klamath Co., Suttle Lake, Umgosh N.F. **Utah**: Alta, Beaver, Brighton, Logan Canyon, Mt. Logan, Mirror Lake, Park City, Wolf Creek Pass. **Washington**: Metaline Falls, Mt. Rainier.

HOST.— *Abies concolor, A. grandis, A. lasiocarpa, A. magnifica, Picea engelmannii, Pinus lambertiana, Pseudotsuga menziesii, Tsuga heterophylla.*

BIOLOGY.— This species breeds in twigs, small branches, and seedlings.

NOTES.— The above treatment was based on the holotype and on 504 other specimens.

### 129. *Pityophthorus furnissi* Bright

*Pityophthorus furnissi* Bright, 1976, Great Basin Nat. 36:433 (Holotype, female, Amecameca, Mexico, Mexico; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from *montivagus* Bright by the very different declivity and female frons as described below.

FEMALE.— Length 1.9–2.3 mm, about 2.9 times as long as wide; color dark brown.

Frons very similar to *brevisetosus* Bright except weakly convex only near median line on lower third, somewhat impressed near marginal areas above, punctures slightly larger; vestiture about as in *brevisetosus.*

Pronotum and elytra as in *brevisetosus* except declivity more narrowly, less strongly sulcate, more nearly resembling *montivagus*, granules on lateral convexities small, not always in rows, vestiture rather abundant (slightly more so than in *brevisetosus*).

MALE.— Similar to female except frons about as in male *montivagus*, with punctures slightly coarser.

DISTRIBUTION.— Mexico.

MEXICO: **Mexico**: Amecameca, 17-III-54, *Pinus hartwegii*, R. L. Furniss.

NOTES.— The above treatment was based on the type series of 11 specimens.

### 130. *Pityophthorus montivagus* Bright

*Pityophthorus montivagus* Bright, 1977, Canadian Ent. 109:527 (Holotype, female; Km 77 on Highway 175 about 85 km or 53 miles N Oaxaca, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished by the unique male declivity and by the equally unique female frons as described below.

FEMALE.— Length 1.9–2.3 mm, 2.9 times as long as wide; color very dark brown.

Frons rather strongly, biconcavely impressed from epistoma to slightly above eyes, median line rounded and longitudinally concave, upper margin rather abrupt; surface smooth, shining, a few fine punctures in marginal areas; vestiture confined to extreme lateral margin of concavities on lower half, consisting of a small tuft of short yellow hair, each hair pointed mesad.

Pronotum and elytral disc as in *pseudotsugae* Swaine except surfaces smooth, shining, with numerous impressed points. Elytral declivity similar to *pseudotsugae* except sulcus much narrower, interstriae 2 ascending laterally, tubercles on lateral summit not as high, not in a row.

MALE.— Similar to female except frons transversely impressed from epistoma to slightly above eyes, rather coarsely punctured in lateral areas and above, transverse carina abrupt, not strongly elevated, vestiture inconspicuous; elytral declivity with sulcus deeper, much narrower on middle third.

DISTRIBUTION.— Oaxaca.

MEXICO: **Oaxaca**: 37 miles or 60 km S Valle Nacional, 24-V-71, 2800 m, *Pinus* and *P. ayacahuite*, D. E. Bright; 85 km N Oaxaca on Highway 175, 22-V-69, *P. patula*, J. E. H. Martin.

NOTES.— The above treatment was based on the type series of 213 specimens.

### 131. *Pityophthorus brevicomatus* Bright

*Pityophthorus brevicomatus* Bright, 1976, Great Basin Nat. 36:430 (Holotype, female; Cerro Potosí, Nuevo León, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *nitidulus* (Mannerheim) by the different female frons as described below, by the less strongly impressed declivity, and by the more abundant elytral setae.

FEMALE.— Length 1.9–2.1 mm, 2.9 times as long as wide; color dark brown.

Frons moderately convex; surface finely, very closely punctured; vestiture of abundant, short hair, longest setae near center, equal in length to less than one-sixth distance between eyes.

Pronotum and elytra essentially as in *nitidulus* except declivital suture as high as lateral convexities, interstriae 2 narrower, not ascending laterally, strial and interstrial setae on declivity much more abundant.

MALE.— Similar to female except frons with a moderate, transverse carina at upper level of eyes and a weak median carina below, surface shining, rather coarsely punctured, vestiture sparse, inconspicuous; declivity similar to, except slightly more strongly impressed than, female.

DISTRIBUTION.— Nuevo León.

MEXICO: **Nuevo León**: Cerro Potosí, 4-V-71, *Pinus strobiformis*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 13 specimens.

## 132. *Pityophthorus occidentalis* Blackman

*Pityophthorus occidentalis* Blackman, 1920, Psyche 27:4 (Lectotype, male; Pitkin, Colorado; U.S. Nat. Mus., designated by Bright, 1976, Coleopt. Bull. 30:183)

DIAGNOSIS.— This species is a geographical replacement of *nitidulus* (Mannerheim), from which it is distinguished by the absence of long setae on the female declivity and by the much shorter, more confused declivital setae in the male, by the less strongly sulcate male declivity, and by the much more nearly obsolete punctures on female declivital striae 2.

FEMALE.— Length 1.9–2.4 mm, 2.8 times as long as wide; color dark reddish brown.

As in *nitidulus* except frontal punctures minute, discal strial punctures averaging slightly smaller, declivital sulcus not as deep, punctures on striae 2 mostly obsolete, granules on interstriae 3 smaller, vestiture minute, interstrial setae on declivity not longer than those of striae, longest setae equal to less than half width of an interstriae.

MALE.— Similar to male of *nitidulus* except declivity slightly less strongly sulcate, slightly fewer tubercles on inner margin of lateral convexity, setae more confused, usually slightly shorter.

DISTRIBUTION.— SW Wyoming, SE Utah, Colorado, and New Mexico.

USA: **Colorado**: Clyde, Colorado Springs, Del Norte, Gould, La Veta Pass, Montezuma N.F., Newcastle, Norwood, Pingree Park, Pitkin. **New Mexico**: Capitan Mts., Sandia Mountains, Santa Fe Ski Basin, Sierra Blanca Mt. **Utah**: La Sal Mts., Monticello. **Wyoming**: Saratoga.

HOSTS.— *Picea engelmannii, P. pungens.*

BIOLOGY.— This species breeds in the tops and limbs of the host.

NOTES.— The above treatment was based on Blackman's syntypes in the U.S. National Museum and on 246 other specimens.

## 133. *Pityophthorus nitidulus* (Mannerheim)

*Bostrichus nitidulus* Mannerheim, 1843, Moskov. Obshch. Isp. Prirody, Otd. Biol. Biul. (Bull. Soc. Imp. Nat. Moscow) 16:298 (Lectotype, female, Sitka, Alaska; Helsinki Mus., designated by Bright, 1977, Coleopt. Bull. 30:186)

*Cryphalus atratulus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:156 (Lectotype, male; Cabo de los Reyes, California; Mus. Comp. Zool., designated by Bright, 1977, Coleopt. Bull. 30:185); LeConte, 1876, Proc. Amer. Philos. Soc. 15:354. *Synonymy*

*Cryphalus puncticollis* LeConte, 1874, Trans. Amer. Ent. Soc. 5:71 (Lectotype, female; Calaveras, California; Mus. Comp. Zool., designated by Bright, 1977, Coleopt. Bull. 30:185); Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:109. *Synonymy*

DIAGNOSIS.— This species is distinguished by the row of tubercles on interstriae 3, extending from base of declivity along inner margin of lateral crest to middle of declivity, and by the distinctive female frons described below.

FEMALE.— Length 1.8–2.6 mm, 2.8 times as long as wide; color very dark reddish brown.

Frons essentially as in *pseudotsugae* Swaine except punctures in central area small to very minute, usually less abundant, setae in central area strongly curved on their basal half, usually less abundant.

Pronotum about as in *pseudotsugae* except surface of posterior areas usually reticulate only in California specimens, those from other areas shining and with impressed points; punctures usually larger.

Elytra outline as in *pseudotsugae*; striae not impressed except 1 near declivity,

punctures varying from rather small to moderately coarse, close; interstriae about two to three times as wide as striae, usually smooth (occasionally reticulate, particularly in males), sparsely punctured to impunctate (geographically variable). Declivity about as in *pseudotsugae* except slightly narrower and deeper, lateral convexities conspicuously higher than suture, suture usually unarmed (variable). Vestiture about as in *pseudotsugae* except strial setae more nearly absent, long interstrial setae on base and sides of declivity as well as on interstriae 3, setae equal in length to one to two times width of an interstriae.

MALE.— Similar to female except frons with a transverse carina at upper level of eyes and a weaker median carina on lower half, surface smooth, shining, coarsely punctured, vestiture sparse, inconspicuous; serrations on anterior margin of pronotum larger; declivity much more deeply sulcate, mesal face of lateral convexities very steep, inner margin armed by a row of denticles from interstriae 2 at base of declivity to middle of declivity, very near but distinct from tubercles on interstriae 3, vestiture on declivity more abundant, confused, slightly coarser.

DISTRIBUTION.— Alaska and California to SW Utah and Wyoming.

ALASKA: Kenai, Matanuska, Nenana, Seward, Sitka. CANADA: **Alberta**: Banff, Highwood Pass. **British Columbia**: Massett, Hope Trail, Queen Charlotte Islands, Trinity Valley. USA: **Arizona**: Hannagan Camp in Greenlee Co., Pineleno Mts., San Francisco Mts. **California**: Alameda Co., Berkeley, Carmel, Del Norte Co., Echo Lake, El Dorado Co., Eureka, Humboldt Co., Inverness, Lake Arrowhead, Los Angeles Co., Los Gatos in Santa Clara Co., Marin Co., Mariposa Grove, Mendocino Co., Mokel Hill, Monterey Co., Oakland, Pacific Grove, Palo Alto, Placer Co., Richmond, San Francisco, San Luis Obispo, Siskiyou Co., Sonoma Co., Tulare Co., Tuolumne Co. **Idaho**: Franklin Co. **Nevada**: Baker. **Oregon**: Albany, Astoria, Bear Spring on Wapinita Cutoff, Bly, Branden, Cascade Head, Mt. Hood, Newport, Portland, Push, Sand Lake, Seaside, Woods. **Utah**: Beaver, Escalante, Logan Canyon, Mirror Lake, Wolf Creek Pass. **Washington**: Hoquiam, Nahotta, Ocean Park, Sea View. **Wyoming**: Buffalo.

HOSTS.— *Picea engelmannii, P. glauca, P. sitchensis, Pinus contorta, P. radiata.*

BIOLOGY.— This species breeds in the bole and limbs of the host. Almost all records from *Pinus* are from the Pacific Coast.

NOTES.— The above treatment was based on a female of *nitidulus* in the Helsinki Museum labeled "type" and bearing the type data, although the original description obviously is composite; on the syntypes of *atratulus* and *puncticollis*; and on 908 other specimens.

Most California and some Oregon specimens are from *Pinus*. They are smaller, have the pronotum reticulate, and the discal interstriae impunctate. That population overlaps the characters of specimens found in *Picea* in Oregon and northward and may or may not represent a different taxon. It is possible that this material represents a subspecies or even a distinct species, but additional data are needed.

The coastal population in *Picea* usually has the discal interstriae sparsely punctured. In most inland series from *Picea* these interstriae are impunctate. It is doubtful that this character is sufficiently distinctive to warrant the recognition of subspecies.

A series in the U.S. National Museum from Metanuska, Alaska, 30-V-72, has a stouter body, a narrower declivital sulcus, with the lateral convexities much thicker than normal, and conspicuously more dense and longer female frontal vestiture than in other series. If future collecting adds additional support, this population could be given taxonomic distinction.

### 134. *Pityophthorus viminalis* Bright

*Pityophthorus viminalis* Bright, 1977, Canadian Ent. 109:530 (Holotype, female; Cerro Potosí, Nuevo León, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *cortezi* Bright by the smaller size, by the less strongly impressed, slightly wider basal half of the declivity, and by the shorter setae on the female frons.

FEMALE.— Length 2.5–2.7 mm, 2.6 times as long as wide; color very dark brown.

Frons as in *cortezi* except setae not as long, length of longest setae equal to slightly less than half distance between eyes.

Pronotum and elytra as in *cortezi* except declivity steeper, basal half of sulcus not as deep, slightly wider. Strial setae on disc usually obsolete (conspicuously present to base in *cortezi* when not abraded).

MALE.— Similar to female except frons slightly impressed, a conspicuous transverse carina at upper level of eyes, median carina

very weak (rather strong in most *cortezi*), punctures coarse, setae inconspicuous; elytral declivity stronger, with lateral convexities slightly higher.

DISTRIBUTION.— Nuevo León.

MEXICO: **Nuevo León**: Cerro Potosí, 4-V-71, 3800 m, *Pinus culminicola*, D. E. Bright.

NOTES.— The above treatment was based on the type series of seven specimens.

### 135. *Pityophthorus cortezi* Bright

*Pityophthorus cortezi* Bright, 1977, Canadian Ent. 109:523 (Holotype, female; Ixtaccihuatl-Popocatepetl N.P., Mexico-Puebla, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *nitidulus* (Mannerheim) by the much larger size and by the more strongly sulcate elytral declivity.

FEMALE.— Length 2.4–3.2 mm, 2.8 times as long as wide; color very dark brown.

As in *nitidulus* except declivital sulcus much deeper and wider, tubercles on interstriae 3 larger; elytral vestiture less abundant.

MALE.— Similar to female except frons as in male *nitidulus*; declivity as in female except lateral margins more strongly elevated.

DISTRIBUTION.— Mexico to Puebla.

MEXICO: **Mexico**: Amecameca, 17-III-54, *Pinus hartwegii*, R. L. Furniss. **Puebla**: Ixta-Popo N.P., 8-V-71, 4100 m, *P. hartwegii*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 62 specimens and on 2 other specimens.

### 136. *Pityophthorus abiegnus* Wood

*Pityophthorus abiegnus* Wood, 1964, Great Basin Nat. 24:67 (Holotype, female; 4 miles W Río Frío, Mexico, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nitidulus* (Mannerheim) by numerous characters, including those described below.

FEMALE.— Length 2.0–2.4 mm, 2.7 times as long as wide; color very dark brown.

Frons as in *nitidulus* except punctures rather coarse, close, abundant; vestiture moderately abundant, fine, only slightly longer on margins.

Pronotum similar to *nitidulus* except anterior margin armed by about 14 serrations, posterior areas with numerous impressed points, punctures rather coarse, deep.

Elytra similar to *nitidulus* except punctures on the disc slightly larger, deeper, declivity much more deeply sulcate, lateral convexities much higher and armed by coarser tubercles.

MALE.— Similar to female except frons as in male *nitidulus*, serrations on anterior margin of pronotum larger, declivity only slightly more strongly sulcate but armed on interstriae 2 by a row of tubercles from base to slightly above middle.

DISTRIBUTION.— Mexico and Puebla to Oaxaca.

MEXICO: **Mexico**: 6 km W Río Frío, 14-VII-53, 2900 m, *Abies religiosa*, S. L. Wood. **Oaxaca**: 85 km S Valle Nacional, 24-V-71, 3300 m, *A. religiosa*, D. E. Bright. **Puebla**: 18 km N Tlaxco, 9-VII-67, 2900 m, *A. religiosa*, S. L. Wood.

HOST.— *Abies religiosa*.

BIOLOGY.— Specimens were taken from limbs.

NOTES.— The above treatment was based on the type series of 12 specimens and on 22 other specimens.

### 137. *Pityophthorus immanis* Blackman

*Pityophthorus immanis* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:98 (Holotype, female; Chiricahua Mts., Arizona; U.S. Nat. Mus., 41302)

*Pityophthorus sulcatus* Bright, 1977, Canadian Ent. 109:528 (Holotype, female; Mt. Lemon, Pima Co., Arizona; Canadian Nat. Coll.); Wood, 1977, Great Basin Nat. 37:515. *Synonymy*

DIAGNOSIS.— This species is distinguished from *abiegnis* Wood by the flatter, more densely punctured female frons, by the smooth pronotum, and by the slightly steeper declivity.

FEMALE.— Length 1.9–2.8 mm, 2.8 times as long as wide; color very dark brown.

Frons as in *abiegnis* except flatter, punctures much closer, vestiture slightly more abundant.

Pronotum as in *abiegnis* except posterior areas smooth, with fewer impressed points.

Elytra as in *abiegnis* except strial punctures smaller, declivity slightly steeper.

MALE.— Similar to female except frons about as in male *abiegnis*.

DISTRIBUTION.— Arizona and New Mexico.

USA: **Arizona**: Chiricahua Mts., 10-V, Hubbard and Schwarz; Rustler's Park, Chiricahua Mts., 7-VI-69, 2700 m, No. 80, *Pinus strobiformis*, S. L. Wood; Bear Wallow, Santa Catalina Mts., 11-VI-69, 2600 m, No. 92, *P. strobiformis*, S. L. Wood; Hannagan Camp in Greenlee Co., 12-VII-68, *P. strobiformis*, D. E. Bright; Mt. Lemon, 5-VIII-68, *P. strobiformis*, D. E. Bright. **New Mexico**:

Capitan, Hopk. 3953, "*P. strobus*," W. F. Fiske. A paratype is labeled "Hopk. US 5489, bred Feb. 1900, J. L. Webb coll." MEXICO: Chihuahua: Basaseachi; Cusarara, San Juanito.

HOST.— *Pinus strobiformis*, *P. lumholzii*.

NOTES.— The above treatment was based on the holotype and on 7 paratypes of *immanis* (one paratype from Flagstaff, Arizona, is apparently a small female of *crassus* Blackman), and on the type series of 86 specimens of *sulcatus*.

### 138. *Pityophthorus discretus* Wood

*Pityophthorus discretus* Wood, 1977, Great Basin Nat. 37:394 (Holotype, female; 3 miles or 5 km W El Salto, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *perotei* Blackman by the larger average size, by the reticulate pronotum that lacks tubercles on the disc, by the more coarsely punctured frons, and by the steeper, more broadly sulcate declivity.

FEMALE.— Length 1.6–2.2 mm, 2.9 times as long as wide.

Frons plano-convex as in *perotei* except more coarsely punctured, vestiture shorter (almost two-thirds as long).

Pronotum about as in *perotei* except posterior areas rather strongly reticulate, punctures moderately coarse, deep (tubercles absent).

Elytra about as in *perotei* except disc less shining, almost subreticulate in some specimens; declivity slightly steeper, sulcus slightly wider and deeper.

MALE.— Similar to female except frontal vestiture shorter and apparently less abundant.

DISTRIBUTION.— Durango to Jalisco and Puebla.

MEXICO: **Durango**: 5 km W El Salto, 7-VI-65, 2500 m, No. 33, *Pinus ayacuhuite*, S. L. Wood. **Jalisco**: 9 km E Volcán Parícutin, 19-VI-65, 2500 m, *Pinus*, S. L. Wood. **Michoacán**: 29 km W Quiroga, 17-VI-65, 2300 m, No. 70, *Pinus*, S. L. Wood. **Puebla**: 25 km W Texmelucan, 14-VII-53, 2800 m, *Pinus*, S. L. Wood.

NOTES.— The above treatment was based on the type series of seven specimens.

### 139. *Pityophthorus perotei* Blackman

*Pityophthorus perotei* Blackman, 1942, Proc. U.S. Nat. Mus. 92:218 (Holotype, female; Perote, Veracruz, Mexico; U.S. Nat. Mus., 55992)

DIAGNOSIS.— This species is distinguished by the fine granules on the pronotal disc that replace the punctures, by the very strongly acuminate elytral apex and shallow declivity, and by the distinctive frons in both sexes.

FEMALE.— Length 1.5–1.9 mm, 2.9 times as long as wide; color dark brown, elytral disc usually pale.

Frons flat to plano-convex on a comparatively small area to a point moderately above eyes, lateral margins rounded to obtusely subangulate; surface shining, closely, uniformly, rather coarsely punctured, interspaces averaging less than half diameter of a puncture; vestiture rather fine, of moderate abundance, rather long on margins, distinctly shorter in central area, longest setae about equal in length to half distance between eyes.

Pronotum 1.0 times as long as wide; outline about as in *watsoni* Schedl, summit more conspicuous, asperities larger, anterior margin armed by 12 serrations; posterior area shining, weakly reticulate, finely punctured in lateral areas, punctures on disc replaced by transversely elongate granules. Vestiture short, almost obsolete in posterior areas, slightly longer on sides and asperate area.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; sides straight and parallel on basal half, then converging slightly to declivity base, very strongly acuminate behind; striae not impressed except 1 near declivity, punctures in rows, rather coarse, shallow; interstriae almost smooth, shining, impunctate, slightly wider than striae. Declivity rather steep, moderately bisulcate; striae 1 obsolete, 2 with very fine, shallow punctures; interstriae 1 moderately elevated, armed by a row of moderately coarse tubercles, 2 moderately impressed, smooth, shining, impunctate, twice as wide as 1, 3, rather broadly convex, as high as 1, with tubercles as on 1. Vestiture of fine, very short strial hair often extending to base, and moderately long hair on odd-numbered interstriae on and near declivity.

MALE.— Similar to female except frons more finely, less densely punctured, vestiture much less abundant but only slightly shorter; declivital sulcus slightly deeper, apex only moderately acuminate.

DISTRIBUTION.— Veracruz.

MEXICO: **Veracruz**: Perote, 9-II-36, *Pinus teocote*, D. DeLeon; Las Vigas, 5-VII-67, No. 156, *Pinus*, S. L. Wood.

HOST.— *Pinus teocote*.

BIOLOGY.— Specimens were taken from broken branches.

NOTES.— The above treatment was based on the holotype and on 13 other specimens.

### 140. *Pityophthorus chalcoensis* Hopkins

*Pityophthorus chalcoensis* Hopkins, 1905, preprint of Proc. Ent. Soc. Washington 7:73 (Holotype, female; Chalco, Mexico; U.S. Nat. Mus., 7511)

*Pityophthorus herrarai* Hopkins, 1905, preprint of Proc. Ent. Soc. Washington 7:74 (Syntypes; A. L. Herrara number 696, Mexico; U.S. Nat. Mus., 7512); Bright, 1978, Great Basin Nat. 38:71. *Synonymy*

DIAGNOSIS.— This species is distinguished from the somewhat remotely allied *scabridus* Schedl by the more slender form, by the much more coarsely punctured female frons, and by the declivity.

FEMALE.— Length 2.4–2.5 mm, 2.7 times as long as wide; color yellowish brown.

Frons with basic contours about as in *scabridus* except punctures coarse (about twice as large), close, vestiture slightly less abundant, with marginal setae slightly longer.

Pronotum 1.1 times as long as wide; sides on basal half almost straight and parallel, broadly rounded behind, anterior margin armed by 12 low serrations; posterior areas smooth, shining, with numerous impressed points, punctures rather coarse, deep, close. Vestiture of fine, moderately abundant, rather long hair except on disc, apparently abraded.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind except very obtusely subangulate at suture; striae not impressed except 1 near declivity, punctures moderately coarse, deep, in slightly irregular rows; interstriae one and one-half times as wide as striae, all with a few punctures equal in size to those of striae. Declivity steeper than *scabridus* and more strongly sulcate; striae 1 and 2 distinctly punctured to apex; interstriae 1 moderately elevated, armed by a row of rather coarse tubercles, 2 twice as wide as 1, strongly sulcate, smooth below, minutely etched above, 3 rather abruptly elevated, slightly higher than 1, armed by about eight tubercles similar to those on 1 (basically similar to *scabridus* but declivity steeper, sulcus deeper). Strial setae slightly longer than normal; setae on all interstriae on posterior half of disc and on declivity except 2, of moderate length, not longer on declivity.

DISTRIBUTION.— Michoacán to Mexico.

MEXICO: **Mexico**: Chalco, Utl., 19-X-03, con 872, Herrera. **Michoacán**: Rancho San Jeronimo at Hidalgo, 29-I-61, tronco de *Pinus*.

NOTES.— The above treatment was based on the holotypes of *chalcoensis* and *herrarai* and on four other specimens. Hopkins listed "Chaleo" as the type locality of *chalcoensis*, but the label on the type clearly reads "Chalco."

### 141. *Pityophthorus miniatus* Bright

*Pityophthorus miniatus* Bright, 1981, Ent. Soc. Canada Mem. 118:280 (Holotype, female; Cerro Peña Blanca, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *ingens* Blackman by the smaller size, by the plano-convex frons, with its surface sometimes falsely appearing granular, and by the slightly narrower sulcus on the lower half of the declivity. This species and *ingens* have the male frons sculptured as in the female and almost equally pubescent.

FEMALE.— Length 2.1–2.6 mm, 2.9 times as long as wide; color dark reddish brown.

Frons plano-convex, shining, densely, finely, uniformly punctured almost from eye to eye; a very weak epistomal process indicated; vestiture as in *ingens* except with fewer long setae on lateral and dorsal margins.

Pronotum essentially as in *pullus* (Zimmermann) and *ingens* except pubescence confined to marginal areas.

Elytra as in *ingens* except declivital sulcus slightly less strongly impressed; declivital interstriae 2 about one and one-half times as wide as 1; sparse elytral setae slightly longer and more abundant than in *ingens*.

MALE.— Similar to female except frontal vestiture less abundant and shorter.

DISTRIBUTION.— Oaxaca to Honduras.

MEXICO: **Oaxaca**: 184 km S Oaxaca on Highway 131, *Pinus lawsoni*, D. E. Bright. GUATEMALA: Godinez, 29-IV-56, *Pinus pseudostrobus*, R. L. Furniss. HONDURAS: Cerro Peña Blanca, 23-IV-64, 1300 m, No. 528, *P. pseudostrobus*, S. L. Wood; Tegucigalpa, 9-III-66, *P. oocarpa*. NICARAGUA: Darrili-Esteli, 12-I-60, pine bark.

BIOLOGY.— Specimens were taken from a bole 1 m in diameter 1.5 m above ground.

NOTES.— The above treatment was based on the type series of seven specimens.

### 142. *Pityophthorus ingens* Blackman

*Pityophthorus ingens* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:124 (Holotype, female; Santa Catalina Mountains, Arizona; U.S. Nat. Mus., 41315)

DIAGNOSIS.— This species is distinguished from *miniatus* Bright by the larger size, by the slightly impressed to partly concave female frons, with its surface less nearly granular, and by the slightly wider sulcus on the lower half of the declivity.

FEMALE.— Length 2.3–3.2 mm, 3.0 times as long as wide; color dark reddish brown.

Frons weakly concave from epistoma to upper level of eyes; surface shining, densely, uniformly, finely punctured almost from eye to eye from epistoma to vertex, spaced by less than half diameter of a puncture; vestiture very fine, uniformly distributed, rather short in central area, much longer on lateral and dorsal margins.

Pronotum as in *pullus* (Zimmermann).

Elytra 1.9 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal two-thirds, obtusely subacuminate behind; striae not impressed, punctures weakly to moderately confused, interstrial punctures rather sparse, usually confused with those of striae. Declivity steep, bisulcate; punctures on striae 1 and 2 very small but distinct to near apex; interstriae 1 moderately elevated and armed by a row of fine tubercles, 2 rather strongly, broadly impressed, slightly more than twice as wide as 1, smooth, shining, with numerous impressed points, impunctate, 3 as high as 1, armed by about 8–10 small tubercles. Vestiture largely confined to declivity, sparse, short, mostly in interstrial rows.

MALE.— Similar to female except frons more strongly concave below upper level of eyes, frontal pubescence finer, shorter, slightly less abundant (general sculpture, punctures, and pubescence as in female).

DISTRIBUTION.— S Arizona to Durango.

USA: **Arizona**: Chiricahua Mts., Graham Mts., Santa Catalina Mts. MEXICO: **Chihuahua**: San Juanito, 15-III-74, *Pinus*, M. M. Furniss. **Durango**: 24-III-74, M. M. Furniss.

HOST.— *Pinus ponderosa*.

NOTES.— The above treatment was based on the holotype and on 21 other specimens.

### 143. *Pityophthorus confusus* Blandford

*Pityophthorus confusus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):237 (Lectotype, female; San Gerónimo, Guatemala; British Mus. Nat. Hist., designated by Bright, 1976, Coleopt. Bull. 30:184)

*Pityophthorus bellus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:123 (Holotype, female; Monongalia Co., West Virginia; U.S. Nat. Mus., 41314); Wood, 1977, Great Basin Nat. 37:515. *Synonymy*

DIAGNOSIS.— This species is distinguished from *miniatus* Bright and *ingens* Blackman by the very different sculpture of the frons in both sexes.

FEMALE.— Length 1.9–2.4 mm, 3.0 times as long as wide; color dark reddish brown.

Frons similar to *confertus* Swaine except median two-thirds moderately concave; surface smooth, shining, punctures moderately coarse, spaced by distances averaging one diameter of a puncture; vestiture fine, moderately long and uniformly distributed in central area, very long on lateral and dorsal margins.

Pronotum and elytral disc as in *ingens* except strial punctures almost always in definite rows. Declivity about as in *ingens* except interstriae 2 about one and one-half times as wide as 1, its surface finely, somewhat obscurely reticulate, tubercles on 3 slightly larger.

MALE.— Similar to female except frons weakly to strongly concave on central area below upper level of eyes (variable within a series), a feeble transverse carina sometimes weakly indicated at upper margin of impressed area, punctures usually slightly closer, vestiture short, less widely distributed (much less abundant and more restricted than in *ingens*, but definitely similar).

DISTRIBUTION.— Pennsylvania and E Texas to Florida, Durango and Veracruz to NW Nicaragua.

USA: **Arkansas**: Ashley Co. **Florida**: Baldwin, Gainesville. **Georgia**: Athens, Clark Co., Columbus, Putnam Co., Thomasville. **Louisiana**: Bogalusa. **Mississippi**: Leaf, Lucidale, Meadville. **North Carolina**: Asheville, Fletcher, Tryon. **Pennsylvania**: Mt. Alto. **Texas**: Call, Hardin Co., Montell. **South Carolina**: Georgetown, Glen Avon, Spartanburg. **Virginia**: Camp Pickett in Nottoway

Co., Gloucester Co. West Virginia: Back Creek Mt., Dellslow, Hampshire Co., Hardy Co., Kanawha Co., Monongalia Co., Pendleton, Randolph Co., Romney, Wood Co. MEXICO: Chiapas: Lazardo Cardenas, junction of Highway 190 and 195. Durango: El Salto. Jalisco: Guadalajara. GUATEMALA: San Geronimo. HONDURAS: San Lucas and Yuscaran (Paraiso). NICARAGUA: Segovia.

HOSTS.— *Pinus echinata, P. oocarpa, P. taeda.*

BIOLOGY.— Specimens taken in Honduras bred in boles 10–25 cm in diameter.

NOTES.— The above treatment was based on the lectotype of *confusus*, on the holotype and allotype of *bellus*, and on 306 U.S. and 62 other specimens from Mexico, Guatemala, and Honduras.

### 144. *Pityophthorus annectens* LeConte
Fig. 207

*Pityophthorus annectens* LeConte, 1878, Proc. Amer. Philos. Soc. 17:622 (Lectotype, female; Tampa, Florida; Mus. Comp. Zool., designated by Bright, 1976, Coleopt. Bull. 30:185)

*Pityophthorus citus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:137 (Holotype, female; Chiricahua Mts., Arizona; U.S. Nat. Mus., 41322); Wood, 1977, Great Basin Nat. 37:514. *Synonymy*

DIAGNOSIS.— This species is distinguished from *consimilis* LeConte by the more extensively flattened female frons and very long frontal vestiture, by the more strongly impressed male declivity, and by other characters mentioned above.

FEMALE.— Length 1.3–1.7 mm, 2.9 times as long as wide; color yellowish to reddish brown.

Frons broadly flattened from epistoma to vertex, more than half of flattened area above upper level of eyes; surface smooth, shining, uniformly, very finely, very closely punctured; vestiture of abundant hair, of moderate length in central area, very long on margins, longest setae equal to two-thirds distance between eyes.

Pronotum 1.14 times as long as wide; as in *consimilis* except either minute impressed points or reticulation also present on posterior areas.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; outline and disc as in *consimilis* except surface smoother, shining. Declivity as in *consimilis* except striae 2 more distinctly punctured, interstriae 2 slightly more strongly impressed.

MALE.— Similar to female except frons rather strongly convex, a moderate transverse impression on lower half, surface shining, coarsely punctured, vestiture inconspicuous; declivital sulcus much deeper, tubercles on interstriae 1 and 2 slightly larger.

DISTRIBUTION.— West Virginia and Virginia to Arizona, British Honduras, and Florida.

USA: Arizona, Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Texas (eastern), Virginia, West Virginia. MEXICO: Hidalgo, Jalisco, Mexico, (?) Chiapas. BRITISH HONDURAS: Belise.

HOSTS.— *Pinus caribaea, P. edulis, P. elliotti, P. palustris, P. ponderosa, P. taeda, P. spp.*

BIOLOGY.— Specimens were taken from branches.

NOTES.— The above treatment was based on the lectotype of *annectans*, on the holotype of *citus*, and on 148 other specimens.

The female frontal vestiture tends to vary considerably throughout the range within and between series. The number and length of the setae tend to decrease slightly in material from Arizona and Mexico.

The material from Chiapas in southern Mexico is larger (1.7–2.1 mm), has the declivital sulcus deeper, has the strial hair at the base of the declivity twice as long, and has the discal punctures on the male elytra rather strongly confused. In the absence of specimens from the area between Mexico (the state) and Chiapas, an evaluation of the significance of these characters is not possible.

### 145. *Pityophthorus cacuminatus* Blandford

*Pityophthorus cacuminatus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):237 (Lectotype, female; San Gerónimo, Verapaz, Guatemala; British Mus. Nat. Hist., designated by Bright, 1977, Coleopt. Bull. 30:183–188)

DIAGNOSIS.— This species is distinguished from *annectens* LeConte by the more coarsely punctured female frons, with the vestiture averaging shorter, less abundant, particularly on the marginal fringe.

FEMALE.— Length 1.5–1.7 mm, 3.0 times as long as wide; color dark reddish brown.

Frons flat from epistoma to vertex, epistoma slightly elevated, lateral margins obtusely angled, about two diameters of a facet

from margin of eye; surface smooth, shining, densely, rather coarsely punctured, interspaces equal in width to less than half diameter of a puncture; vestiture of uniformly distributed, fine, long hair, conspicuously longer toward dorsal margin, longest setae equal in

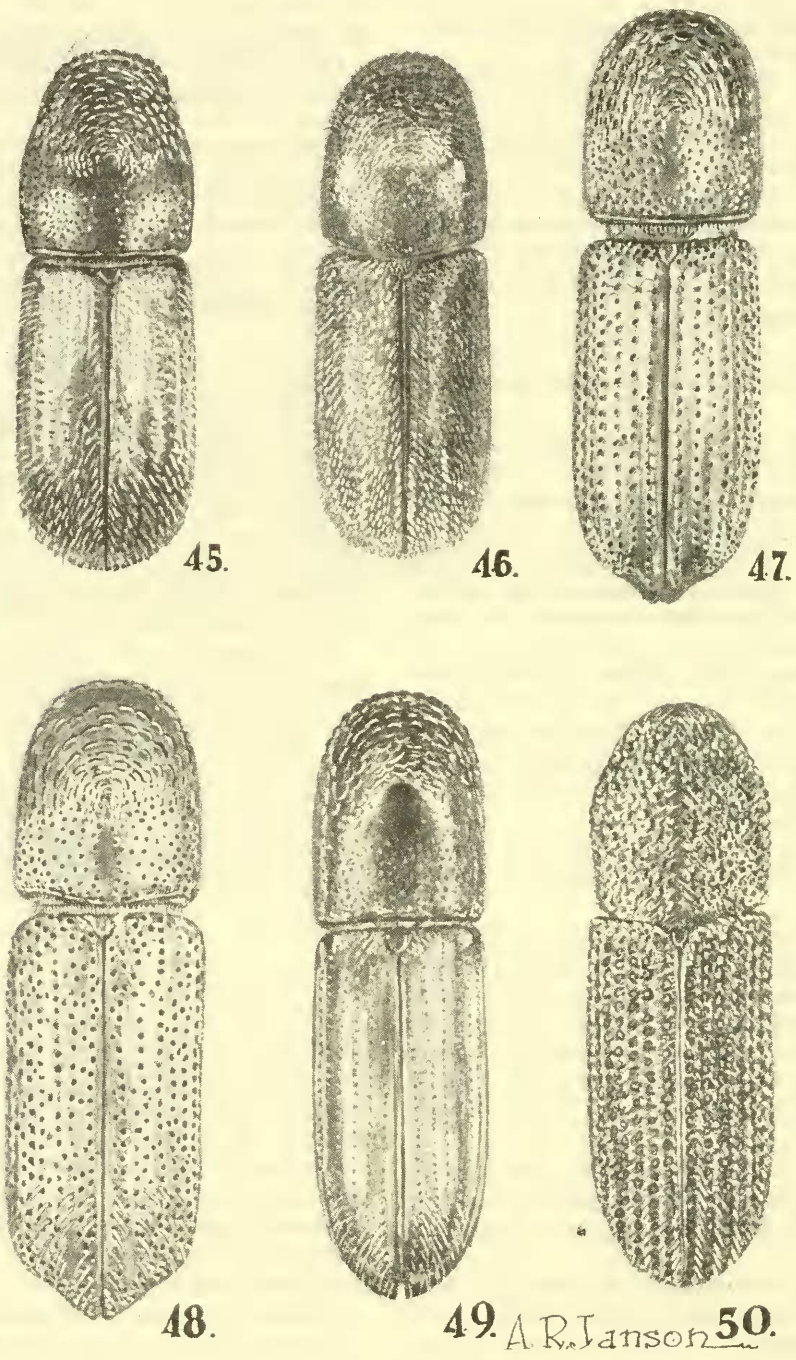



Fig. 207. Dorsal aspect of adult Scolytidae: 45, *Pseudopityophthorus minutissimus*; 46, *Pseudopityophthorus pruinosus*; 47, *Pityophthorus annectans*; 48, *Pityophthorus pullus*; 49, *Gnathotrichus materiarius*; 50, *Hylastes tenuis*. (After Blackman 1922:pl. IX.)

length to three-fourths distance between eyes.

Pronotum 1.12 times as long as wide; as in *annectens*.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum, as in *annectens*.

MALE.— Similar to female except frons moderately, transversely impressed from epistoma to upper level of eyes, a transverse carina usually present at upper level of eyes (varying from obscure to conspicuous), surface coarsely, closely punctured, vestiture inconspicuous; declivity slightly steeper, sulcus slightly deeper.

DISTRIBUTION.— Jalisco to Honduras.

MEXICO: Jalisco: Guadalajara. Michoacán: Quiroga. GUATEMALA: San Gerónimo, Verapaz, Champion. HONDURAS: San Lucas in Paraíso, 22-IV-64, 800 m, No. 525, *Pinus oocarpa*, S. L. Wood; Tegucigalpa, 9-III-66, *P. oocarpa*.

HOST.— *Pinus oocarpa*, *P. sp.*

BIOLOGY.— Specimens were taken from a cut top, 10 cm in diameter, and in branches.

NOTES.— The above treatment was based on the lectotype and on 34 other specimens.

### 146. *Pityophthorus murrayanae* Blackman

*Pityophthorus murrayanae* Blackman, 1922, New York St. Coll. For., Syracuse, Tech. Pub. 16:138 (Holotype, female; Grand Lake, Colorado; U.S. Nat. Mus.)

*Pityophthorus elongatus* Swaine, 1925, Canadian Ent. 57:194 (Holotype, female; Merritt, Midday Valley, British Columbia; Canadian Nat. Coll., 1365); Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:133. *Synonymy*

*Pityophthorus gracilis* Swaine, 1925, Canadian Ent. 57:195 (Holotype, female; Grant Co., Oregon; Canadian Nat. Coll., 1364); Wood, 1977, Great Basin Nat. 37:515. *Synonymy*

*Pityophthorus cutleri* Swaine, 1925, Canadian Ent. 57:195 (Holotype, female; Merritt, Midday Valley, British Columbia; Canadian Nat. Coll.) Wood, 1977, Great Basin Nat. 37:515. *Synonymy*

*Pityophthorus exilis* Swaine, 1925, Canadian Ent. 57:196 (Holotype, female; Ochoco N.F., Oregon; Canadian Nat. Coll., 1362); Wood, 1977, Great Basin Nat. 37:515. *Synonymy*

*Pityophthorus tenuis* Swaine, 1925, Canadian Ent. 57:196 (Holotype, female; Merritt, Midday Valley, British Columbia; Canadian Nat. Coll., 1366); Wood, 1957, Canadian Ent. 89:401. *Synonymy*

*Pityophthorus depygis* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:128 (Holotype, female; Clyde, Colorado; U.S. Nat. Mus., 41318); Wood, 1977, Great Basin Nat. 37:515. *Synonymy*

*Pityophthorus watsoni* Schedl, 1930, Canadian Ent. 62:197 (Holotype, female; Nictor Lake, New Brunswick; Canadian Nat. Coll., 3167); Wood, 1977, Great Basin Nat. 37:515. *Synonymy*

*Pityophthorus aurulentus* Bright, 1966, Pan Pacific Ent. 42:301 (Holotype, female; Shell Ridge at Walnut Creek, Contra Costa Co., California; California Acad. Sci.); Wood, 1977, Great Basin Nat. 37:515. *Synonymy*

*Pityophthorus acceptus* Bright, 1981, Ent. Soc. Canada Mem. 118:315 (Holotype, female; Granite Pass, Big Horn Mts., Wyoming; Canadian Nat. Coll.). *New synonymy*

DIAGNOSIS.— This species is distinguished from *consimilis* LeConte by the larger size, by the more slender body form, by the wider discal striae, and by the occasional presence of a few interstrial punctures on the disc. The female frons varies radically within and between series.

FEMALE.— Length 1.8–2.4 mm, 2.9–3.1 times as long as wide; color reddish brown.

Frons varying from extensively flattened, with margins abrupt to moderately convex, with margins rounded; varying from uniformly, very finely, densely punctured to uniformly, rather coarsely, closely punctured, shining; varying from glabrous to dense micropile to moderately fine, rather abundant setae of moderate length to abundant and very long, with longest setae at margins; most series of one variant only, others sometimes containing all possible variants and intermediates.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on basal half, broadly rounded in front; anterior margin armed by about 10–14 low serrations; summit at middle, distinct; posterior areas smooth, shining, numerous minute impressed points present, punctures sparse, spaced by 2–4 diameters of a puncture, rather fine, deep. Disc glabrous, sparse setae on lateral margins and in asperate area.

Elytra 1.9 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather abruptly rounded, then subacuminate at apex; striae in rows, not impressed, punctures moderately coarse, spaced by 1–2 diameters of a puncture; interstriae shining, varying from almost smooth to obscurely subreticulate (impressed lines or points usually indicated), slightly wider than striae, odd-numbered interstriae usually sparsely punctured, punctures almost

as large as those of striae. Declivity steep, moderately bisulcate; striae 1 and 2 minutely punctured to obsolete; interstriae 1 moderately elevated, armed by a sparse row of fine granules, 2 moderately, broadly impressed, twice as wide as 1, obscurely subreticulate, impunctate, 3 rather narrowly convex, as high or slightly higher than 1, armed by a few fine granules as on 1. Vestiture of fine short strial hair sometimes extending to base; setae on odd-numbered interstriae on and near declivity varying from absent to short to moderate length.

MALE.— Similar to female except frons rather strongly, uniformly convex, often with a moderate, transverse impression below, more coarsely, less closely punctured, vestiture short, inconspicuous; declivital sulcus very slightly deeper.

DISTRIBUTION.— Alaska and Manitoba to California and Arizona.

ALASKA: Hope, Richardson Highway mile 295. CANADA: **British Columbia**: Hixon, Merritt in Midday Valley. **Manitoba**: Winnipeg. **New Brunswick**: Nictor Lake. **Northwest Territories**: Aklavik, Reindeer Depot. **Ontario**: Frater. USA: **Arizona**: Prescott N.F. **California**: Shell Ridge at Walnut Creek in Contra Costa Co. **Colorado**: Clyde, Gould, Grand Lake, Pingree Park, Pitkin. **Idaho**: Payette N.F., Smith's Ferry. **Montana**: Bozeman, Glacier N.P., Sula. **Nevada**: Bear Creek Summit in Elko Co., Mt. Wheeler. **Oregon**: East Lake, Grant Co., Ochoco N.F., Pringle Falls near Bend, Blue Mts. **Utah**: Elk Park in Ashley N.F., Convulsion area in Fishlake N.F., Hoop Lake in Wasatch N.F., Huntington Canyon, Logan Canyon, Sanford Canyon in Dixie N.F., Wolf Creek Pass. **Washington**: Metaline Falls. **Wyoming**: Atlantic City, Bighorn Mts., Elk Mt., Frontier Creek in Shoshone N.F., Laramie, Moran in Bridger N.F., Mountain View, Saratoga, Shoshone River, Tensleep.

HOSTS.— *Picea glauca, P. engelmannii, P. pungens, Pinus albicaulis, P. contorta, P. flexilis, P. ponderosa, P. radiata.*

BIOLOGY.— This species has been taken in branches 1–4 cm in diameter, but it occurs much more commonly in the bole of small trees up to 20 cm in diameter. Males are rare in most areas.

NOTES.— The above treatment was based on the holotypes of *murrayanae, elongatus, gracilis, cutleri, exilis, tenuis, depygis, watsoni,* and *acceptus,* on several paratypes of *aurulentus,* and on more than 2000 other specimens.

The large number of synonyms calls attention to the extreme variability of the female frons in this species. This variability is somewhat comparable to that seen in *carniceps* LeConte and allied species and in *Ips tridens* (Mannerheim). The rarity of males and the variability of the female frons suggests the occurrence of a form of facultative parthenogenesis in at least some of the populations.

### 147. *Pityophthorus consimilis* LeConte

*Pityophthorus consimilis* LeConte, 1878, Proc. Amer. Philos. Soc. 17:622 (Lectotype, male; Marquette, Michigan; Mus. Comp. Zool., designated by Bright, 1976, Coleopt. Bull. 30:185)

*Pityophthorus granulatus* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):28 (Lectotype, male; presumably Manitoba, Quebec, or Nova Scotia; Canadian Nat. Coll., 3149, designated by Bright, 1967, Canadian Ent. 99:678); Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:132. *Synonymy*

*Pityophthorus nudus* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):30 (Lectotype, male; Ste. Anne de Bellvue, Quebec; Canadian Nat. Coll., 3148, designated by Bright, 1967, Canadian Ent. 99:678); Wood, 1977, Great Basin Nat. 37:515. *Synonymy*

DIAGNOSIS.— This species is distinguished from *annectens* LeConte by the less extensively flattened female frons with very short to obsolete vestiture and by the less strongly sulcate declivity.

FEMALE.— Length 1.3–1.7 mm, 2.9 times as long as wide; color yellowish to dark reddish brown.

Frons varying from rather strongly, evenly convex, with a weak, transverse impression immediately above epistoma to flattened on lower two-thirds; surface shining, very densely, coarsely, deeply punctured, interspaces equal in width to less than half diameter of a puncture; glabrous to very finely pubescent on lower two-thirds, setae equal in length to less than one-fifth distance between eyes.

Pronotum 1.1 times as long as wide; widest on basal third, sides on basal two-thirds weakly arcuate, converging slightly, rather broadly rounded in front; anterior margin armed by 10–12 low serrations; summit at middle, distinct; posterior areas smooth, shining, punctures rather fine, moderately abundant. Disc glabrous, inconspicuous, short setae on margins and asperate area.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather abruptly

rounded at base of declivity, rather strongly acuminate at apex; striae not impressed except 1 slightly near declivity, punctures in rows, moderately coarse, rather deep; interstriae almost smooth to minutely irregular, impunctate, one to one and one-half times as wide as striae. Declivity steep, rather strongly bisulcate; striae 1 obsolete, 2 with minute, widely spaced punctures; interstriae 1 moderately elevated, armed by a sparse row of fine tubercles, 2 moderately impressed, more than twice as wide as 1, impunctate, almost smooth, 3 rounded, as high as 1, with fine tubercles as on 1. Vestiture of sparse, short hair on odd-numbered interstriae on and near declivity, sometimes glabrous.

MALE.— Similar to female except transverse impression on lower half of frons usually stronger, sometimes with a transverse median callus at upper level of eyes.

DISTRIBUTION.— NE British Columbia and Nova Scotia to E Texas and Florida.

CANADA: Alberta, British Columbia (158 mi House, Alaska Highway), Manitoba, Nova Scotia, Ontario, Quebec, Saskatchewan. USA: Florida, Georgia, Kentucky, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Mississippi, New Hampshire, New York, North Carolina, Ohio, Virginia, West Virginia, Wisconsin.

HOSTS.— *Picea glauca*, *P.* sp., *Pinus banksiana*, *P. resinosa*, *P. rigida*, *P. strobus*, *P. virginiana*, *P.* spp.

BIOLOGY.— They breed in twigs and branches up to 2 cm in diameter.

NOTES.— The above treatment was based on the syntypes of *consimilis*, on the lectotypes of *granulatus* and *nudus*, and on 382 other specimens.

### 148. *Pityophthorus intentus* Bright

*Pityophthorus intentus* Bright, 1978, Great Basin Nat. 38:77 (Holotype, female; Bear Canyon in Santa Catalina Mts., Arizona; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *consimilis* LeConte by characters of the frons and elytral declivity as described below.

FEMALE.— Length 1.4–1.7 mm, 2.7 times as long as wide; color yellowish brown.

Frons strongly convex above, flattened on lower half of area below upper level of eyes; surface smooth, shining, coarsely punctured; vestiture sparse, short, inconspicuous.

Pronotum and elytra as in *consimilis* except declivital sulcus slightly deeper, interstriae 1 and 3 each armed by about four pointed tubercles (much larger than in *consimilis*), setae on odd-numbered declivital interstriae much longer.

MALE.— Similar to female except frons usually with a conspicuous transverse carina at upper level of eyes, impression on lower frons stronger, minute setae on declivity rather stout, much more conspicuous.

DISTRIBUTION.— Arizona.

USA: Arizona: Bear Canyon in Santa Catalina Mts., 15-VIII-68, *Pinus engelmannii*, D. E. Bright; Santa Rita Mts., 29-VII-68, *Pinus strobiformis*, *Pseudotsuga menziesii*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 18 specimens.

### 149. *Pityophthorus pullus* (Zimmermann)

Fig. 207

*Cyrpturgus pullus* Zimermann, 1868, Trans. Amer. Ent. Soc. 2:143 (Holotype, female; South Carolina; Mus. Comp. Zool.); Bright, 1976, Coleopt. Bull. 30:187 (Lectotype?)

*Cryphalus pullus*: LeConte, 1868, Trans. Amer. Ent. Soc. 2:155

*Pityophthorus pullus*: LeConte, 1876, Proc. Amer. Philos. Soc. 15:352

*Pityophthorus cribripennis* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:274 (Holotype, sex?; America septentr.; apparently lost with Hamburg Mus.; Neotype, sex?; Ripley, Mississippi; U.S. Nat. Mus., designated by Bright, 1978, Great Basin Nat. 38:72); Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:119. *Synonymy*

*Pityophthorus bisulcatus* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:274 (Holotype, sex?; America borealis; apparently lost with Hamburg Mus.); LeConte, 1876, Proc. Amer. Philos. Soc. 15:352. *Synonymy*

DIAGNOSIS.— This species is distinguished from *grandis* Blackman by the smaller average size, by the more weakly, transversely impressed frons, by the finer frontal sculpture, by the steeper, narrower declivital sulcus, and by the distribution.

FEMALE.— Length 1.8–2.6 mm, 2.9 times as long as wide; color reddish brown.

Frons shallowly, transversely impressed from epistoma to upper level of eyes, a conspicuous transverse carina at upper level of eyes on median half; surface smooth, brightly shining, punctures moderately coarse, rather close; vestiture rather sparse, of moderate length.

Pronotum 1.1 times as long as wide; widest at base, sides on basal half almost straight, converging slightly, broadly rounded in front;

anterior margin armed by about 10–14 serrations; summit slightly elevated, slightly in front of middle; posterior areas smooth, shining, with numerous impressed points, punctures moderately coarse, rather close. Vestiture short, rather sparse, often absent on discal area.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather abruptly rounded, then obtusely subacuminate at apex; striae not impressed, punctures rather coarse, deep, moderately to rather strongly confused, interstriae not distinguishable on most specimens. Declivity very steep, rather strongly bisulcate; striae 1 and 2 indicated by rows of fine punctures; interstriae 1 moderately elevated, with a few, fine, irregularly spaced granules, 2 almost twice as wide as 1 below, narrower above, rather strongly, broadly impressed, surface indistinctly to strongly reticulate, impunctate, 3 very slightly higher than suture on upper half, rounded, armed by 4–6 fine tubercles. Vestiture rather short on disc, twice as long on declivity, moderately abundant, absent on declivital interstriae 2.

MALE.— Similar to female except usually slightly smaller, frontal vestiture shorter, less abundant.

DISTRIBUTION.— Michigan and New York to E Texas and South Carolina.

USA: **District of Columbia**: Washington. **Maryland**: "Md." **Massachusetts**: "Mass." **Michigan**: "Michigan." **Mississippi**: Corinth, Iuka, Ripley. **New Jersey**: Clemonton. **New York**: Greenwood Lake. **North Carolina**: Asheville, Boardman, Chadburn, Durham, Raleigh, Tryon. **Pennsylvania**: Hunters Run. **South Carolina**: Columbia. **Texas**: Call, Kirbyville. **West Virginia**: Dellslow, Charleston, Doddridge Co., Hampshire Co., Roosevelt, Wood Co.

HOSTS.— *Pinus* spp.

NOTES.— The above treatment was based on a specimen of *cribripennis* compared to the type by Eggers (Bright's neotype) and on 272 other specimens. The lectotype of *pullus* was not examined.

### 150. *Pityophthorus grandis* Blackman

*Pityophthorus grandis* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:119 (Holotype, sex?; Kaibab National Forest, Arizona; U.S. Nat. Mus., 41312)

DIAGNOSIS.— This species is distinguished from *pullus* (Zimmermann) by the slightly larger average size, by the more strongly impressed, more coarsely sculptured frons, by the more broadly sulcate elytral declivity, and by other characters.

FEMALE.— Length 2.3–3.1 mm, 2.9 times as long as wide; color dark reddish brown.

Frons as in *pullus* except more strongly impressed, punctures slightly coarser, closer, vestiture less abundant, shorter.

Pronotum as in *pullus* except anterior margin slightly more narrowly rounded.

Elytra as in *pullus* except declivital sulcus wider, three times as wide as interstriae 1 near middle, less strongly narrowed above. Vestiture shorter, less abundant on disc.

MALE.— Similar to female except frontal carina longer, frontal vestiture shorter, less abundant.

DISTRIBUTION.— British Columbia and South Dakota to Arizona and New Mexico.

CANADA: **British Columbia**: Grand Forks, Merritt in Midday Valley. USA: **Arizona**: Kaibab N.F., Prescott. **California**: McCloud. **Colorado**: Colorado N.F., Colorado Springs, Ft. Garland. **Nebraska**: Norden. **New Mexico**: Meek, Sandia Mts. **South Dakota**: Black Hills, Custer. **Utah**: La Sal Mts., Long Hollow in Dixie N.F. **Wyoming**: Buckeye.

HOST.— *Pinus ponderosa.*

BIOLOGY.— Specimens were taken from shaded out or broken branches and seedlings 3–8 cm in diameter. It evidently does not occur in slash.

NOTES.— The above treatment was based on the holotype and on 409 other specimens.

### 151. *Pityophthorus serratus* Swaine

*Pityophthorus serratus* Swaine, 1918, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(2):103 (Holotype, male; Barkhouse Creek, Siskiyou Co., California; Canadian Nat. Coll., 1374)

DIAGNOSIS.— This rare species is distinguished from *confertus* Swaine by the very strongly sulcate declivity, with the suture unarmed and the subacutely elevated lateral convexities armed by about 10 moderately coarse tubercles and considerably higher than the suture.

FEMALE.— Length 2.1–2.2 mm, 3.0 times as long as wide; color reddish brown.

Frons plano-convex almost from eye to eye, from epistoma to vertex, epistomal process obscure or absent; surface smooth, shining, finely, closely, uniformly punctured,

punctures spaced by slightly less than diameter of a puncture; vestiture of fine, long, moderately abundant hair, setae on upper and lateral margins much longer, longest setae equal to more than half distance between eyes.

Pronotum 1.1 times as long as wide; essentially as in *confertus*.

Elytra 1.9 times as long as wide, 1.7 times as long as elytra; sides almost straight and parallel on basal three-fourths, abruptly rounded, rather narrowly subacuminate behind; striae not impressed, punctures varying from feebly to moderately confused, moderately coarse, rather deep. Declivity steep, very strongly sulcate; punctures on striae 1 and 2 minute, many obscure; interstriae 1 rather weakly, narrowly elevated, unarmed, 2 very broad, ascending on lateral half, four times as wide as 1, shining, almost smooth, 3 on upper two-thirds very strongly, subacutely elevated; considerably higher than suture, armed by 8–10 rather coarse tubercles. Vestiture of moderately long strial and interstrial setae from base to declivity, much longer on declivity except minute on interstriae 1 and absent on 2.

MALE.— Similar to female except frons transversely impressed, a transverse carina at upper level of eyes, more coarsely punctured, vestiture sparse, inconspicuous; row of setae on crest of declivital elevation shorter and very strongly compressed.

DISTRIBUTION.— British Columbia and Idaho to N California.

CANADA: **British Columbia**: Aspen Grove, 16-VIII-31, 17360 Lot 50, *Pinus ponderosa*, H. Richmond; Merritt, Midday Valley, 17-VIII-22, lot 900–1705, *P. ponderosa*, V. Cutler. USA: **California**: Barkhouse Creek, Siskiyou Co., No. 2933, *P. ponderosa*, R. Hopping; McCloud, 27-X-72, sticky trap, H. A. Moeck. **Idaho**: Viola Grade near Moscow, 23-IV-52, 1000 m, W. F. Barr.

HOST.— *Pinus ponderosa*.

NOTES.— The above treatment was based on the holotype and on nine other specimens.

### 152. *Pityophthorus confertus* Swaine

*Pityophthorus confertus* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):27 (Lectotype, female; Adams Lake, British Columbia; Canadian Nat. Coll., 1375, designated by Bright, 1967, Canadian Ent. 99:678)

*Pityophthorus agnatus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:125 (Holotype, female; Cloudcroft, New Mexico; U.S. Nat. Mus., 41316); Wood, 1977, Great Basin Nat. 37:514. *Synonymy*

*Pityophthorus comptus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:127 (Holotype, female; Santa Catalina Mts., Arizona; U.S. Nat. Mus., 41317); Wood, 1977, Great Basin Nat. 37:514. *Synonymy*

*Pityophthorus burkei* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:129 (Holotype, female; Meyers, California; U.S. Nat. Mus., 41319); Bright, 1966, Pan Pacific Ent. 42:304. *Synonymy*

DIAGNOSIS.— This common species is distinguished from *serratus* Swaine by the stouter body form and by the less strongly sulcate declivity, with interstriae 1 as high as 3 and each armed by about six fine tubercles.

FEMALE.— Length 1.8–2.3 mm, 2.8–2.9 times as long as wide; color very dark brown.

Frons flat to plano-concave, impression confined to central half, epistomal process conspicuous; surface smooth, shining, punctures moderately coarse, almost uniformly distributed, spaced by slightly less than diameter of a puncture; vestiture fine, uniformly distributed, moderately long in central area, much longer on margins.

Pronotum 1.1 times as long as wide; outline as in *pullus* (Zimmermann) except anterior margin armed by about eight serrations; posterior areas smooth, shining, impressed points obscure to absent; median line impunctate; punctures rather coarse, deep, moderately close. Vestiture inconspicuous, confined to margins.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, obtusely subacuminate behind; discal punctures rather coarse, deep, moderately to very strongly confused. Declivity steep, bisulcate; punctures on striae 1 and 2 minute, mostly distinct; interstriae 1 moderately elevated, armed by a row of about eight fine denticles, 2 broadly, rather strongly impressed, almost smooth, about three times as wide as 1, 3 rounded, as high as 1, armed by about six small tubercles. Vestiture varying from subglabrous to moderately abundant from base to apex; rather short on disc, up to three times as long on declivity.

MALE.— Similar to female except frons transversely impressed below a conspicuous, transverse carina at upper level of eyes,

surface coarsely punctured, vestiture sparse, short.

DISTRIBUTION.— British Columbia and Montana to Baja California and Hidalgo.

CANADA: British Columbia (Creston, Terrace). USA: Arizona, California, Colorado, Idaho, Montana (western), Nevada, New Mexico, Oregon, Texas (western), Utah, Washington, Wyoming. MEXICO: Baja California, Chihuahua, Hidalgo, Nuevo León.

HOSTS.— *Pinus albicollis*, *P. cembroides*, *P. contorta*, *P. edulis*, *P. flexilis*, *P. jeffreyi*, *P. monticola*, *P. ponderosa*, *P. strobiformis*.

BIOLOGY.— This common species infests tops, limbs, and seedlings and is particularly abundant in slash.

NOTES.— The above treatment was based on the lectotype of *confertus*, on the holotypes of *agnatus*, *burkei*, and *comptus*, and on 3088 other specimens.

### 153. *Pityophthorus clarus* Blackman

*Pityophthorus clarus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:130 (Holotype, female; Kaibab N.F., Arizona; U.S. Nat. Mus., 41320)

DIAGNOSIS.— This species is distinguished from *murrayanae* Blackman by the less slender body, by the rather coarsely punctured declivital striae 1 and 2, by the very different frons, and by other characters.

FEMALE.— Length 1.8–2.1 mm, 2.8 times as long as wide; color reddish brown.

Frons flat to transversely, weakly concave, longitudinally very feebly concave to upper level of eyes, a small, conspicuous, median callus at upper level of eyes, surface smooth, shining, punctures rather coarse, close, uniformly distributed except impunctate on a small median area above epistoma; vestiture very fine, of moderate abundance, rather short in central area of moderate length on margins, longest setae equal in length to one-third distance between eyes.

Pronotum 1.9 times as long as wide; about as in *murrayanae*.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; outline and disc about as in *murrayanae* except surface smoother. Declivity similar to *murrayanae* except steeper, striae 1 and 2 rather coarsely punctured, interstriae 2 slightly more strongly impressed.

MALE.— Similar to female except frons rather strongly, transversely impressed from epistoma to upper level of eyes, upper margin transversely subcarinate, surface more coarsely punctured, vestiture short, inconspicuous.

DISTRIBUTION.— Arizona.

USA: Arizona: Kaibab N.F., 10-VIII-25, K-113 and K-114, and 17-VIII-25, K-126, *Pinus ponderosa*, M. W. Blackman; Flagstaff, Hopk. U.S. 5073a; Prescott, 18-VII-30, *P. ponderosa*, M. W. Blackman.

HOST.— *Pinus ponderosa*.

NOTES.— The above treatment was based on the holotype, on 64 paratypes, and on 4 other specimens.

### 154. *Pityophthorus solatus* Wood

*Pityophthorus solatus* Wood, 1977, Great Basin Nat. 37:215 (Holotype, female; 51 miles or 81 km NW Oaxaca, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *solers* Blackman by the different frons and elytra as described below.

FEMALE.— Length 1.9–2.2 mm, 2.7 times as long as wide; color very dark brown.

Frons similar to *solers* except planoconvex, punctured pubescent area extending to well above eyes, vestiture slightly more abundant and longer.

Pronotum and elytra as in *solers* except surface of elytral disc smoother, declivital sulcus slightly wider and deeper, its surface more nearly microreticulate, declivital vestiture distinctly longer.

MALE.— Similar to female except frons as in male *solers*, declivity similar to male *solers* except sulcus narrower, lateral elevation distinctly higher.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 81 km NW Oaxaca, 10-V-71, 7500 ft., *Quercus*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 14 specimens. The host recorded for the type series appears to be either accidental or in error; all allied species are in coniferous hosts.

### 155. *Pityophthorus solers* Blackman

*Pityophthorus solers* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:138 (Holotype, female; Cloudcroft, New Mexico; U.S. Nat. Mus., 41323)

DIAGNOSIS.— This species is distinguished from *clarus* Blackman by the darker color, by the minutely punctured declivital striae 1 and 2, and by the very different frons in both sexes.

FEMALE.— Length 1.5–2.1 mm, 2.7 times as long as wide; color very dark brown.

Frons plano-convex to slightly above eyes, epistomal margin distinctly elevated; surface smooth, shining, punctures rather small, moderately close, slightly more concentrated in marginal areas; vestiture rather sparse, moderately long, of about uniform length.

Pronotum 1.13 times as long as wide; about as in *clarus* except anterior margin more strongly rounded and discal punctures slightly larger.

Elytra as in *clarus* except declivity not as steep, declivital striae obsolete, 2 finely punctured.

MALE.— Similar to female except frons rather strongly, transversely impressed from epistoma almost to upper level of eyes, a strongly elevated transverse carina at upper level of eyes, surface coarsely punctured, subglabrous; declivity slightly more strongly impressed, tubercles on interstriae 1 and 3 slightly larger.

DISTRIBUTION.— Utah to Chihuahua.

USA: **Arizona**: Alpine, Chiricahua Mts., Flagstaff, Graham Mts., Huachuca Mts., Jacob's Lake, Kaibab N.F., Pinelino Mts., Prescott, Santa Catalina Mts., Walker. **New Mexico**: Capitan Mts., Cloudcroft, Emory Pass, Meek, Sacramento Mts. **Utah**: Alta, Mt. Nebo Loop, Parowan Canyon, Payson Canyon, Tooele. MEXICO: **Chihuahua**: San Juanito. **Nuevo León**: Cerro Potosí.

HOSTS.— *Abies concolor*, uncommon in *A. lasiocara*, *A. religiosa*, *Pseudotsuga menziesii*, and *Pinus*.

BIOLOGY.— This species breeds in small branches.

NOTES.— The above treatment was based on the holotype and on 506 other specimens.

### 156. *Pityophthorus bassetti* Blackman

*Pityophthorus bassetti* Blackman, 1920, Psyche 27:1 (Lectotype, male; Pitkin, Colorado; U.S. Nat. Mus., designated by Bright, 1976, Coleopt. Bull. 30:183)

DIAGNOSIS.— This species is distinguished from *solers* Blackman by the very different female frons, by the color, by the unarmed declivital interstriae 1, and by the much deeper male declivity. Declivital interstriae 3 is much higher than 1.

FEMALE.— Length 1.8–2.4 mm, 2.9 times as long as wide; color reddish brown.

Frons rather broadly plano-convex to well above eyes, lower fourth ascending toward epistomal margin; surface smooth, shining, punctures very fine, rather dense, each with upper rim very minutely granulate; vestiture moderately abundant, very long, longest setae equal to slightly more than one-third distance between eyes.

Pronotum and elytral disc essentially as in *solers*. Declivity about as in *murrayanae* Blackman except much more strongly impressed, striae 1 and 2 almost obsolete; interstriae 1 rather weakly to moderately elevated, usually unarmed except for two or three fine granules near apex (occasionally with more granules), 2 very strongly sulcate and three times as wide as 1, 3 abruptly, rather strongly elevated, conspicuously higher than 1, with a row of fine granules. Strial and interstrial setae minute.

MALE.— Similar to female except frons strongly impressed from epistoma to upper level of eyes, a strongly elevated, transverse carina at upper level of eyes, surface coarsely punctured, vestiture short, inconspicuous; declivity more strongly impressed, interstriae usually without any granules, 3 with a row of 10–12 rather coarse tubercles, interstrial setae on declivity rather long.

DISTRIBUTION.— Northwest Territories to Chihuahua.

CANADA: **Northwest Territories**: Aklavik, 10-V, 5-IX-31, O. Bryant. USA: **Colorado**: Pingree Park in Larimer Co., 14-VI-68, *Picea pungens*, S. L. Wood; Ft. Garland; 25-IV, *Picea*; *Pitkin*, 3-VIII-17, lot 360, R. Bassett. **Utah**: Logan Canyon, 24-VII-46, *P. engelmannii*, S. L. Wood; McKee Draw in Ashley N.F., 16-VI-60, *P. pungens*, S. L. Wood. **Chihuahua**: La Laja, 16-VII-60, *Picea chihuahuana*, S. L. Wood.

HOSTS.— *Picea chihuahuana*, *P. glauca*, *P. engelmannii*, *P. pungens*.

BIOLOGY.— Specimens were taken from shaded-out branches 2–6 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 269 other specimens.

### 157. *Pityophthorus delicatus* Wood

*Pityophthorus delicatus* Wood, 1978, Great Basin Nat. 38:399 (Holotype, female, 35 miles or 56 km SW El Salto, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *cacuminatus* Blandford by the larger size, by the much more finely punctured subconcave female frons, by the sparsely punctured discal interstriae 1 and 3, and by other characters indicated below.

FEMALE.— Length 1.7–2.2 mm, 3.0 times as long as wide; color reddish brown.

Frons broadly, shallowly subconcave from epistomal margin to well above upper level of eyes, margins abrupt, about two diameters of a facet from margin of eye; surface smooth, shining, very finely, somewhat closely punctured, interspaces two or more times diameter of a puncture; vestiture abundant, rather long in central area, conspicuously longer on margins, longest setae equal in length to two-thirds distance between eyes.

Pronotum 1.14 times as long as wide; outline as in allied species; posterior areas shining, subreticulate, punctures fine, those on disc with a fine granule on lateral rim.

Elytra 1.9 times as long as wide, 1.7 times as long as pronotum; outline and disc about as in *cacuminatus* Blandford except interstriae 1 and 3 with sparse punctures. Declivity steep, moderately bisulcate, moderately acuminate behind; striae 1 and 2 rather finely punctured; interstriae 1 moderately elevated, armed by a row of fine tubercles, 2 moderately impressed, twice as wide as 1, smooth, shining, 3 rather narrowly convex, armed as on 1. Vestiture of fine, short, strial hair to base, odd-numbered interstriae on and near declivity with rather sparse, moderately long setae.

MALE.— Similar to female except frons shallowly, transversely impressed from epistoma to upper level of eyes, upper margin of impressed area with a short, transverse callus or carina, surface rather coarsely punctured, vestiture inconspicuous; declivity more strongly impressed, tubercles distinctly larger.

DISTRIBUTION.— Chihuahua to Honduras.

MEXICO: **Chihuahua**: La Magdalena, 26-IV-77, Hopk. 60601-D, M. M. Furniss. **Durango**: 40, 48, and 60 km W Durango, El Salto. **Mexico**: Apizaco-Mexico km 49. **Michoacán**: Carapan, Volcán Parícutin. GUATEMALA: Huehuetenango, Putzum. HONDURAS: Tegucigalpa.

HOSTS.— *Pinus leiophylla*, *P. pseudostrobus*, *P. tenuifolia*, *P.* spp.

BIOLOGY.— Specimens were taken from branches.

NOTES.— The above treatment was based on the type series of 46 specimens.

### 158. *Pityophthorus arcanus* Bright

*Pityophthorus arcanus* Bright, 1976, Great Basin Nat. 36:429 (Holotype, female; Bear Canyon, Santa Catalina Mts., Arizona; Canadian Nat. Coll.)

DIAGNOSIS.— This species has the pronotal asperities in somewhat subconcentric rows, but because of the abundant female frontal vestiture it is grouped with those having confused asperities. It is distinguished from *delicatus* Wood by the arrangement of the pronotal asperities, by the flat frons with the punctures slightly larger and much closer, and by the more broadly, more deeply impressed elytral declivity.

FEMALE.— Length 1.7–2.4 mm, 2.9 times as long as wide; color dark reddish brown.

Frons plano-convex from epistoma to slightly above upper level of eyes, surface smooth, shining, densely, rather coarsely punctured, interspaces equal to less than half diameter of a puncture; vestiture rather long, abundant, only slightly longer on margins.

Pronotum and elytral disc about as in *jeffreyi* Blackman except pronotal asperities slightly less concentric and odd-numbered discal interstriae each with a row of fine punctures. Elytral declivity broadly, rather deeply sulcate; striae 1 and 2 with reduced punctures; interstriae 1 distinctly elevated, with a few small tubercles, 2 three times as wide as 1, its surface subreticulate, 3 distinctly higher than 1, its summit armed by three or four small tubercles. Vestiture largely confined to declivity, consisting of sparse, long hair on odd-numbered interstriae.

MALE.— Similar to female except frons transversely impressed to upper level of eyes, rather coarsely punctured, an acutely elevated, transverse carina at upper level of eyes.

DISTRIBUTION.— Nevada to Arizona and W Texas.

USA: **Arizona**: 12 miles or 18 km N Sedonia, Coconino Co., 13-VIII-68, *Pinus ponderosa*, D. E. Bright; Bear Canyon, Santa Catalina Mts., 15-VIII-68, *P. cembroides*, D. E. Bright; Walker, Yavapai, 23-VIII-68, *Pseudotsuga menziesii*, D. E. Bright. **Nevada**: Kyle Canyon in Toyabe N.F., Clark Co., 10-VI-69, *Pinus monophylla*, W. G. Harwood. **Texas**: Madera Canyon in Davis Co., 19-VII-74, *P. ponderosa*, D. E. Bright.

NOTES.— The above treatment was based on the holotype and on 57 paratypes.

### 159. *Pityophthorus zonalis* Bright

*Pityophthorus zonalis* Bright, 1976, Great Basin Nat. 36:443 (Holotype, female; Jerome, Arizona; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from *cuspidatus* Blackman by the very long, dense, female frontal vestiture, by the more coarsely punctured pronotal disc, by the coarser strial punctures on disc and declivity, and by the narrower declivital interstriae 2.

FEMALE.— Length 2.2 mm, 3.0 times as long as wide; color dark brown.

Frons largely concealed by very dense, very long vestiture, length of setae equal to at least four-fifths distance between eyes.

Pronotum and elytral disc as in *cuspidatus* (strial punctures in definite rows) except declivity slightly steeper, sulcus moderately deep, punctures on striae 1 and 2 moderately large, impressed, sutural profile convex, interstriae 1 and 3 armed by tubercles.

MALE.— Similar to female except frons weakly impressed, coarsely punctured, transverse carina at upper level of eyes weak; punctures on discal striae 1 and 2 slightly confused.

DISTRIBUTION.— Arizona and Nuevo León.

USA: **Arizona**: Jerome, 22-XI-35, *Pinus ponderosa*. MEXICO: **Nuevo León**: 24 km E San Roberto, 5-V-71, *P. cembroides*, D. E. Bright.

NOTES.— The above treatment was based on the holotype and on a male from Nuevo León that is presumed to be this species.

### 160. *Pityophthorus cuspidatus* Blackman

*Pityophthorus cuspidatus* Blackman, 1942, Proc. U.S. Nat. Mus. 92:217 (Holotype, female; Jacala, Hidalgo, Mexico; U.S. Nat. Mus., 55991)

DIAGNOSIS.— This species is distinguished from *cacuminatus* Blandford by the very different frons in both sexes, by the deeper, more broadly impressed declivital sulcus, and by other characters indicated below.

FEMALE.— Length 1.7–2.3 mm, 3.2 times as long as wide; color reddish brown.

Frons plano-convex from epistoma to slightly above upper level of eyes, margins rounded, about four diameters of a facet from margin of eye; surface smooth, shining, rather coarsely, closely punctured, interspaces averaging slightly more than half diameter of a puncture; vestiture somewhat sparse, rather long, distinctly longer on margins, longest setae equal in length to slightly more than half distance between eyes.

Pronotum 1.15 times as long as wide; outline as in allied species; posterior areas smooth, shining, with obscure, minute, impressed points indicated, punctures rather coarse, moderately close.

Elytra 2.0 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on basal three-fourths, strongly acuminate behind; striae not impressed except 1 slightly near declivity, punctures rather coarse, deep, in rows; interstriae smooth, shining, impunctate. Declivity steep, rather strongly sulcate, strongly acuminate at apex; striae 1 obsolete, 2 rather finely punctured; interstriae 1 moderately elevated, armed by a row of fine tubercles, 2 strongly impressed, twice as wide as 1, subreticulate, 3 moderately elevated, armed by a row of rather coarse tubercles, as high or very slightly higher than suture on upper half. Vestiture restricted to declivity on odd-numbered interstriae, moderately long.

MALE.— Similar to female except frons as in male *delicatus*; declivity more strongly impressed, tubercles slightly larger, interstriae 3 distinctly higher than suture.

DISTRIBUTION.— Durango to Veracruz.

MEXICO: **Durango**: Durango, 37 and 96 km W Durango, El Salto. **Hidalgo**: Jacala. **Mexico**: Tequesquinahua. **Puebla**: Texmelucan. **Veracruz**: Texcoco.

HOSTS.— *Pinus ayacahuite, P. lumholtzii.*

BIOLOGY.— Specimens were taken from small branches.

NOTES.— The above treatment was based on the holotype and on 41 other specimens.

### 161. *Pityophthorus acutus* Blackman

*Pityophthorus acutus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:134 (Holotype, female; Kaibab N.F., Arizona; U.S. Nat. Mus., 41321)

DIAGNOSIS.— This species is distinguished from *cuspidatus* Blackman by the larger average size, by the different frons in both sexes, by the more strongly impressed declivity within striae 2 obsolete, and by other characters mentioned below.

FEMALE.— Length 1.9–2.4 mm, 2.8 times as long as wide; color very dark brown.

Frons broadly plano-convex from epistoma to well above upper level of eyes, margins

obtusely subangulate, about three diameters of a facet from margin of eye; surface smooth, shining, closely, rather finely punctured, interspaces about equal to diameter of a puncture; vestiture moderately abundant, long, distinctly longer on margins.

Pronotum 1.13 times as long as wide; outline as in allied species; posterior area smooth, shining, finely to rather coarsely punctured (variable), moderately close. Vestiture confined to marginal and asperate areas.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; outline and disc about as in *cuspidatus*. Declivity steep, strongly bisulcate, strongly acuminate at apex; punctures on striae 1 and 2 obsolete, interstriae moderately elevated, armed by a row of rather coarse granules; 2 strongly impressed, three times as wide as 1, surface obscurely reticulate, 3 on upper half slightly higher than 1, with a row of moderately coarse tubercles. Vestiture of fine, short, strial hair to base and, on declivity, moderately long interstrial hair except absent on 2.

MALE.— Similar to female except frons transversely impressed from epistoma to upper level of eyes, upper margin of impression with a strongly elevated transverse carina, surface rather coarsely punctured, vestiture inconspicuous; serrations on anterior margin of pronotum slightly larger; declivital sulcus deeper.

DISTRIBUTION.— Utah and Colorado to Arizona and New Mexico.

USA: **Arizona**: Carr Canyon in Huachuca Mts., Rustler's Park in Chiricahua Mts., Flagstaff, Kaibab N.F., Oak Creek Canyon, Montezuma N.F., Santa Catalina Mts. **Colorado**: Colorado N.F., Estes Park. **New Mexico**: Clouderoft, Emory Pass, Meek. **Utah**: Sanford Canyon.

HOSTS.— *Pinus flexilis, Pinus strobiformis.*

BIOLOGY.— Specimens were taken from branches.

NOTES.— The above treatment was based on the holotype and on 111 other specimens.

### 162. *Pityophthorus spadix* Blackman

*Pityophthorus spadix* Blackman, 1942, U.S. Nat. Mus. 92:219 (Holotype, female; Río Frío, Puebla, Mexico; U.S. Nat. Mus., 55993)

DIAGNOSIS.— This species is distinguished from *acutus* Blackman by the larger size, by the (usually) confused elytral punctures, by the unarmed declivital interstriae 1, and by other characters.

FEMALE.— Length 2.3–3.0 mm, 2.9 times as long as wide; color dark brown.

Frons plano-convex to slightly above eyes, epistoma slightly elevated, lateral margins rounded, about four diameters of a facet from margin of eye; surface smooth, shining, very closely, uniformly, rather coarsely punctured; vestiture moderately abundant, uniformly distributed, long, a few longer setae on margins.

Pronotum 1.13 times as long as wide; outline as in *acutus*; posterior areas smooth, shining, punctures varying from small to moderately large; sparse vestiture limited to sides and asperate area.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; outline as in *acutus*; striae usually not evident, punctures moderately to strongly confused, rather coarse,

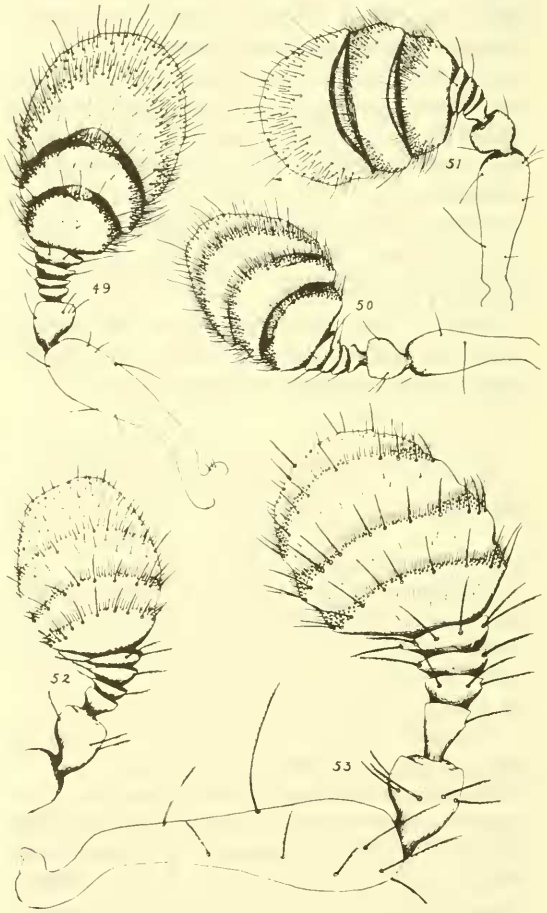



Fig. 208. Antennae of Corthylini spp.: 49, *Pseudopityophthorus pubipennis*; 50, *Pityotrichus barbatus*; 51, *Pityoborus comatus*; 52, *Pityophthorus ramiperda*; 53, *Conophthorus coniperda*. (After Blackman 1928:165.)

deep. Declivity steep, very strongly sulcate, apex strongly acuminate; striae 1 and 2 obsolete; interstriae 1 rather weakly elevated, unarmed (two or three fine tubercles sometimes present), 2 strongly impressed, twice as wide as 1, finely reticulate, 3 strongly, rather abruptly elevated on upper half, much higher than suture, armed by 6–8 rather coarse tubercles. Vestiture of fine, short strial hair to base, interstrial setae on posterior third of disc and lateral areas on declivity rather long, interstriae 1 and 2 glabrous.

MALE.— Similar to female except frons strongly, transversely impressed, a strongly elevated, transverse carina at upper level of eyes, surface smooth, shining, coarsely punctured, vestiture short, inconspicuous; declivital tubercles usually larger.

DISTRIBUTION.—Chihuahua to Veracruz and Oaxaca.

MEXICO: **Chihuahua**: San Juanito, 16-III-74, *Pinus*, Hopk 58591, M. M. Furniss. **Durango**: 17 km W El Salto, 7-VI-65, 2500 m, No. 39, *Pinus pseudostrobus*, S. L. Wood; 64 km W Durango, 4-VI-65, 2500 m, No. 20, *Pinus*, S. L. Wood. **Hidalgo**: 17 km NE Jacala, 23-VI-53, *Pinus*, S. L. Wood. **Mexico**: Tequesquinahua, III-62, R. Coronado. **Michoacán**: 9 km E Volcan Parícutin, 19-VI-65, 2500 m, No. 89, *Pinus*, S. L. Wood. **Puebla**: Río Frío, 10-II-36, *Pinus leiophylla*, 692-I, D. DeLeon. **Oaxaca**: Nochixtlán, 17-VI-67, No. 56, *Pinus*, S. L. Wood. **Veracruz**: Texcoco, 5-II-62, *Pinus*, R. Coronado.

HOSTS.— *Pinus pseudostrobus*, *P.* spp.

BIOLOGY.— Specimens were taken from shaded-out pine branches 2–7 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 34 other specimens.

### 163. *Pityophthorus rubidus* Wood

*Pityophthorus rubidus* Wood, 1978, Great Basin Nat. 38:400 (Holotype, female; Madera Canyon, Santa Rita Mts., Arizona; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *spadix* Blackman by the stouter body, by the reddish brown color, and by the confused discal punctures and the less strongly acuminate elytral apex and by other characters indicated below.

FEMALE.— Length 2.3–3.0 mm, 2.6 times as long as wide; color reddish brown.

Frons plano-convex to slightly above eyes, ascending toward epistoma on lower fifth, particularly on median third, margins rounded, about three diameters of a facet from margin of eye; surface smooth, shining, rather finely, closely, uniformly punctured, interspaces in central area equal in width to diameter of a puncture, less than half as great in marginal areas; vestiture of fine, moderately abundant long hair, longest setae about equal in length to half distance between eyes.

Pronotum 1.12 times as long as wide; widest at base, sides on posterior two-thirds feebly arcuate, moderately converging to rather narrowly rounded anterior margin; anterior margin armed by about 10–14 low serrations; summit at middle, rather high; posterior areas smooth, shining, with numerous impressed points, punctures coarse, deep, close. Glabrous on disc, sparse hair on sides and asperate area.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather abruptly rounded at base of declivity, strongly acuminate behind; striae 1 weakly impressed, rows obscurely visible, largely confused, punctures rather coarse, deep, close. Declivity very steep, rather strongly bisulcate, strongly acuminate at apex; striae 1 and 2 rather coarsely punctured; interstriae 1 moderately elevated, armed by a row of small tubercles, 2 twice as wide as 1, almost smooth, shining, impunctate, 3 on upper half slightly higher than 1, armed by 6–10 rather coarse, closely spaced tubercles. Vestiture on posterior third of disc and declivity long, moderately abundant on all interstriae.

MALE.— Similar to female except frons transversely impressed from epistoma to upper level of eyes, a strong, transverse carina at upper level of eyes, surface coarsely punctured, vestiture inconspicuous; declivital tubercles slightly larger.

DISTRIBUTION.— Arizona to Durango.

USA: **Arizona**: Madera Canyon, Santa Rita Mts., 1-VI-78, *Pinus engelmannii*, S. L. Wood. MEXICO: **Durango**: 35 km W Durango, 4-VI-65, 2000 m, No. 14, *Pinus leiophylla*, S. L. Wood; 40 km W Durango, 23-VII-53, *Pinus*, S. L. Wood.

NOTES.— The above treatment was based on the type series of 77 specimens.

### 164. *Pityophthorus megas* Bright

*Pityophthorus megas* Bright, 1976, Great Basin Nat. 36:436 (Holotype, female; Cerro Potosí, Nuevo León, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *spadix* Blackman by the larger size, by the slightly steeper, less strongly sulcate elytral declivity, and by the less strongly acuminate elytral apex.

FEMALE.— Length 2.7–3.7 mm, 3.0 times as long as wide; color very dark brown.

As in *spadix* except for elytral declivity. declivity as in *spadix* except slightly steeper, apex subacuminate, lateral convexities on upper half not as high, only slightly higher than suture, vestiture distinctly longer.

MALE.— Similar to female except frons about as in male *spadix* but with transverse impression deeper; declivital sulcus deeper and lateral convexities higher than in female.

DISTRIBUTION.— Nuevo León.

MEXICO: Nuevo León: Cerro Potosí, 4-V-71, 3800 m, *Pinus cumminicola*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 165. *Pityophthorus nemoralis* Wood

*Pityophthorus nemoralis* Wood, 1976, Great Basin Nat. 36:351 (Holotype, female, Zamorano, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *regularis* Blackman by the larger size, by the slightly impressed declivital interstriae 2, and by the larger interstrial granules on the declivity. These two are unique in having a row of normal setae on declivital interstriae 2.

FEMALE.— Length 1.4–1.8 mm, 2.6 times as long as wide; color dark brown.

Frons uniformly convex; rugose-reticulate above eyes and laterally, lower areas smooth, shining, punctures deep, rather coarse, moderately close; vestiture sparse, short, inconspicuous.

Pronotum 1.04 times as long as wide; widest one-third pronotum length from base, sides weakly arcuate on basal half, a slight constriction on anterior half, rather narrowly rounded in front; anterior margin armed by about 10 low, basally contiguous serrations; summit indefinite, at middle; asperities in three concentric rows supplemented by those at summit, rows a bit irregular on median third; posterior areas reticulate, punctures deep, rather fine, moderately close. Sparse setae confined to margins.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, then slightly, arcuately converging, very broadly rounded behind; striae not impressed except 1 slightly near declivity, punctures small, deep, spaced by about two diameters of a puncture; interstriae smooth, shining, with a few faint irregular lines, three times as wide as striae, impunctate except at margin of declivity. Declivity steep, rather shallowly sulcate; striae 1 moderately impressed, punctures on 1 and 2 distinct, smaller than on disc; interstriae 1 moderately elevated, 2 moderately impressed, more strongly on median side, 3 very slightly higher than 1, rounded, all with numerous impressed points, rows of tubercles on 1 very fine, 2 sometimes irregular, 3 slightly larger than on 1 and 2. Vestiture confined to declivity; strial setae very minute but usually present; interstrial setae erect, in regular rows including 2, each very slightly longer than distance between rows.

MALE.— Similar to female except serrations on anterior margin of pronotum and tubercles on declivity slightly larger.

DISTRIBUTION.— Honduras to Costa Rica.

HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 549, *Aristochia anguicida*, S. L. Wood. COSTA RICA: 8 km SE Cartago, Cartago, 1800 m, 29-VII-63 (No. 91), 2-VIII-63 (No. 100), liana, S. L. Wood.

NOTES.— The above treatment was based on the type series of 44 specimens.

### 166. *Pityophthorus concentralis* Eichhoff

*Pityophthorus concentralis* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:188 (Holotype, sex?; Cuba; apparently lost with Hamburg Mus.; Neotype, female; Biscayne, Florida; U.S. Nat. Mus., designated by Bright, 1978, Great Basin Nat. 38:72)

*Pityophthorus lateralis* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):27 (Lectotype, female; Key West, Florida; Cornell Univ., designated by Bright, 1967, Canadian Ent. 99:678); Wood, 1957, Canadian Ent. 89:401. *Synonymy*

DIAGNOSIS.— This species is distinguished from *nemoralis* Wood by the smooth, shining pronotal disc, by the row of punctures on discal interstriae 1, by the row of punctures on declivital interstriae 2, and by other characters indicated below.

FEMALE.— Length 1.3–1.5 mm, 2.8 times as long as wide; color yellowish brown.

Frons plano-convex to upper level of eyes, margins rounded; surface smooth, shining, rather finely, not closely punctured; vestiture fine, short, sparse.

Pronotum 1.13 times as long as wide; sides almost straight and subparallel on basal half, rather broadly rounded in front; anterior margin armed by about 12 serrations; summit at middle, distinct; anterior slope with three to four concentric rows of basally fused asperities; posterior areas smooth, shining, moderately numerous impressed points very minute, punctures rather coarse, deep, moderately close. Disc glabrous, a few short setae at sides; concentric rows of setae arise from posterior margins of asperities.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, very broadly rounded behind; striae not impressed except 1 slightly near declivity, punctures coarse, deep, close; interstriae as wide as striae, smooth, shining, 1 usually punctured to base, others with a few punctures at base of declivity. Declivity very steep, shallowly bisulcate; striae 1 and 2 rather coarsely punctured, 1 impressed; interstriae 1 abruptly, rather weakly elevated, with a row of fine punctures, 2 wider than 1, smooth, shining, ascending laterally, with a row of fine punctures, 3 convex, armed by a row of fine granules. Vestiture of fine short strial hair to base, and short to moderately long interstrial hair on and near declivity on all interstriae, those on declivital interstriae 1 and 2 short (sometimes short on entire declivity).

MALE.— Similar to female except frons more distinctly convex, with puncture larger.

DISTRIBUTION.— Florida to Cuba.

USA: **Florida**: Biscayne Bay, Dunedin, Everglades N.P., Key Vaca, Key West, Plantation Key, Royal Palm St. Pk., Stock Island, Sugar Loaf Key.

HOST.— *Metopium toxiferum*.

BIOLOGY.— This species was taken from the bole and larger branches.

NOTES.— The above treatment was based on the neotype of *concentralis*, on the holotype of *lateralis*, and on 133 other specimens.

### 167. *Pityophthorus coronarius* Blackman

*Pityophthorus coronarius* Blackman, 1942, Proc. U.S. Nat. Mus. 92:220 (Holotype, female; Jalisco, Mexico; U.S. Nat. Mus., 55994)

DIAGNOSIS.— This variable species is probably more closely allied to *mexicanus* Blackman than to those associated with it in the above key. The pronotal asperities vary from subconcentric to completely confused and the elytral apex is moderately acuminate. The reticulate pronotum and the host are useful in distinguishing it.

FEMALE.— Length 1.4–1.9 mm, 2.7 times as long as wide; color brown.

Frons broadly flattened from epistoma to well above upper level of eyes, usually weakly concave on upper half, ascending slightly toward median area of epistomal margin; surface smooth, shining, punctures very fine, almost uniformly distributed (slightly less abundant in central area), interspaces equal to 2–4 diameters of a puncture; vestiture uniformly distributed, rather long, distinctly longer on margins.

Pronotum 1.1 times as long as wide; outline as in *watsoni* Schedl; anterior margin armed by about 12 serrations; summit at middle, distinct; asperities on anterior slope usually confused, one to three partial rows in concentric arrangement sometimes present; posterior areas strongly reticulate, punctures rather fine, moderately abundant, several of those on anterior half of disc with a shining granule on their posterior rims. Vestiture short, sparse, inconspicuous.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; outline about as in *watsoni* except declivity much steeper, more strongly sulcate; striae not impressed except 1 near declivity, punctures in rows (occasionally very slightly confused), moderately coarse, deep; interstriae smooth, shining (slightly wrinkled in a few specimens), slightly wider than striae, impunctate except each with a few punctures or tubercles at base of declivity (including 2). Declivity very steep, rather strongly bisulcate; punctures on striae 1 obsolete, 2 rather coarsely, shallowly punctured; interstriae 1 rather abruptly, moderately elevated, armed by a sparse row of fine tubercles, 2 rather strongly impressed, almost twice as wide as 1, surface subshining, minutely irregular, impunctate, 3 as high or

very slightly higher than 1 on basal half, armed by about a half dozen fine tubercles, lateral areas with two or three similar tubercles on each interstriae. Vestiture largely confined to declivity, consisting of setae of moderate length on all interstriae except 2 on face.

MALE.— Similar to female except frons transversely impressed from epistoma to upper level of eyes, surface smooth, shining, rather coarsely, deeply punctured above, more finely below, vestiture fine, short, of moderate abundance; declivital sulcus slightly deeper, lateral tubercles slightly larger.

DISTRIBUTION.— Jalisco.

MEXICO: Jalisco: 23 km NW Guadalajara, 19-VII-53, 1600 m, shrub, S. L. Wood; intercepted at quarantine in *Sambucus* bark of a crate.

NOTES.— The above treatment was based on the type series of 65 specimens and on 17 other specimens.

### 168. *Pityophthorus concinnus* Wood

*Pityophthorus concinnus* Wood, 1977, Great Basin Nat. 37:214 (Holotype, female; intercepted at Nogales, Arizona, in wood from "Plaquepaque, Mexico"; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from *coronarius* Blackman by the larger size, by the more strongly impressed male frons, and by the longer, darker, more abundant setae on the female frons.

FEMALE.— Length 1.7–2.3 mm, 2.7 times as long as wide; color dark yellowish brown.

Frons similar to *coronarius* except a bit more strongly impressed, vestiture reddish brown, longer, much more abundant, longest setae equal in length to half distance between eyes.

Pronotum and elytra as in *coronarius* except lateral convexities on declivity conspicuously higher than suture.

MALE.— Similar to female except frons rather strongly impressed from epistoma to upper level of eyes, upper margin of impressed area marked by a conspicuous, transverse carina.

DISTRIBUTION."Mexico."

MEXICO: Intercepted at Nogales, Arizona, in unidentified wood from "Plaquepaque, Mexico," 21-X-41, Lot No. 41-18984; and "Mexico," 22-III-62, Crump Colr., in unidentified wood intercepted at Boston 27132, No. 62-11725.

NOTES.— The above treatment was based on the type series of 20 specimens.

### 169. *Pityophthorus jeffreyi* Blackman

*Pityophthorus jeffreyi* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:113 (Holotype, female; Inyo N.F., Bishop, California; U.S. Nat. Mus. 41311)

DIAGNOSIS.— The true affinities of this species and *barberi* Blackman probably lie nearer to *lecontei* Bright than to other species with concentric rows of pronotal asperities. It is distinguished from *barberi* by the regularly punctured discal interstriae, by the finer declivital granules, and by the very weak or obsolete male frontal carina.

FEMALE.— Length 1.7–1.9 mm, 2.6 times as long as wide; color dark reddish brown.

Frons somewhat flattened on median half from near epistoma to above eyes, sometimes transversely subcarinate at upper margin of impressed area; surface smooth, shining, rather coarsely, closely punctured; epistomal process indicated; vestiture fine, rather sparse, inconspicuous, consisting of a mixture of short and moderately long hair.

Pronotum 1.1 times as long as wide; widest near base, sides almost straight on basal half, converging very slightly, rather broadly rounded in front; anterior margin armed by about eight serrations; summit at middle, distinctly elevated; asperities in rather indefinite concentric rows, most rows broken at least once, some asperities independent, without bases fused (completely confused in some specimens); posterior areas smooth, shining, punctures rather coarse, close, deep. Vestiture confined to margins.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; striae not impressed, punctures in rows, fine, rather deep; interstriae smooth, shining, usually with numerous fine, short, impressed lines, slightly more than twice as wide as striae, punctures usually regularly spaced, almost as large as those of striae. Declivity steep, very shallow, rather broadly sulcate; striae 1 and 2 with punctures fine, shallow; interstriae 1 distinctly elevated, minute granules mostly obsolete, 2 twice as wide as 1, moderately impressed, surface subreticulate, impunctate, 3 as high as 1, armed by about six small tubercles. Vestiture of

short, erect strial and interstrial hair to base, up to twice as long on declivity.

MALE.— Similar to female except frontal impression more extensive, slightly deeper, carina more distinct; serrations on anterior margin of pronotum larger.

DISTRIBUTION.— California to Oregon.

USA: **California**: Bishop, Inyo Co., Hopk. US 8794i, J. D. Coffman; Myers Flat, Humboldt Co., F. B. Herbert; Old Station, Lassen Co., 29-X-47, S. L. Wood; Westgard Pass in Inyo Co., 6-IX-68, *P. aristata*, *P. monophylla*; all from *Pinus jeffreyi* except as noted. **Oregon**: Deschutes N.F., 19-IX-30, *P. ponderosa*, F. P. Keen; Klamath Falls, 1930, Hopk. U.S. 18189-c, *P. ponderosa*, F. P. Keen.

HOST.— *Pinus jeffreyi*, *P. ponderosa*, probably accidental in other hosts.

BIOLOGY.— Specimens were taken from shaded-out branches 2 cm in diameter on a tree about 10 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 28 other specimens.

### 170. *Pityophthorus barberi* Blackman

*Pityophthorus barberi* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:112 (Holotype, female; Las Vegas Hot Springs, New Mexico; U.S. Nat. Mus., 41310)

DIAGNOSIS.— This species is distinguished from *jeffreyi* Blackman by the almost impunctate discal interstriae, by the larger declivital granules, and by the strongly developed, transverse, male carina.

FEMALE.— Length 1.7–2.2 mm, 2.7 times as long as wide; color very dark reddish brown.

Frons about as in *jeffreyi* except flattened area less extensive, transverse carina at upper level of eyes much more strongly developed.

Pronotum as in *jeffreyi* except anterior margin usualy armed by 10 serrations; discal area sometimes indistinctly reticulate (variable).

Elytra similar to *jeffreyi* except surface often subreticulate or irregular, punctures larger, often slightly confused, even-numbered interstriae with few if any punctures, odd-numbered interstriae sparsely punctured. Declivity as in *jeffreyi* except surface reticulate, tubercles slightly larger. Vestiture of minute strial hair and moderately long interstrial hair; interstrial setae largely confined to odd-numbered declivital interstriae.

MALE.— Similar to female except lower frons transversely impressed, transverse carina strongly developed; serrations on anterior margin of pronotum larger.

DISTRIBUTION.— Utah and Colorado to Durango and Nuevo León.

USA: **Arizona**: Flagstaff, Carr Canyon in Cochise Co., Pinaleno Mts. **Colorado**: El Paso Co., Ft. Garland, Manitou. **New Mexico**: Aragon, Bingham Summit, Kingston, Lake Roberts, Las Vegas, Nogal Lake, Sandia Mts. **Utah**: Beaver, Gooseberry area of Fishlake N.F., Panguitch. MEXICO: **Durango**: 37 km W Durango. **Nuevo León**: San Roberto.

HOST.— *Pinus cembroides*, *P. edulis*.

BIOLOGY.— Specimens were taken from small shaded out and broken branches of living trees.

NOTES.— The above treatment was based on the holotype and on 248 other specimens.

### 171. *Pityophthorus torridus* Wood

*Pityophthorus torridus* Wood, 1971, Great Basin Nat. 31:76 (Holotype, female; 6 miles W High Rolls, Lincoln N.F., New Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *mexicanus* Blackman by the smaller size, by the darker color, by the less strongly acuminate elytral apex, and by other characters. It might be more easily confused with *franseriae* Wood, but the relationship is remote.

FEMALE.— Length 1.8–2.0 mm, 2.9 times as long as wide; color very dark reddish brown, almost black.

Frons broadly flattened from eye to eye, central half weakly concave; surface subshining, rather finely, uniformly, densely, deeply punctured; evenly, rather densely clothed by fine, long hair, setae near lateral and upper margins slightly longer.

Pronotum 1.1 times as long as wide; essentially as in *franseriae* Wood except anterior margin armed by 16 serrations and punctures in posterior areas finer.

Elytra 1.8 times as long as wide; sides straight and parallel on basal three-fourths, subacuminate behind; striae not impressed, punctures moderately coarse, deep; interstriae almost smooth, subshining, impunctate. Declivity steep, rather shallowly, broadly bisulcate; punctures of striae 1 and 2 very small, rather shallow; sutural interstriae moderately elevated, as high as lateral areas, interstriae 2 rather broadly, rather strongly impressed and impunctate, 1 and 3 each with a sparse row of pointed tubercles. Vestiture

confined to posterior half, of rather coarse, moderately long hair of moderate abundance.

MALE.— Similar to female except frons weakly convex, coarsely, sparsely punctured, vestiture sparse, inconspicuous, a very weak median carina on lower half; pronotal punctures distinctly larger.

DISTRIBUTION.— New Mexico.

USA: New Mexico: 10 km W High Rolls in Lincoln N.F., 2-VI-69, 2000 m, *Franseria*, S. L. Wood.

HOST.— *Franseria* sp.

BIOLOGY.— Specimens were taken from stems 1–2 cm in diameter with *franseriae*.

NOTES.— The above treatment was based on the type series of five specimens.

### 172. *Pityophthorus mexicanus* Blackman

*Pityophthorus mexicanus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:121 (Holotype, female; Correen, Coahuila, Mexico; U.S. Nat. Mus., 41313)

DIAGNOSIS.— This species is distinguished from *torridus* Wood by the larger size, by the coarser pronotal punctures, by the much more strongly sulcate elytral declivity, and by many other characters.

FEMALE.— Length 2.0–2.9 mm, 2.8 times as long as wide; color dark reddish brown.

Frons almost flat to well above eyes, lower fourth gradually ascending to epistomal margin, epistoma low, rather distinct; surface smooth, shining, closely, rather coarsely, uniformly punctured; lateral margin rather abrupt, separated from eye by distance equal to diameters of four facets; vestiture of fine, abundant, uniformly distributed long hair of uniform length, setae equal in length to one-fourth distance between eyes.

Pronotum 1.07 times as long as wide; widest on basal fourth, sides almost straight and parallel on basal fourth then arcuately converging to rather broadly rounded anterior margin; anterior margin armed by 14–16 serrations; summit at middle, low; anterior slope armed by about three concentric rows of asperities, rows usually broken or sometimes overlapping slightly at median line; posterior areas smooth, shining, punctures coarse, deep, close except on posterolateral areas. Vestiture of fine, short, rather sparse hair.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on more than basal two-thirds, then abruptly rounded to strongly acuminate apex; striae not impressed except 1 slightly, punctures rather coarse, deep, usually in definite rows, occasionally slightly confused on posterior half; interstriae smooth, shining, slightly less than twice as wide as striae, usually sparsely punctured near declivity (occasionally punctured to base), sparse punctures similar to those of striae. Declivity steep, very strongly bisulcate; striae 1 impressed, punctures almost obsolete, 2 not impressed, moderately large punctures clearly impressed to near apex; interstriae 1 abruptly, rather strongly elevated, armed by sparse, moderately coarse tubercles, 2 broadly, strongly impressed, smooth, shining, impunctate, 3 on upper two-thirds abruptly, strongly elevated, conspicuously higher than suture, summit armed by about six low, often rounded tubercles. Vestiture consisting of short strial hair to base and longer interstrial hair on and near declivity.

MALE.— Similar to female except frons convex, a slight transverse impression on lower half, epistomal process a low fold on median half, procurved almost to epistomal margin, surface much more coarsely punctured, vestiture inconspicuous except for epistomal brush; tubercles on lateral margins of declivity slightly larger.

DISTRIBUTION.— Coahuila to Jalisco and Tabasco.

MEXICO: **Coahuila**: Correen, Hopk. U.S. 6094, rubber plant; Torreon, 16-VI-45, guayule, V. E. Romney. **Jalisco**: Chapala, Hopk. U.S. 8949, N. D. Cattila. **Tabasco**: Intercepted at the state border or "frontera" in rubber tree.

HOST.— *Parthenium argentatum*.

BIOLOGY.— This species breeds in the cut or unthrifty stems of the guayule plant (Lloyd 1911:43–45).

NOTES.— The above treatment was based on the holotype and on 21 other specimens. Informants report this species from New Mexico and Texas; however, voucher specimens have not been located.

### 173. *Pityophthorus scriptor* Blackman

*Pityophthorus scriptor* Blackman, 1921, Mississippi Agric. Expt. Sta. Tech. Bull. 10:7 (Lectotype, female; Agricultural College, Mississippi, U.S. Nat. Mus., designated by Bright, 1976, Coleopt. Bull. 30:184)

DIAGNOSIS.— This species, *virilis* Blackman, *hylocuroides* Wood, and *crinalis* Blackman form a distinctive group, all of which normally breed in *Rhus*. This species is distinguished by the less strongly impressed declivital sulcus, with the lateral margins and tubercles less strongly developed, and by the more finely punctured female frons with less abundant vestiture.

FEMALE.— Length 1.3–1.5 mm, 2.7 times as long as wide; color dark reddish brown.

Frons broadly plano-convex from epistoma to well above eyes, lateral margins subangulate, separated by distance equal to diameter of three facets from lateral margin of eye; surface smooth, shining, finely, rather closely, uniformly punctured; vestiture of fine, moderately abundant hair of about uniform length.

Pronotum 1.09 times as long as wide; widest near base, sides on basal half weakly arcuate, converging slightly, rather broadly rounded in front; anterior margin armed by about 14 serrations; summit at or slightly anterior to middle, a distinct, transverse impression behind summit; anterior slope armed by three subconcentric rows of asperities, each row usually broken at or near median line, posterior areas smooth, shining, numerous minute impressed points present, punctures coarse, deep, rather close. Glabrous except at margins.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides almost straight and subparallel on basal two-thirds, obtusely subangulate behind; striae not impressed, punctures rather coarse, deep; interstriae slightly less than twice as wide as striae, surface almost smooth, impunctate except 2 near declivity. Declivity steep, rather shallowly bisulcate; striae 1 almost obsolete, 2 rather coarsely, deeply punctured to apex; interstriae 1 abruptly, distinctly elevated, armed by a row of fine granules, 2 moderately, broadly impressed, twice as wide as 1, three or four fine granules at base, smooth, shining, impunctate, 3 distinctly elevated on upper half, as high as suture, armed by about six fine granules. Vestiture largely confined to declivity, sparse, rather short.

MALE.— Similar to female exept frons rather strongly, transversely impressed from epistoma to above upper level of eyes, a rather strong, transverse carina at upper margin of impression, punctures sparse, obscure, vestiture sparse, short, inconspicuous; declivital sulcus slightly deeper, lateral tubercles slightly larger.

DISTRIBUTION.— North Carolina to Texas and Georgia.

USA: **Georgia**: Macon. **Mississippi**: Corinth, New Albany, Starkville. **North Carolina**: Tryon. **Tennessee**: Gatlinburg. **Texas**: Kerrville, Montell, Pine Springs.

HOST.— *Rhus typhina.*

NOTES.— The above treatment was based on the holotype and on 153 other specimens.

### 174. *Pityophthorus virilis* Blackman

*Pityophthorus virilis* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:143 (Holotype, female; Vermego, New Mexico; U.S. Nat. Mus., 41327)

*Pityophthorus fortis* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:142 (Holotype, female; Montell, Texas; U.S. Nat. Mus., 41326); Bright, 1977, Canadian Ent. 109:518. *Synonymy*

DIAGNOSIS.— This species is distinguished from *hylocuroides* Wood by the more finely punctured female frons and by the less broadly flattened male elytral declivity, with the lateral margin subacutely elevated only near the apex.

FEMALE.— Length 1.4–1.8 mm, 2.8 times as long as wide; color rather dark reddish brown.

Frons as in *scriptor* Blackman except punctures smaller.

Pronotum as in *scriptor* except with fewer serrations on anterior margin.

Elytra as in *scriptor* except discal interstriae 2 and 4 punctured at least on posterior half (to base in some specimens); declivity steeper, more strongly sulcate, lower declivity more broadly flattened, ventrolateral margin subacutely elevated near apex, interstriae 1 unarmed except with one or two granules near apex, 2 almost three times as wide as 1, 3 more strongly elevated on upper half, much higher than suture, tubercles much larger.

MALE.— Similar to female except slightly stouter; frons as in male *scriptor*; declivity more strongly sulcate, lateral elevations higher on upper half.

DISTRIBUTION.— Utah and Wyoming to Chihuahua and W Texas.

USA: **Arizona**: Arivaca Road, Chiricahua Mts., Lakeside. **Colorado**: Canyon City, El Paso Co., Glen Eyrie, Poudre Canyon in Larimer Co. **Missouri**: Union. **New Mexico**: Vermego. **Texas**: Big Band N.P., David Mts., Montell. **Utah**: Kanab, Logan, Provo, River Heights, Springville, Tabiona. **Wyoming**: Lusk. MEXICO: **Chihuahua**: La Pinta.

HOST.— *Rhus trilobata.*

BIOLOGY.— This species breeds in the larger stems of the host. The parental tunnels engrave the wood rather deeply; the egg galleries are longer than normal for this genus.

NOTES.— The above treatment was based on the holotypes of *virilis* and *fortis* and on 371 other specimens.

### 175. *Pityophthorus hylocuroides* Wood

*Pityophthorus hylocuroides* Wood, 1964, Great Basin Nat. 24:69 (Holotype, female; 11 miles NE Jacala, Hidalgo, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *virilis* Blackman by the more coarsely punctured female frons and by the more broadly flattened lower male declivity, with the lateral margin subacutely elevated from the apex to above the middle of the declivity.

FEMALE.— Length 1.4–1.7 mm, 2.8 times as long as wide; color dark reddish brown.

Frons similar to *virilis* except slightly more convex, punctures conspicuously larger, interspaces much narrower than diameter of a puncture (twice as wide in *virilis*).

Pronotum and elytral disc as in *scriptor.* Elytral declivity intermediate between *scriptor* and *virilis.*

MALE.— Similar to female except frons about as in male *scriptor*; declivity as strongly impressed as male *virilis* except lower area more strongly, more broadly flattened, lateral margin subacutely elevated from apex to more than half distance to base, four or five tubercles on interstriae 3 in normal position but appearing displaced mesad from lateral margin, much as in certain male *Hylocurus.*

DISTRIBUTION.— Hidalgo.

MEXICO: **Hidalgo**: 17 km NE Jacala, 27-VI-53, *Rhus*, S. L. Wood.

HOST.— *Rhus* possibly *aromatica.*

NOTES.— The above treatment was based on the type series of 14 specimens.

### 176. *Pityophthorus costatulus* Wood

*Pityophthorus costatulus* Wood, 1976, Great Basin Nat. 36:351 (Holotype, female; 18 miles or 29 km W Niltepec, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *costabilis* Wood by the smaller average size, by the straight suture 1 of the antennal club, and by declivity interstriae 2 being impressed only on the mesal side in the female.

FEMALE.— Length 0.9–1.2 mm, 2.6 times as long as wide; color very dark brown.

Frons flattened on a rather narrow area to well above upper level of eyes, slightly elevated toward epistomal margin, margins obtusely subangulate, laterally separated from margin of eye by distance equal to diameters of four facets; surface smooth, shining, punctures moderately coarse, deep, close, spaced by distances equal to less than half diameter of a puncture except more widely spaced on median third near epistoma; vestiture very fine, moderately abundant, uniformly distributed, slightly longer at margins, longest setae equal to about one-fourth distance between eyes. Antennal club small, oval; suture 1 straight, mostly septate, 2 moderately procurved, usually not septate.

Pronotum 1.1 times as long as wide; widest near base, sides on basal half almost straight, converging very slightly, rather narrowly rounded in front; anterior margin broadly armed by a subserrate continuous costa; summit at middle, distinct; anterior slope armed by three continuous, subserrate costae, a fourth at summit; posterior areas smooth, shining, with numerous impressed points, punctures moderately coarse, rather widely spaced. A row of setae behind each costa; posterior area glabrous.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures rather fine, close, deep; interstriae smooth, shining, with a few irregular, indefinite surface lines, twice as wide as striae, impunctate. Declivity steep, convex; striae 1 impressed, 2 not impressed, both with punctures smaller than on disc, impressed; interstriae 1 distinctly, abruptly elevated, armed by a row of fine granules, 2 weakly impressed, as wide as 1, with one or two punctures near apex and at base, 3 not elevated, rounded, armed by about six fine granules. Vestiture largely confined to declivity, consisting of sparse rows of short, stout setae on odd-numbered interstriae.

MALE.— Similar to female except frons rather strongly convex, more coarsely punctured, transverse impression above epistoma deeper, vestiture much shorter, less abundant; declivital interstriae 1 without granules, punctures on declivital striae 1 and 2 smaller.

DISTRIBUTION.— Jalisco to Oaxaca.

MEXICO: **Jalisco**: 16 km W Tizapán, 18-VII-53, *Thevetia*, S. L. Wood. **Oaxaca**: 29 km W Niltepec, 23-VI-67, 30 m, No. 87, *Thevetia*, S. L. Wood.

BIOLOGY.— This species was removed from the cambium region of leaf-bearing terminal twigs, where it was intermixed with *Liparthrum cracentis* Wood.

NOTES.— The above treatment was based on the type series of 24 specimens.

In some respects the antennal club of this species resembles that of certain *Araptus* more closely than that of other *Pityophthorus*. In the closely related *costabilis*, however, suture 2 is usually at least feebly septate. This fact, the small size of the club, the tibial characters, habits, and other less tangible features suggest placement of these species in *Pityophthorus*. The two known species of *Araptus* having the pronotal asperities arranged concentrically are entirely unrelated to *costatus* and *costabilis* both anatomically and biologically.

### 177. *Pityophthorus costabilis* Wood

*Pityophthorus costabilis* Wood, 1976, Great Basin Nat. 36:352 (Holotype, female; 10 miles or 16 km W Tizapán, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *costatulus* Wood by the larger size, by the much more strongly procurved sutures of the antennal club, by the more coarsely punctured declivital striae in the female, and by the more conspicuous epistomal brush of the male.

FEMALE.— Length 1.6–1.8 mm, 2.6 times as long as wide; color very dark brown, almost black.

Frons largely concealed in specimens at hand, evidently similar to *costatulus* except coarsely punctured, vestiture apparently less abundant, shorter. Antennal club with sutures 1 and 2 rather strongly procurved, 2 weakly, more distinctly septate near margins.

Pronotum about as in *costatulus* except crest of costae more strongly serrate.

Elytra as in *costatulus* except strial punctures slightly larger, deeper; declivital striae 1 and 2 more coarsely punctured, interstriae 1 unarmed, 2 more strongly impressed, 3 rounded, slightly elevated, without granules, vestiture similar but more closely spaced, an occasional seta on interstriae 4, 6, and 8.

MALE.— Similar to female except frons as in *costatulus*, with all features more strongly developed; strial punctures on disc half as large as in female, those on declivity minute, interstriae 3 with minute granules.

DISTRIBUTION.— Jalisco.

MEXICO: **Jalisco**: 16 km W Tizapán, 18-VI-53, *Thevetia*, S. L. Wood.

BIOLOGY.— Specimens were taken in stems 1–2 cm in diameter in association with *costatulus*.

NOTES.— The above treatment was based on the type series of eight specimens.

### 178. *Pityophthorus detentus* Wood

*Pityophthorus detentus* Wood, 1976, Great Basin Nat. 36:352 (Holotype, female; Carapan, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the broadly convex elytral declivity, with strial punctures 1 and 2 minute and interstriae 1 not elevated, and by the male and female frons as described below.

FEMALE.— Length 1.4–1.8 mm, 2.6 times as long as wide; color brown.

Frons flat to well above eyes, ascending slightly toward epistomal margin on lower fourth, lateral margins subangulate, separated from eye by distance equal to diameter of three facets; surface smooth, shining, punctures in central area very small, rather widely spaced, larger and more numerous at margins; vestiture sparse and rather short in central area, moderately abundant and very long at margin. Antennal club 1.5 times as long as wide, septum in suture 2 almost obsolete.

Pronotum 1.04 times as long as wide; outline about as in *costatulus* Wood except rows of asperities divided to their bases, not costiform, impressed points largely obsolete, punctures rather small; anterior margin armed by about 18 serrations.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; outline and disc as in *costatulus*; declivity steep, broadly convex, striae 1 feebly impressed, 1 and 2 minutely

punctured, interstriae 1 weakly elevated, unarmed, sparse, punctures minute, 2 not impressed, almost twice as wide as 1, 3 not elevated, punctures small, widely spaced. Vestiture of minute strial setae and with interstrial setae as in *costabilis* Wood.

MALE.— Similar to female except frons distinctly impressed, its margin forming a distinctly elevated crest outlining a semicircle from lateral margin of epistoma to slightly above eyes, punctures coarse, not close, vestiture short, sparse.

DISTRIBUTION.— Michoacán to Queretaro.

MEXICO: **Michoacán**: Carapan, 18-VI-65, 2300 m, woody vine, S. L. Wood; 10 km E Volcán Parícutin, 19-VI-65, 2500 m, probably *Toxicodendron*, S. L. Wood. **Querétaro**: 16 km E Landa de Matamores, 11-VI-71, 1800 m, D. E. Bright.

NOTES.— The above treatment was based on the type series of 31 specimens and on 7 other specimens.

### 179. *Pityophthorus inops* Wood

*Pityophthorus inops* Wood, 1976, Great Basin Nat. 36:353 (Holotype, female; Rincón, Osa Peninsula, Costa Rica; Wood Coll.)

DIAGNOSIS.— In this species and *debilis* Wood sutures 1 and 2 on the antennal club are virtually obsolete. This species is distinguished from *debilis* by the smaller size, by the strongly reticulate pronotum, by the reticulate frons, and by other characters indicated below.

FEMALE.— Length 1.1–1.2 mm, 2.7 times as long as wide; color yellowish brown.

Frons plano-convex from epistoma to slightly above upper level of eyes, lateral margins subangulate, separated from margin of eye by distance equal to diameter of one facet; surface apparently reticulate, oral area pale and covered by short, rather abundant hair, upper area with fine, uniformly distributed punctures, upper margin above upper level of eyes bearing a fringe of very long, yellow hair, tips exceeding epistomal margin. Antennal club subcircular, sutures 1 and 2 moderately procurved, marked only by very obscure lines, not marked by setae.

Pronotum 1.1 times as long as wide; outline as in *costatulus* Wood; anterior margin subcostate, with about 14 serrations obscurely indicated; summit at middle; anterior slope with two concentric rows of asperities, those near summit largely confused; posterior areas reticulate, punctures fine, not close. Vestiture confined to lateral margins and asperate area.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures very fine, shallow, spaced within a row by two to four diameters of a puncture; interstriae smooth, shining, with numerous impressed points, about three times as wide as striae. Declivity steep, broadly convex; striae 1 and 2 punctured as on disc; interstriae 1 weakly elevated, a few minute granules obscurely indicated, 2 as wide as 1, very feebly impressed, 3 not elevated, armed by a row of very fine granules. Strial setae very short, very fine, confined to posterior half; odd-numbered interstriae with rather sparse, narrowly spatulate setae on and near declivity.

MALE.— Similar to female except frons more strongly convex, a slight transverse impression above epistoma, fully reticulate, punctures slightly larger.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Rincón on Osa Peninsula, Puntarenas, 11-VII-66, 30 m, No. 85, unidentified tree limb, S. L. Wood.

NOTES.— The above treatment was based on the type series of seven specimens.

### 180. *Pityophthorus debilis* Wood

*Pityophthorus debilis* Wood, 1976, Great Basin Nat. 36:354 (Holotype, female; San Ignacio de Acosta, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *inops* Wood by the slightly larger size, by the shining lower frons and pronotum, by the longer setae on the female frons, and by the presence of setae on all interstriae.

FEMALE.— Length 1.2–1.4 mm, 2.7 times as long as wide; color yellowish brown.

Frons about as in *inops* except marginal fringe of hair extending from dorsal margin to lower lateral margins, short setae in lower central area apparently absent; surface shining from epistoma to upper level of eyes.

Pronotum as in *inops* except serrations on anterior margin more deeply divided, disc usually shining, obscurely reticulate in some specimens.

Elytra as in *inops* except strial punctures slightly larger, declivital interstriae 2 weakly, more distinctly impressed; all interstriae on declivity with erect, blunt setae, except absent on 2 below basal margin.

MALE.— Similar to female except frons convex, with punctures coarse and vestiture very short, sparse, inconspicuous.

DISTRIBUTION.— Chiapas to Costa Rica.

MEXICO: Chiapas: 15 km SE Teopisca, 14-V-69, D. E. Bright. COSTA RICA: San Ignacio de Acosta, San José, 4-VII-63, 1500 m, No. 28 from unidentified branch, No. 32 from *Mauria glauca*, S. L. Wood.

BIOLOGY.— Specimens were taken from twigs 1 cm in diameter. The short, longitudinal egg galleries engraved the wood deeply.

NOTES.— The above treatment was based on the type series of 40 specimens and on 10 other specimens. The series from Chiapas differs very slightly but almost certainly is of this species.

### 181. *Pityophthorus juglandis* Blackman

*Pityophthorus juglandis* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:42 (Holotype, female; Lone Mountain, New Mexico, U.S. Nat. Mus., 41271)

DIAGNOSIS.— This species is distinguished by having four to six concentric rows of pronotal asperities, by the dull (shagreened) declivital surface, and by other characters described below.

FEMALE.— Length 1.5–1.9 mm, 2.8–3.1 times as long as wide; color yellowish brown.

Frons flat to plano-concave, slightly elevated toward epistomal margin, lateral margins rather abruptly rounded, spaced from margin of eye by distance equal to two to three diameters of a facet; surface smooth, shining, rather finely, closely, uniformly punctured; vestiture rather abundant, much longer at margins, longest setae equal to half distance between eyes. Antennal club with sutures 1 and 2 septate, almost straight.

Pronotum 1.10–1.16 times as long as wide; sides almost straight and parallel on basal half, rather broadly rounded in front; anterior margin armed by about 18 serrations; summit at or slightly in front of middle; anterior slope armed by four to six concentric rows of asperities, each usually broken and often overlapping near median line; posterior area smooth, shining, with numerous impressed points, punctures moderately large, rather close. Vestiture minute on disc, longer, and arranged in rows with asperities on anterior slope.

Elytra 1.8–1.9 times as long as wide, 1.7 times as long as pronotum; sides straight and parallel on basal three-fourths, rather broadly rounded behind; striae not impressed except 1 slightly near declivity, punctures in rows, moderately coarse, interstriae smooth, shining, impunctate, about one and one-half times as wide as striae. Declivity steep, very shallowly bisulcate; striae 1 impressed, 1 and 2 very finely punctured; interstriae 1 rather wide, moderately elevated, with a very sparse row of fine punctures, 2 as wide as 1, slightly impressed on mesal side, surface smooth, slightly shagreened, 3 with a sparse row of fine punctures. Minute, very short strial setae extend to base; interstrial setae largely confined to declivity, in very sparse rows on odd-numbered interstriae.

MALE.— Similar to female except frons very broad, strongly concave, more coarsely punctured, vestiture short, less abundant; inconspicuous; declivital interstriae 1 and 2 each with a row of fine granules.

DISTRIBUTION.— S California and New Mexico to Chihuahua.

USA: Arizona: Chiricahua Mts., Miller Canyon in Huachuca Mts., Paradise, Peña Blanca, Portal. California: San Fernando, Tarzana. New Mexico: Lone Mountain. MEXICO: Chihuahua: Ciudad Chihuahua.

HOST.— *Juglans californica*, *J. major*, *J. nigra*.

BIOLOGY.— Specimens were taken from small branches from July to September.

NOTES.— The above treatment was based on the holotype and on 73 other specimens.

### 182. *Pityophthorus tenax* Wood

*Pityophthorus tenax* Wood, 1976, Great Basin Nat. 36:354 (Holotype, female; Volcán Pacaya, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *juglandis* Blackman by the absence of long hair on the female frons, by the more abundant, longer interstrial setae on all declivital interstriae except 2, by the steeper, more shining declivity, and by other characters.

FEMALE.— Length 1.6–1.7 mm, 2.8 times as long as wide; color yellowish brown.

Frons broadly convex, epistomal margin distinctly elevated; surface smooth and shining below upper level of eyes, reticulate above, punctures rather coarse, vestiture short, sparse, inconspicuous. (Upper areas on holotype concealed by pronotum, not fully visible.)

Pronotum 1.17 times as long as wide; pronotum as in *juglandis* except anterior margin armed by about 10 serrations and punctures on posterior areas slightly larger.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; outline as in *juglandis* except sides on posterior third converging more conspicuously, declivital area narrower; striae as in *juglandis* except punctures slightly larger, interstriae as wide as striae. Declivity much as in *juglandis* except striae 1 more strongly impressed, interstriae 2 ascending laterally more strongly, 1 and 3 without granules; surface smooth, shining, not shagreened. Interstrial setae largely confined to declivity, on all interstriae except absent on 2, slightly longer and much more closely spaced than in *juglandis*.

MALE.— Similar to female except frons very slightly more strongly convex.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán Pacaya, 1-VI-64, 1300 m, No. 692, unidentified branch, S. L. Wood.

NOTES.— The above treatment was based on the type series of three specimens.

### 183. *Pityophthorus strictus* Wood

*Pityohthorus strictus* Wood, 1976, Great Basin Nat. 36:354 (Holotype, female; Santa Ana, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *tenax* Wood by the presence of a few long setae on the female frons, by the much more finely punctured frons, pronotum, and elytra, and by the different declivity as described below.

FEMALE.— Length 1.3 mm, 2.8 times as long as wide; color yellowish brown.

Frons as in *tenax*, with punctures much finer, about a dozen long setae in lateral areas on lower half, a somewhat indistinct median callus above upper level of eyes.

Pronotum 1.08 times as long as wide; about as in *tenax* except anterior margin costate, its crest weakly serrate, and posterior areas rather finely punctured.

Elytra 1.7 times as long as wide, 1.7 times as long as pronotum; as in *tenax* except strial punctures smaller, interstriae one and one-half times as wide as striae, declivity more strongly convex, striae 1 less strongly impressed, interstriae 1 and 3 with very fine granules.

MALE.— Similar to female except frons very slightly more strongly convex and without any long setae.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Santa Ana, San José, 30-VIII-63, 1300 m, No. 157, *Rheedia edulis* branches, S. L. Wood.

NOTES.— The above treatment was based on the type series of six specimens.

### 184. *Pityophthorus franseriae* Wood

*Pityohthorus franseriae* Wood, 1971, Great Basin Nat. 31:75 (Holotype, female; 6 miles W High Rolls, Lincoln National Forest, New Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the obsolete declivital striae 1 and 2, by the presence of setae only on the odd-numbered interstriae, by the distinctive frons in both sexes as described below, and by other characters.

FEMALE.— Length 1.2–1.3 mm, 2.7 times as long as wide; color very dark reddish brown.

Frons flattened on a rather narrow area from epistoma to well above eyes, lateral margins very obtusely subangulate, separated from eye by distance equal to width of four facets; surface smooth, shining, punctures fine, close, uniformly distributed except almost impunctate on small median area near epistoma; vestiture of very fine, moderately abundant, rather short hair of uniform distribution and length.

Pronotum 1.03 times as long as wide; widest behind middle, sides moderately arcuate on slightly more than basal half, rather broadly rounded in front; anterior margin armed by eight subcontiguous, coarse teeth; anterior slope armed by three concentric rows of asperities; posterior area shining, punctures rather fine, deep, moderately sparse, median line impunctate. A few small setae at margins.

Elytra 1.6 times as long as wide; sides almost straight and parallel on basal three-fourths, abruptly rounded, then feebly acuminate at apex; striae not impressed, punctures

rather coarse, deep; interstriae almost smooth, almost as wide as striae, impunctate. Declivity steep, very shallow, broadly bisulcate; surface shining, impunctate; sutural interstriae distinctly elevated, 2 shallowly impressed, 3 weakly elevated, 2 and 3 each armed by widely spaced, very fine granules. Odd-numbered interstriae on declivity each bearing a row of moderately long, fine setae.

MALE.— Similar to female except frons with a well-developed transverse carina at vertex, frontal area slightly impressed, with moderately coarse punctures in lateral areas, vestiture less conspicuous, sparse.

DISTRIBUTION.— New Mexico.

USA: **New Mexico**: 6 miles or 10 km W High Rolls, Lincoln N.F., 2-VI-69, *Fransceria*, S. L. Wood.

BIOLOGY.— Specimens were taken from the cambium region of small stems less than 2 cm in diameter.

NOTES.— The above treatment was based on the type series of 58 specimens.

### 185. *Pityophthorus nanus* Wood

*Pityophthorus nanus* Wood, 1964, Great Basin Nat. 24:64 (Holotype, female; Totolapan, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the unique mustachelike female frontal pubescence, by the absence of granules on declivital interstriae 1, and by other characters indicated below.

FEMALE.— Length 1.2–1.5 mm, 2.8 times as long as wide; color yellowish brown.

Frons broadly convex; surface smooth, shining, rather densely, finely punctured on area below upper level of eyes; vestiture of fine, abundant, very long, uniformly distributed hair on lower two-thirds of area below upper level of eyes.

Pronotum 1.2 times as long as wide; widest near base, sides straight and converging very slightly on basal half, rather narrowly rounded in front; anterior margin a serrate costa; summit slightly anterior to middle; anterior slope armed by four concentric rows of basally fused asperities; posterior areas smooth, shining, some very minute impressed points usually present, punctures fine, rather shallow. Vestiture consisting of rows of setae behind asperities and minute, sparse setae on sides, disc glabrous.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; striae not impressed, punctures moderately coarse, rather close; interstriae smooth, shining, two to two and one-half times as wide as striae. Declivity steep, shallowly bisulcate; striae 1 impressed, punctures not evident, 2 not impressed, punctures about half as large as on disc, clearly impressed, interstriae 1 distinctly elevated, unarmed, punctures not clearly evident, 2 moderately impressed on median side, gradually, weakly ascending laterally, surface smooth, shining, about one and one-half times as wide as 1, 3 convexly rounded, with a few setiferous punctures similar to those of striae. Vestiture confined to odd-numbered declivital interstriae, short, sparse.

MALE.— Similar to female except frons shallowly, transversely impressed from epistoma to upper level of eyes, sometimes subconcave in central area, a distinct median callus at upper level of eyes, vestiture short, fine, inconspicuous; upper half of declivity more strongly impressed, lateral margins much higher than suture and armed by two or three fine to moderately coarse denticles.

DISTRIBUTION.— Jalisco to Oaxaca.

MEXICO: **Chiapas**: Junction Highways 190 and 195, 12-V-69, D. E. Bright. **Jalisco**: Barra de Navidad, IX-65, N. L. H. Krauss; 21 km N Juchitlán, 2-VII-64, 1000 m, No. 180, *Bursera*, S. L. Wood; 42 km N Rosamorada, 15-VII-65, 100 m, No. 253, *Bursera*, S. L. Wood. **Oaxaca**: 13 km SE Cameron, 21-VI-67, No. 75, *Bursera*, S. L. Wood; Totolapan, 7-VII-53 and 20-VI-67, 1100 m, *Bursera*, S. L. Wood.

NOTES.— The above treatment was based on the type series of 9 specimens and on 38 other specimens.

### 186. *Pityophthorus galeritus* Wood

*Pityophthorus galeritus* Wood, 1976, Great Basin Nat. 36:355 (Holotype, female; Río Damitas in the Dota Mts., San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nanus* Wood by the more extensively distributed female frontal vestiture, by the less strongly impressed male frons, by the more shallowly sulcate male declivity, and by other characters.

FEMALE.— Length 1.1–1.2 mm, 2.8 times as long as wide; color yellowish brown.

Frons plano-convex on a rather limited area from epistoma to well above eyes, lateral margins rounded, separated from margin of eye by distance equal to width of four facets; surface smooth, shining, rather coarsely, closely punctured; vestiture fine, moderately abundant, uniformly distributed, of uniform length, rather short.

Pronotum as in *nanus* except posterior areas with numerous strongly impressed points, punctures deeper, evidently very slightly larger.

Elytra as in *nanus* except strial punctures on disc closer, deeper, declivity slightly narrower, appearing deeper, interstriae 3 higher than 1, 1 and 3 armed by very fine tubercles, vestiture confined to declivital area on all interstriae except 2, setae much stouter, more closely spaced.

MALE.— Similar to female except frons subconcavely impressed on median half of area between epistoma and upper level of eyes, upper margin transversely subcarinate, surface smooth, shining, coarsely punctured, vestiture fine, short, inconspicuous; declivital setae slightly stouter.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Río Damitas, Dota Mts., San José, 18-II-64, 250 m, No. 434, *Rheedia edulis*, S. L. Wood.

BIOLOGY.— Specimens were taken in the cambium region of a tree 25 cm in diameter.

NOTES.— The above treatment was based on the type series of five specimens.

### 187. *Pityophthorus nebulosus* Wood

*Pityophthorus nebulosus* Wood, 1976, Great Basin Nat. 36:355 (Holotype, female; Lake Catemaco, Veracruz, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *nanus* Wood by the very different female frons, by the smaller elytral punctures, and by the much more shallowly sulcate declivity.

FEMALE.— Length 1.4–1.7 mm, 3.0 times as long as wide; color yellowish brown.

Frons transversely impressed from epistoma to upper level of eyes, upper margin subangulate; surface shining, rather coarsely, closely punctured except sparsely on small central area; vestiture of moderately abundant, rather long hair about uniformly distributed over impressed area.

Pronotum as in *nanus* except asperities in less definite rows, punctures on disc slightly smaller, disc more shagreened.

Elytra as in *nanus* except discal punctures smaller, declivital sulcus very shallow, interstriae 2 flat, 1 as high as 3, shagreened. Vestiture confined to odd-numbered declivity interstriae, sparse, each seta flattened on its apical third, appearing narrowly spatulate.

MALE.— Similar to female except slightly smaller, frontal impression restricted to lower half, deeper, punctures less abundant, more uniformly distributed, vestiture short, sparse, inconspicuous; declivital impression wider, distinctly deeper (but much less strongly impressed than in *nanus*), lateral convexities unarmed or with very minute granules.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: Lago Catemaco, 1–3-V-69, *Bursera*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 18 specimens.

### 188. *Pityophthorus indigens* Wood

*Pityophthorus indigens* Wood, 1976, Great Basin Nat. 36:361 (Holotype, female; 2 miles or 3 km W Armeria, Colima, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nanus* Wood by the much more feebly sulcate elytral declivity, by the very different frons in both sexes, and by other characters described below.

FEMALE.— Length 1.2–1.4 mm, 2.7 times as long as wide; color yellowish brown.

Frons flattened to well above eyes, ascending slightly at epistomal margin; lateral margins abruptly angulate, separated from margin of eye by distance equal to width of two facets; surface smooth, shining, punctures fine, not close, uniformly distributed; vestiture of fine hair, those in central area of moderate length, those on margin twice as long, tips of longest setae on upper margin reach epistomal margin.

Pronotum 1.06 times as long as wide; essentially as in *nanus* except anterior margin more narrowly rounded, serrations more restricted to median area, punctures on posterior areas less numerous, slightly smaller.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum, essentially as in *nanus* except declivity more strongly convex, striae

1 narrowly, rather deeply impressed, punctures on 1 and 2 smaller, interstriae 2 narrower, ascending more abruptly laterally, 1 and 3 without granules.

MALE.— Similar to female except shallowly, transversely impressed to upper level of eyes, its upper margin broadly, obtusely, subcarinate, surface rather coarsely, sparsely punctured, impressed area ornamented by sparse, very long hair.

DISTRIBUTION.— Jalisco to Oaxaca.

MEXICO: **Colima**: 3 km W Armeria, 28-VI-65, 70 m, No. 129, *Bursera*, S. L. Wood. **Jalisco**: 21 km N Juchitlán, 2-VII-65, 1000 m, No. 180, *Bursera*, S. L. Wood. **Oaxaca**: 29 km W Niltepec, 23-VI-67, 30 m, No. 88, *Bursera*, S. L. Wood.

BIOLOGY.— Specimens were taken from small dying branches on the living host tree.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 189. *Pityophthorus burserae* Wood

*Pityophthorus burserae* Wood, 1976, Great Basin Nat. 36:362 (Holotype, female; Atenquique, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *indigens* Wood by the larger size, by the longer, more abundant vestiture on the female frons, and by other characters mentioned below.

FEMALE.— Length 1.5–1.6 mm, 2.7 times as long as wide; color yellowish brown.

Frons as in *indigens* except central area almost impunctate and glabrous, extending higher on vertex, marginal setae longer.

Pronotum and elytra essentially as in *indigens* except elytral declivity narrowly, more deeply sulcate, lateral convexities slightly higher than suture, interstriae setae on all declivital interstriae except upper two-thirds of 2.

MALE.— Similar to female except frons as in male *indigens*.

DISTRIBUTION.— Jalisco.

MEXICO: **Jalisco**: Atenquique, 24-VI-65, 1000 m, No. 114, *Bursera*, S. L. Wood; 21 km N Juchitlán, 2-VII-65, 1000 m, No. 180, *Bursera*, S. L. Wood.

BIOLOGY.— Specimens were taken from small, dying branches on living trees.

NOTES.— The above treatment was based on the type series of six specimens.

### 190. *Pityophthorus germanus* Bright

*Pityophthorus germanus* Bright, 1976, Great Basin Nat. 36:434 (Holotype, male?; 154 km or 92 miles N Oaxaca, Oaxaca, Mexico; Canadian Nat. Coll. 15083)

DIAGNOSIS.— The large size, the sparse, subconcentric pronotal asperities, and the strongly impressed declivity distinguish this species.

MALE.— Length 2.7 mm, 2.6 times as long as wide; color reddish brown.

Frons largely concealed by pronotum; lower half broadly convex, its surface smooth, shining, punctures rather fine, spaced by one to three diameters of a puncture, vestiture sparse, short, inconspicuous.

Pronotum 1.1 times as long as wide; widest near base, arcuately converging to constriction just behind rather narrowly rounded anterior margin; anterior margin armed by 12 coarse serrations; summit at middle; anterior slope with asperities rather sparse, obscurely subconcentric in arrangement; posterior area smooth, shining, with numerous impressed points; punctures moderately coarse, spaced by one to three diameters of a puncture.

Elytra 1.6 times as long as wide, 1.7 times as long as pronotum; sides straight and parallel on basal three-fourths, abruptly rounded, almost straight on median half behind; striae not impressed except 1 slightly, punctures rather small, close, in rows except 1 and 2 slightly staggered; interstriae twice as wide as striae, smooth, shining, impressed points obscure,a few punctures on posterior half except to base on 1. Declivity very steep, strongly impressed; striae 1 and 2 impressed to apex, punctures only slightly smaller than on disc; interstriae 1 distinctly elevated, armed by a row of tubercles, 2 as wide as 1, flat, strongly impressed, smooth, shining, two or three small tubercles near apex, 3 abruptly, strongly elevated, a double or staggered row of tubercles on inner margin and slope, striae 3 and interstriae 4 on broadly rounded summit. Vestiture of fine, long, interstrial setae, shorter and stouter in impressed area of declivity.

DISTRIBUTION.— Oaxaca.

MEXICO: **Oaxaca**: 154 km N Oaxaca, 18-V-71, blacklight, D. E. Bright.

NOTES.— The above treatment was based on the holotype.

### 191. *Pityophthorus obtusipennis* Blandford

*Pityophthorus obtusipennis* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):240 (Lectotype, male; Balheu, Verapaz, Guatemala; British Mus. Nat. Hist., designated by Bright, 1976, Coleopt. Bull. 30:184)

DIAGNOSIS.— This unique species has the frons convex and without conspicuous vestiture or other features; the declivity is also unique as described below.

FEMALE.— Length 1.5–2.0 mm, 2.6 times as long as wide; color reddish brown.

Frons broadly convex, a slight transverse impression immediately above epistoma; surface smooth, shining, punctures coarse, deep, close; vestiture sparse, inconspicuous.

Pronotum 1.1 times as long as wide; widest on basal third, sides weakly arcuate, almost parallel on basal two-thirds, rather broadly rounded in front; anterior margin armed by about 12 serrations; summit at middle, distinct; anterior slope armed by about three subconcentric rows of asperities (variable, occasionally confused); posterior areas almost smooth, usually with impressed points, punctures fine to rather coarse, moderately close. Vestiture moderately abundant or restricted to margins and asperate areas, sparse.

Elytra 1.5 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal two-thirds, very broadly rounded behind; striae not impressed, punctures in rows, varying from small to moderately coarse; interstriae smooth, shining, once to twice as wide as striae, odd-numbered interstriae punctured at least on posterior third (often to base). Declivity steep, broadly impressed, sulcus between striae 2 extending to middle of elytra; striae 1 and 2 coarsely, deeply punctured; interstriae 1 weakly elevated, usually unarmed, less commonly with a few small granules, 2 as wide as 1, distinctly impressed, impunctate, 3 rather strongly elevated, much higher than suture, reaching summit almost on striae 3, armed by 6–8 rather coarse serrations. Vestiture of fine, rather short strial hair, and interstrial setae on posterior half or more, mostly on odd-numbered interstriae.

MALE.— Similar to female in all respects; vestiture evidently more abundant and longer.

DISTRIBUTION.— Nayarit and Hidalgo to Guatemala.

MEXICO: **Hidalgo**: Jacala, 18-I-36, *Pinus lawsonii*, D. DeLeon. **Michoacán**: 33 km W Morelia, 16-VI-65, 2300 m, No. 62, *Pinus*, S. L. Wood; 29 km W Quiroga, 16-VI-65, 2200 m, No. 74, *Pinus*, S. L. Wood. GUATEMALA: Balhue, Verapaz.

BIOLOGY.— Specimens were taken from branches 2–6 cm in diameter.

NOTES.— The above treatment was based on the syntypes and on 39 other specimens.

### 192. *Pityophthorus euterpes* Bright

*Pityophthorus euterpes* Bright, 1978, Great Basin Nat. 38:75 (Holotype, male; 21 miles or 33 km W Lazardo Cárdenas, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *obtusipennis* Blandford by the smaller size, by the more slender body form, and by slight differences on the elytral declivity.

FEMALE.— Length 1.5–1.8 mm, 2.8 times as long as wide; color reddish brown.

Frons, pronotum, and elytra as in *obtusipennis* except lateral convexities of elytral declivity higher and usually more narrowly rounded (thinner).

MALE.— Similar to female except lateral convexities on declivity sometimes more broadly rounded (thicker).

DISTRIBUTION.— Chiapas.

MEXICO: **Chiapas**: 33 km W Lazardo Cárdenas, 26-VI-69, *Pinus oocarpa*, D. E. Bright; Ocosingo Valley, 2-VII-50, L. V. Stannard.

NOTES.— The above treatment was based on the type series of 10 specimens.

### 193. *Pityophthorus occlusus* Bright

*Pityophthorus occlusus* Bright, 1976, Great Basin Nat. 36:437 (Holotype, female; Yuscarán, Paraíso, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *obtusipennis* Blandford by the smaller size, by the subaciculate frons, and by the slightly different elytral declivity as described below.

FEMALE.— Length 1.3–1.6 mm, 2.7 times as long as wide; color yellowish to reddish brown.

Frons as in *obtusipennis* except subaciculate on lower half.

Pronotum as in *obtusipennis* except posterior areas very finely punctured (somewhat variable).

Elytra as in *obtusipennis* except declivity less strongly impressed, areas lateral to interstriae 3 on lower half usually somewhat flattened and usually armed by three or four small tubercles.

MALE.— Similar to female.

DISTRIBUTION.— Nayarit to Honduras.

MEXICO: **Nayarit**: Laguna Santa María, 6-VII-65, 1000 m, No. 204, *Pinus*, S. L. Wood. **Oaxaca**: Nochixtlán, 17-VI-67, No. 56, *Pinus*, S. L. Wood. HONDURAS: Paraíso: San Lucas, 22-IV-64, 750 m, No. 524, *P. oocarpa*, S. L. Wood; Yuscarán, 23-IV-64, 750 m, No. 519, *P. oocarpa*, S. L. Wood.

NOTES.— The above treatment was based on the type series of 35 specimens.

### 194. *Pityophthorus speciosus* Wood

*Pityophthorus speciosus* Wood, 1977, Great Basin Nat. 37:215 (Holotype, female; 15 miles or 24 km S Valle Nacional, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *assitus* Wood by the smooth, shining frons that is transversely impressed on its lower half and by differences on the pronotum and elytra as described below.

FEMALE.— Length 1.7–2.0 mm, 2.5 times as long as wide; color reddish brown.

Frons smooth, shining, punctures coarse, close, deep, transversely impressed from epistoma to slightly below upper level of eyes, upper area convex; vestiture short, inconspicuous.

Pronotum about as in *assitus* except transversely much more broadly arched, smooth, shining, with numerous, rather large, impressed points, punctures very small.

Elytra about as in *assitus* except surface smooth, brightly shining, declivital interstriae 2 strongly impressed and narrower.

MALE.— Similar to female in all respects.

DISTRIBUTION.— Oaxaca.

MEXICO: **Oaxaca**: 24 km S Valle Nacional, 20-V-71, 4000 ft, D. E. Bright; 147 km N Oaxaca, 18-V-71, blacklight, D. E. Bright.

NOTES.— The above treatment was bsed on the type series of 10 specimens.

### 195. *Pityophthorus assitus* Wood

*Pityophthorus assitus* Wood, 1977, Great Basin Nat. 37:214 (Holotype, female; Lagos de Colores, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *morosus* Wood by the larger size, by the stouter body, by the strongly reticulate head and pronotum, and by the more strongly impressed declivital interstriae 2.

FEMALE.— Length 1.9–2.2 mm, 2.6 times as long as wide; color dark brown.

Frons and pronotum as in *morosus* except strongly reticulate.

Elytra as in *morosus* except strial punctures smaller, not as deep, in slightly irregular rows, a few interstrial punctures present on posterior half of disc, declivital interstriae 2 more strongly impressed on its lateral half, strial setae slightly longer.

MALE.— Similar to female in all respects.

DISTRIBUTION.— Oaxaca to Chiapas.

MEXICO: **Chiapas**: Lagos des Colores, 17-V-69, D. E. Bright. **Oaxaca**: 24 km S Valle Nacional, 20-V-71, 4000 ft, D. E. Bright.

NOTES.— The above treatment was based on 61 specimens in the type series and on 6 other specimens.

### 196. *Pityophthorus morosus* Wood

*Pityophthorus morosus* Wood, 1976, Great Basin Nat. 36:362 (Holotype, female; Zamorano, Morazán, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *paulus* Wood by the distinctly, moderately arcuate sutures 1 and 2 of the antennal club, by the absence of a median callus on the vertex, and by other characters mentioned below.

FEMALE.— Length 1.3–1.6 mm, 2.7 times as long as wide; color very dark brown.

Frons broadly convex, a feeble, transverse impression in some specimens; surface smooth and shining on lower half, reticulate above, reticulation on vertex often transversely etched, punctures rather fine, never confluent, median callus feebly developed or absent; vestiture fine, sparse, short, inconspicuous. Antennal club conspicuously longer than scape; sutures 1 and 2 slightly arcuate.

Pronotum as in *paulus* except discal punctures much smaller, impressed points minute, less abundant; asperities varying from subconcentric to confused.

Elytra as in *paulus* except surface smoother, punctures much smaller, interstriae twice as wide as striae, impressed points on declivity less abundant and minute to absent, vestiture usually shorter, stouter.

MALE.— Similar to female in all respects.

DISTRIBUTION.— Veracruz to Honduras.

MEXICO: Chiapas: Ocozocoautla, Tapilula, Teopisca. Veracruz: 14 km E Huatusco, 7-VII-67, 250 m, No. 175, cut sapling, S. L. Wood. GUATEMALA: Volcán de Agua, 19-V-64, 1000 m, No. 601, woody vine, S. L. Wood. HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 554, *Eupatorium dalioides*, S. L. Wood.

BIOLOGY.— The Huatusco series formed large nuptial chambers in the cambium region, from which as many as 18 short egg tunnels radiated. Twenty-two specimens were removed from one system of galleries, including several males. Collections of other series were represented only by brood; consequently, this mating habit could not be verified.

NOTES.— The above treatment was based on the type series of 30 specimens and on 48 other specimens.

### 197. *Pityophthorus borrichiae* Wood

*Pityophthorus borrichiae* Wood, 1964, Great Basin Nat. 24:60 (Holotype, female; Key Largo, Florida; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *paulus* Wood by the smaller size, by the smaller antennal club, which is as short or shorter than the scape, by the smaller strial punctures, and by the shorter elytral setae.

FEMALE.— Length 1.1–1.3 mm, 2.8 times as long as wide; color very dark brown.

Frons as in *paulus* except surface smooth, shining, with punctures small, rather widely spaced. Antennal club smaller, usually shorter than scape.

Pronotum as in *paulus* except surface subreticulate, punctures smaller, asperities always in concentric rows.

Elytra as in *paulus* except surface of disc smooth, impressed points almost obsolete, strial punctures smaller, interstriae two to four times as wide as striae, vestiture fine, shorter, more nearly restricted to declivity.

MALE.— Similar to female in all respects.

DISTRIBUTION.— Florida.

USA: Florida: Key Largo, 25-VI-51, 2 m, *Borrichia arborescens* and *B. frutescens*, S. L. Wood.

NOTES.— The above treatment was based on the type series of 32 specimens.

### 198. *Pityophthorus paulus* Wood

*Pityophthorus paulus* Wood, 1964, Great Basin Nat. 24:63 (Holotype, female; 24 miles NE Jacala, Hidalgo, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *morosus* Wood by the straight sutures on the antennal club, by the presence of a conspicuous median frontal callus above the eyes, by the more coarsely punctured frons with many punctures confluent, and by the more slender, longer, elytral setae. The pronotal asperities may be either confused or subconcentric.

FEMALE.— Length 1.4–1.8 mm, 2.9 times as long as wide; color very dark brown.

Frons convex, with a conspicuous, impunctate, transversely etched, median callus from upper level of eyes to vertex, its lower extremity ending abruptly; surface transversly etched above, becoming subreticulate below to near epistoma, punctures coarse, close, many of them confluent; vestiture fine, short, inconspicuous. Antennal club moderately large, as long as or slightly longer than scape.

Pronotum 1.14 times as long as wide; outline as in *nanus* Wood; asperities on anterior slope varying from one or two concentric rows to entirely confused; posterior areas smooth, shining, impressed points large, very numerous, punctures coarse, deep. Vestiture as in *nanus*.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on more than basal two-thirds, very broadly rounded behind; striae not impressed except 1 slightly near declivity, punctures moderately coarse, deep; interstriae shining, somewhat wrinkled, with numerous impressed points, varying from once to almost twice width of striae. Declivity steep, rather strongly bisulcate; striae 1 and 2 rather coarsely, deeply punctured; interstriae 1 moderately, abruptly elevated, armed by a sparse row of moderately large granules, 2 as wide as 1, deeply impressed, smooth, shining, with impressed points and one or two setiferous punctures near apex, 3 rather strongly elevated, summit rather broadly convex, its mesal margin armed by a row of moderately small granules. Vestiture of rather fine, moderately long interstrial setae, mostly on or near declivity, except a few in lateral areas extend to base; less abundant on even-numbered interstriae.

MALE.— Similar to female in all respects.

DISTRIBUTION.— Chihuahua and Hidalgo to Chiapas.

MEXICO: Chiapas: Ocozocoautla, Tapilula, Teopisca. Chihuahua: Maguarichic. Hidalgo: Jacala, Pachuca. Michoacán: Carapan. San Luis Potosí: San Luis Potosí. Tlaxcala: Tlaxco.

HOST.— Apparently *Baccharus* sp.

NOTES.— The above treatment was based on the type series of 20 specimens and on 132 other specimens.

This species is somewhat variable, and it is possible that *morosus* and *borrichiae* are nothing more than well-marked geographical races of this form. Much more material from additional localities will be required for a proper evaluation of this complex.

### 199. *Pityophthorus molestus* Wood

*Pityophthorus molestus* Wood, 1976, Great Basin Nat. 36:362 (Holotype, female; Los Abritos, San Luis Potosí, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *lautus* Eichhoff by the presence of a median frontal carina, by the more shallowly sulcate declivity, and by the longer elytral setae.

FEMALE.— Length 1.3–1.5 mm, 2.8 times as long as wide; color yellowish brown.

Frons weakly convex, with a weak median carina from epistoma almost to upper level of eyes; surface shining, with indistinct fine lines and punctures, more coarsely punctured above eyes; vestiture of fine, short, sparse, hair.

Pronotum and elytral disc as in *lautus*. Elytral declivity as in *lautus* except interstriae 2 very slightly less strongly impressed, vestiture much longer.

MALE.— Similar to female in all respects.

DISTRIBUTION.— San Luis Potosí.

MEXICO: San Luis Potosí: Los Abritos (east of Ciudad del Maíz), 18-VI-53, *Liquidambar styraciflua*, S. L. Wood.

NOTES.— The above treatment was based on the type series of 14 specimens.

### 200. *Pityophthorus lautus* Eichhoff

*Pityophthorus lautus* Eichhoff, 1872, Berliner Ent. Zeitschr. 15:135 (Holotype, sex?; Americae boreali, apparently lost with Hamburg Mus.; Neotype, female; Morgantown, West Virginia; U.S. Nat. Mus., by Bright, 1976, Great Basin Nat. 36:427)

*Pityophthorus rhois* Swaine, 1917, Dom. Canada Dept. Agric. Ent. Br. Tech. Bull. 14(1):26 (Holotype, sex?; Ithaca, New York; Canadian Nat. Coll., 1379); Bright, 1976, Great Basin Nat. 36:427. *Synonymy*

*Pityophthorus natalis* Blackman, 1921, Mississippi Agric. Expt. Sta. Tech. Bull. 10:8 (Lectotype, male?, Agricultural College, Mississippi; U.S. Nat. Mus., designated by Bright, 1976, Coleopt. Bull. 30:183); Bright, 1976, Great Basin Nat. 36:427. *Synonymy*

*Pityophthorus rhois* var. *sucainei* Blackman, 1922, Mississippi Agric. Expt. Sta. Tech. Bull. 11:103 (Syntypes; Agricultural College and Wallerville, Mississippi; U.S. Nat. Mus.). *No status*

*Pityophthorus rhois* var. *hamamelidus* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:39 (Syntypes; Hancock Co., West Virginia; U.S. Nat. Mus.). *No status*

*Pityophthorus rhois* var. *acerini* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:39 (Syntypes; Monongalia Co., West Virginia; U.S. Nat. Mus.). *No status*

DIAGNOSIS.— This species is distinguished from *molestus* Wood by the transversely impressed lower frons that lacks a median carina and by the shorter elytral vestiture.

FEMALE.— Length 1.3–1.5 mm, 2.7 times as long as wide; color brown.

Frons broadly convex, transversely impressed on lower third, epistoma distinctly elevated; surface shining, closely, rather coarsely, deeply punctured; vestiture of fine, short, sparse hair.

Pronotum 1.1 times as long as wide; sides on basal half almost straight and parallel, rather broadly rounded in front; anterior margin armed by about 12 low serrations; summit at middle, distinct; asperities in subconcentric rows, not always clearly defined; posterior areas smooth, shining, with numerous impressed points, punctures rather coarse, deep, moderately close. Vestiture confined to sides and asperate area.

Elytra 1.7 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on basal two-thirds, very broadly rounded behind; striae not impressed except 1 slightly near declivity, punctures coarse, deep, close; interstriae as wide as striae, smooth, shining, impunctate except sparse punctures on 1 and at margin of declivity. Declivity steep, shallowly bisulcate; striae 1 and 2 rather coarsely, deeply punctured, 1 distinctly impressed; interstriae 1 abruptly, moderately elevated, with sparse, fine granules at summit, 2 as wide as 1, moderately impressed, smooth, shining, impunctate, 3

convex, as high as 1, with a row of fine granules. Vestiture largely confined to declivital area, of minute strial setae and moderately short interstrial setae, less abundant on even-numbered interstriae, absent on 2.

MALE.— Similar to female except declivital sulcus slightly deeper.

DISTRIBUTION.— Minnesota and Quebec to Kansas and Mississippi.

CANADA: **Ontario**: Prince Edward Co. **Quebec**: Ste. Annes, Wakefield. USA: **District of Columbia**: Washington. **Indiana**: Shoals. **Kansas**: Lawrence. **Maine**: Kittery Point. **Maryland**: Plummer's Island, University Park. **Massachusetts**: Springfield. **Michigan**: Detroit. **Minnesota**: Atkin, Houston Co., Winona Co. **Mississippi**: Starkville, Wallerville. **Missouri**: Union. **New Jersey**: Five-mile Beach, Red Bank. **New York**: Cranberry Lake, Green Lakes, Ithaca, Syracuse, Warrensbury, West Point. **North Carolina**: Boardman, Durham. **Ohio**: Pickaway Co. **Pennsylvania**: Essington, Hummelstown. **Virginia**: Falls Church, Vienna, Virginia Beach. **West Virginia**: Charleston, Hancock Co., Little Falls, Kanawha Co., Marion Co., Monongalia Co., Morgantown, Rosslyn, Wood Co.

HOSTS.— *Acer saccharum*, *Cercis canadensis*, *Hamamelis* sp., *Juglans nigra*, *Picea* sp., *Pinus strobus*, *Rhus typhina*, *R. radicans*.

BIOLOGY.— Specimens were taken in stems 2–8 cm in diameter.

NOTES.— The above treatment was based on the neotype of *lautus*, on the holotypes of *rhois* and *natalis*, on the specimens compared by Eggers to the type of *lautus* before the type was destroyed, on Blackman's series on which he based his morphological varieties, and on 537 other specimens. The varieties *swainei*, *hamamelidis*, and *acerini* were based on intrapopulational variants and, consequently, have no status in nomenclature.

### 201. *Pityophthorus sambuci* Blackman
Fig. 200

*Pityophthorus sambuci* Blackman, 1942, Proc. U.S. Nat. Mus. 92:207 (Holotype, male?; Jalisco, Mexico; U.S. Nat. Mus., 55982)

DIAGNOSIS.— This species is distinguished from *diligens* Wood by the more narrowly impressed declivity, with the lateral convexities more broadly rounded, by the weakly impressed lower frons that lacks a carina, and by other characters described below.

FEMALE.— Length 1.3–1.4 mm, 2.6 times as long as wide; color dark brown.

Frons broadly convex, a slight, transverse impression below upper level of eyes; surface smooth, shining, rather coarsely punctured; vestiture short, sparse, inconspicuous.

Pronotum 1.03 times as long as wide; outline essentially as in *lautus* Eichhoff, except anterior margin armed by 8–10 serrations; posterior areas weakly subreticulate, coarsely, deeply, rather closely punctured. Vestiture as in *lautus*, disc glabrous.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; outline about as in *lautus*; striae not impressed, punctures in rows, moderately coarse, rather deep; interstriae one and one-half times as wide as striae; surface shining, irregular, obscurely reticulate in a few small areas, impunctate except near declivity. Declivity steep, rather shallowly bisulcate; striae 1 and 2 with punctures half as large as on disc; interstriae 1 rather weakly, abruptly elevated, sparsely, minutely punctured, 2 moderately impressed, one and one-half times as wide as 1, very weakly reticulate, impunctate, 3 very slightly higher than 1, rather broadly convex, with a row of punctures similar to those of striae. Vestiture confined to declivital areas on odd-numbered interstriae except one or two setae at base of declivity on 2.

MALE.— Similar to female except transverse frontal impression slightly stronger.

DISTRIBUTION.— Jalisco.

MEXICO: **Jalisco**: state record, 29-IX-39, *Sambucus* branches. "Mexico at N.Y. 6-V-40."

NOTES.— The above treatment was based on the holotype and on six paratypes.

### 202. *Pityophthorus diligens* Wood

*Pityophthorus diligens* Wood, 1976, Great Basin Nat. 36:363 (Holotype, female; 16 km or 10 miles E Pachuca, Hidalgo, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *sambuci* Blackman by the more broadly impressed elytral declivity, with the lateral convexities more abruptly rounded, by the more strongly, more extensively impressed frons, and by other characters.

FEMALE.— Length 1.3–1.5 mm, 2.8 times as long as wide; color almost black.

Frons broadly convex, almost flat on median part of lower half, often with upper margin of impressed area abrupt or obscurely subcarinate; surface smooth, shining, rather finely punctured; vestiture short, sparse, inconspicuous.

Pronotum 1.15 times as long as wide; outline as in *sambuci*; anterior margin costate; posterior areas almost smooth, shining, very obscurely subreticulate, punctures rather fine, deep, not close. Vestiture as in *sambuci*, disc glabrous.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; outline and disc about as in *sambuci* except strial punctures deeper, surface smoother, without any reticulation. Declivity steep, shallowly bisulcate; as in *sambuci* except punctures on striae 1 and 2 as large as on disc, appearing slightly more broadly impressed, with lateral convexities more abruptly rounded, more deeply impressed in some specimens; vestiture finer.

MALE.— Similar to female except frons and declivital sulcus more distinctly impressed.

DISTRIBUTION.— Hidalgo.

MEXICO: Hidalgo: 16 km E Pachuca, 10-VI-67, 2600 m, No. 186, desert shrub, S. L. Wood.

NOTES.— The above treatment was based on the type series of 13 specimens.

### 203. *Pityophthorus corruptus* Wood

*Pityophthorus corruptus* Wood, 1976, Great Basin Nat. 36:363 (Holotype, female; Matamoros, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *lautus* Eichhoff by the larger size, by the different frons in both sexes, and by other minor differences described below.

FEMALE.— Length 1.4–1.8 mm, 2.6 times as long as wide; color reddish brown.

Frons plano-convex to upper level of eyes, more strongly convex above; surface almost smooth and shining on lower half, punctures moderately coarse, not close, becoming closely granulate-punctate above eyes; vestiture of rather sparse, almost uniformly distributed, moderately long hair.

Pronotum and elytra as in *lautus* except elytral declivity steeper, interstriae 2 more strongly impressed, interstriae 3 conspicuously higher than 1.

MALE.— Similar to female except lower half of frons moderately, transversely impressed, surface more coarsely punctured, vestiture short, inconspicuous.

DISTRIBUTION.— Puebla.

MEXICO: Puebla: 5 km or 3 miles S Matamoros, 14-VI-67, 2000 m, No. 34, *Toxicodendron*, S. L. Wood.

BIOLOGY.— Specimens were taken from a climbing poison ivy vine.

NOTES.— The above treatment was based on the type series of 27 specimens.

### 204. *Pityophthorus liquidambarus* Blackman

*Pityophthorus liquidambarus* Blackman, 1921, Mississippi Agric. Expt. Sta. Tech. Bull. 10:14 (Lectotype, female; Mound, Louisiana; U.S. Nat. Mus., designated by Bright, 1976, Coleopt. Bull. 30:183)

DIAGNOSIS.— This species is distinguished from *lautus* Eichhoff by the sexually dimorphic, very different frons and by the narrower elytral declivity that is not as steep on the lower half.

FEMALE.— Length 1.3–1.5 mm, 2.7 times as long as wide; color yellowish brown.

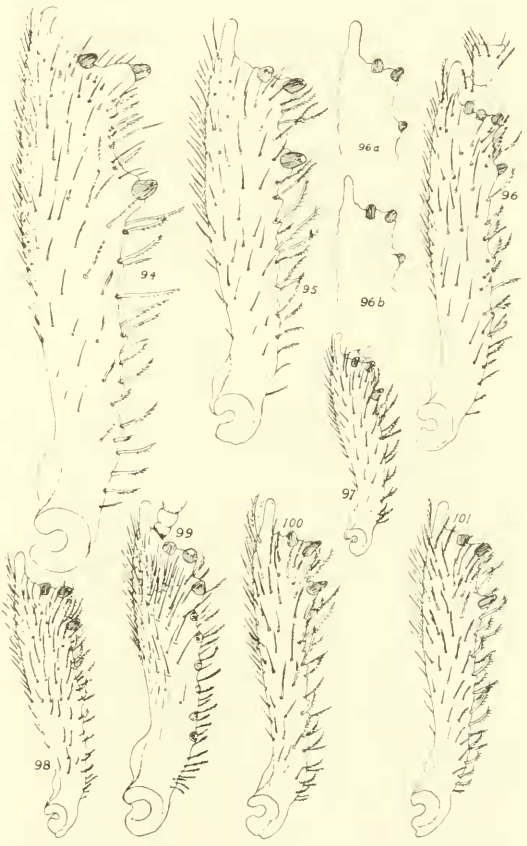



Fig. 209. Protibiae of Corthylini spp.: 94, *Conophthorus ponderosae*; 95, *Pityophthorus amplus*; 96, *Pityophthorus ramiperda*; 97, *Pityotrichus barbatus*; 98, *Pityophthorus nitidus* (=*anceps*); 99, *Pseudopityophthorus pubipennis*; 100, *Pityophthorus boycei*; 101, *Pityophthorus pinguus*. (After Blackman 1928:179.)

Frons plano-convex from epistoma to well above eyes, lateral margins rather abruptly rounded; surface smooth, brightly shining, punctures very minute, sparse; vestiture very sparse and short in central area, long and rather sparse on lateral and dorsal margins.

Pronotum and elytra as in *lautus* except posterior third of elytra, including declivity, distinctly narrower, declivity not as steep on lower half; declivital vestiture finer, evidently less abundant.

MALE.— Similar to female except frons transversely impressed on lower third, rather strongly convex above, coarsely, closely, deeply punctured; declivity slightly more strongly impressed.

DISTRIBUTION.— Arkansas and West Virginia to Louisiana and Florida.

USA: **Arkansas**: Texarkana. **Connecticut**: Milford. **District of Columbia**: Washington. **Florida**: Haw Creek, Mariana, Monticello, Suwannee Springs. **Georgia**: Riceboro, Savannah. **Louisiana**: Mound. **Mississippi**: Corinth, Fulton, Hattiesburg, Iuka, Meridian, Ripley, Starksville. **North Carolina**: Boardman, Chadbourn, Durham, Tryon. **West Virginia**: Charleston, Jackson Co.

HOST.— *Liquidambar styraciflua.*

BIOLOGY.— Specimens were taken from limbs and boles 6–20 cm in diameter.

NOTES.— The above treatment was based on the lectotype and on 229 other specimens.

### 205. *Pityophthorus crinalis* Blackman

*Pityophthorus crinalis* Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Pub. 25:41 (Holotype, female; Washington, D.C.; U.S. Nat. Mus., 41270)

DIAGNOSIS.— This species is distinguished from *lautus* Eichhoff by the more slender body form, by the very different female frons, and by the slightly different elytral vestiture.

FEMALE.— Length 1.3–1.5 mm, 2.8 times as long as wide; color yellowish brown.

Frons basically flat, a slight transverse impression on lower half, surface brilliantly shining, smooth, impunctate; dorsal margin with a dense fringe of long, yellow hair.

Pronotum (1.1 times as long as wide) and elytra (1.7 times as long as wide) essentially as in *lautus* except declivital vestiture slightly more abundant and present on all interstriae except 2 on face.

MALE.— Similar to female except frons as in male *liquidambarus.*

DISTRIBUTION.— Michigan and West Virginia to Indiana and Florida.

USA: **District of Columbia**: Washington. **Florida**: Haw Creek, Mariana. **Indiana**: Indianapolis. **Kentucky**: Barbourville. **Maryland**: Bladensburg. **Michigan**: Detroit. **North Carolina**: Fletcher. **West Virginia**: Jefferson Co., Kanawha Station.

HOSTS.— *Toxicodendron vernix.*

NOTES.— The above treatment was based on the holotype and on 102 other specimens.

### 206. *Pityophthorus acuminatus* (Schedl)

*Neopityophthorus acuminatus* Schedl, 1940, An. Esc. Nac. Cienc. Biol., Mexico 1:346 (Syntypes, female; Tuxtepec, Oaxaca and Finca la Florida, Chiapas; Schedl and Dampf colls.)

DIAGNOSIS.— This species is distinguished from *vesculus* Wood by the dull, reticulate pronotum, with obscure punctures, by the more slender elytral setae, by the sparse inconspicuous female frontal vestiture, and by other characters.

FEMALE.— Length 1.2–1.5 mm, 2.8 times as long as wide; color yellowish brown.

Frons evenly convex from eye to eye from slightly above epistoma to vertex, a distinct, transverse impression immediately above epistoma; surface reticulate on upper three-fourths, smooth, shining below, punctures coarse, rather close; vestiture short, sparse, inconspicuous.

Pronotum 1.08 times as long as wide; sides almost subparallel on basal half, rather broadly rounded in front; anterior margin armed by about a dozen low, basally subcontiguous serrations; summit indefinite, slightly in front of middle; asperities on anterior half rather coarse, confused; posterior areas finely, strongly reticulate, punctures fine, shallow, somewhat obscure. Glabrous.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; outline as in vesculus; striae not impressed, punctures fine, distinct, spaced by diameter of a puncture; interstriae three to four times as wide as striae, smooth, brightly shining, with moderately abundant impressed points, punctures absent except at base of declivity. Declivity steep, convex except narrowly, shallowly bisulcate; striae 1 impressed, punctures on all striae as on disc but slightly deeper; interstriae 1 slightly elevated, armed by a row of about 10 small granules, 2 as wide as 1, with impressed points, no punctures, slightly impressed, 3

about as high as 1, armed as on 1. Vestiture confined to declivital interstriae except absent on 2, setae slender, about twice as long as distance between rows.

MALE.— Similar to female in all respects.

DISTRIBUTION.— Oaxaca to Honduras.

MEXICO: Chiapas: Finca La Florida. Oaxaca: Tuxtepec. Tabasco: 23 km or 14 miles W Cárdenas, 26-VI-67, 30 m, bark of log, S. L. Wood. HONDURAS: La Ceiba, Atlántida, 29-V to 28-VI-49, at light, E. C. Becker.

NOTES.— The above treatment was based on the syntypes of Schedl and on 21 other specimens.

### 207. *Pityophthorus vesculus* Wood

*Pityophthorus vesculus* Wood, 1978, Great Basin Nat. 38:401 (Holotype, female; Ft. Clayton, Canal Zone, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *acuminatus* (Schedl) by the smooth, shining, more coarsely punctured pronotum, by the much stouter, almost spatulate interstrial setae on the elytral declivity, and by the more abundant, much longer pubescence on the female frons.

FEMALE.— Length 1.3–1.5 mm, 3.0 times as long as wide; color reddish brown.

Frons flattened to well above eyes, margins rounded, separated from eye by distance equal to diameters of three facets; epistomal margin gradually, distinctly elevated; surface smooth, shining, densely, finely punctured; vestiture of fine, moderately abundant, uniformly distributed setae, little if any longer at margins. Eye normal, rather finely faceted.

Pronotum 1.2 times as long as wide; sides almost straight and parallel on basal two-thirds, rather broadly rounded in front; anterior margin armed by about 12 low serrations; summit rather indefinite, anterior to middle; asperities on anterior slope confused; posterior areas smooth, shining, punctures moderately coarse, numerous impressed points present. Glabrous except on asperate area.

Elytra 1.8 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal two-thirds, rather strongly acuminate behind; striae not impressed, except 1 feebly, punctures rather coarse, close, deep; interstriae slightly wider than striae, smooth, shining, with a few obscure impressed points, impunctate except near declivity. Declivity steep, shallowly bisulcate; striae 1 and 2 with punctures almost as coarse as on declivity; interstriae 1 distinctly elevated, granules minute, almost obsolete, 2 shallowly impressed, as wide as 1, smooth, shining, impunctate, 3 as high as 1, armed on upper half by two small, pointed tubercles. Vestiture confined to declivity, of stout, rather short, interstrial setae, absent on 2.

MALE.— Similar to female except frons convex, a slight transverse impression on lower third, surface smooth, shining, coarsely punctured, vestiture inconspicuous; declivital sulcus stronger, tubercles on interstriae 1 and 3 distinctly larger, declivital vestiture much stouter, almost spatulate.

DISTRIBUTION.— Panama.

PANAMA: Ft. Clayton, Canal Zone, 22-XII-63, 30 m, No. 325, bole 25 cm in diameter, S. L. Wood.

NOTES.— The above treatment was based on the type series of five specimens.

### 208. *Pityophthorus sparsepilosus* (Schedl)

*Gnathophorus sparsepilosus* Schedl, 1935, Rev. de Ent. 5:343 (Syntypes, female; Hamburgfarm on Río Reventazón, Limón, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *acuminatus* (Schedl) by the larger size, by the shagreened pronotal disc, by the rounded elytral apex, by the abundant vestiture on the female frons, and by the very coarsely faceted eyes.

FEMALE.— Length 1.5–1.7 mm, 3.2 times as long as wide; color yellowish brown.

Frons rather narrow, almost flat on upper three-fourths, moderately ascending on lower fourth to epistomal margin; surface shining rather densely, very finely punctured on marginal areas, more sparsely punctured in central area; vestiture dense and rather long on lateral and upper margins, much shorter and rather sparse on central area, longest setae equal in length to half distance between eyes. Eyes large, very coarsely faceted.

Pronotum 1.3 times as long as wide; sides almost straight and parallel on more than basal half, rather narrowly rounded in front; anterior margin armed by about a dozen low, basally contiguous serrations; low summit well in front of middle; asperities on anterior slope rather small, confused; posterior areas shagreened, punctures small, shallow, not sharply impressed. Glabrous.

Elytra 2.0 times as long as wide, 1.9 times as long as pronotum; sides almost straight and parallel on more than basal two-thirds, rather broadly rounded behind; striae not impressed except 1 slightly, punctures moderately coarse, shallow; interstriae two to three times as wide as striae, smooth, shining, impressed points minute, obscure, punctures absent. Declivity rather steep, shallowly bisulcate; strial punctures smaller than on disc, striae 1 impressed; interstriae slightly shagreened, 1 distinctly elevated, with two or three punctures, 2 moderately impressed on mesal side, 2 as wide as 1, impunctate, 3 as high as 1, with a row of very fine punctures. Vestiture confined to odd-numbered declivital interstriae, sparse, rather stout.

MALE.— Similar to female except frons weakly (transversely) convex, a distinct summit at upper level of eyes, surface smooth, shining, punctures coarse, close, vestiture short, sparse, inconspicuous; serrations on anterior margin of pronotum much larger in median area, punctures on disc rather coarse, longitudinally almost subaciculate; declivity more strongly, more broadly sulcate, tubercles on interstriae 1 and 3 (two or three on each) moderately coarse, pointed.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Hamburgfarm on Río Reventazón, Limón; Peralta, Cartago, 10-III-64, 500 m, No. 465, tree limb (*Protium*?), S. L. Wood.

NOTES.— The above treatment was based on the Schedl syntypes and on eight other specimens. Because my specimens were associated in the same limb with *Camptocerus aeneipennis*, it is presumed the host was *Protium*.

## 209. *Pityophthorus subsimilis* Schedl

*Pityophthorus subsimilis* Schedl, 1955, Zeitschr. angew. Ent. 38:25 (Lectotype, male; G. Ciudad, Guatemala; Schedl Coll., designated by Bright, 1976)

*Pityophthorus subimpressus* Bright, 1976, Great Basin Nat. 36:441 (Holotype, female; 32 miles or 51 km S Valle Nacional, Oaxaca, Oaxaca; Canadian Nat. Coll.); Wood, 1977, Great Basin Nat. 37:210. *Synonymy*

DIAGNOSIS.— This species is distinguished from *delicatus* Wood by the flat female frons, by the much narrower declivital sulcus, and by the (frequently) subconcentric arrangement of the pronotal asperities. It is probably more closely related to *attenuatus* Blackman, but the host clearly distinguishes them.

FEMALE.— Length 1.5–1.7 mm, 3.0 times as long as wide; color brown.

Frons as in *attenuatus* except flattened area a bit more extensive, punctures slightly larger, vestiture moderately abundant, uniformly distributed, fine, very long (variable).

Pronotum as in *attenuatus* except asperities either confused or concentric (with all degrees of intermediacy represented), posterior areas smoother, usually obscurely shagreened.

Elytra as in *attenuatus* except declivital striae 2 much more distinctly punctured, interstriae 2 not as wide and impressed only at striae 1, ascending laterally, interstriae 3 with punctures very feebly granulate, surface of declivity usually and disc occasionally shagreened.

MALE.— Similar to female except frons transversely impressed from epistoma to upper level of eyes, a conspicuous transverse impression at its upper limit, surface smooth, shining, moderately punctured, vestiture inconspicuous; declivity distinctly more strongly impressed, granules on interstriae 3 slightly larger.

DISTRIBUTION.— Puebla to Chiapas.

MEXICO: **Chiapas**: Lagos des Colores, 14-VI-69, D. E. Bright; 15 km SE Teopisca, 14-V-69, D. E. Bright. **Oaxaca**: 51 km S Valle Nacional, 21-V-71, *Pinus*, D. E. Bright. **Puebla**: 9 km NE Teziutlan, 2-VII-67, 1600 m, No. 153, *Pinus*, S. L. Wood.

NOTES.— The above treatment was based on the lectotype of *subsimilis* and on the type series of 65 specimens of *subimpressus*.

## 210. *Pityophthorus attenuatus* Blackman

*Pityophthorus attenuatus* Blackman, 1942, Proc. U.S. Nat. Mus. 92:222 (Holotype,female; Mexico; U.S. Nat. Mus., 55996)

*Pityophthorus pusillus* Wood, 1964, Great Basin Nat. 24:62 (Holotype, female; 9 miles or 14 km S Zimapan, Hidalgo, Mexico; Wood Coll.); Wood, 1978, Great Basin Nat. 38:397. *Synonymy*

DIAGNOSIS.— Among those species with the pronotal asperities arranged in concentric rows, this species is uniquely distinguished by the slender body form and the subacuminate elytral apex.

FEMALE.— Length 1.2–1.5 mm, 3.0 times as long as wide; color yellowish brown to brown.

Frons flattened on a rather small, semicircular area from epistoma to well above eyes, margins obtusely abrupt, separated from margin of eye by distance equal to width of four facets, epistomal margin slightly elevated; surface smooth, shining, finely, rather closely, uniformly punctured; vestiture very fine, uniformly distributed (sometimes appearing partly divided along median line), short, longest setae equal in length to less than one-fourth distance between eyes (Guatemalan series with slightly longer, more abundant setae). Antennal club small, sutures straight, 1 completely, 2 partly septate.

Pronotum 1.14 times as long as wide; sides almost straight and parallel on basal half, rather broadly rounded in front; anterior margin armed by 12–14 serrations; summit distinctly in front of middle; anterior slope with three concentric rows of asperities; posterior areas shining, usually smooth, limited reticulation sometimes present; punctures rather fine to moderately coarse (variable). Posterior half glabrous.

Elytra 1.9 times as long as wide, 1.7 times as long as pronotum; sides straight and parallel on basal two-thirds, rather strongly acuminate behind; striae not impressed, punctures moderately coarse, interstriae smooth, shining, as wide as striae, impunctate. Declivity rather steep, moderately bisulcate; striae 1 obsolete, 2 with minute punctures; interstriae 1 abruptly, moderately elevated, armed by a sparse row of fine granules, 2 twice as wide as 1, rather strongly impressed but ascending slightly on its lateral half, 3 rather narrowly rounded and armed by about four small granules. Minute strial setae extend to base; odd-numbered interstriae on declivity, each with a sparse row of moderately long setae.

MALE.— Similar to female except frons moderately convex to moderately, transversely impressed below upper level of eyes, upper margin of impression rounded to transversely subcarinate.

DISTRIBUTION.— Jalisco and Veracruz to Guatemala.

MEXICO: **Jalisco**: Volcán Colima. **Hidalgo**: Zimapán. **Michoacán**: Quiroga. GUATEMALA: Guatemala City.

HOST.— A composite shrub.

NOTES.— The above treatment was based on the holotypes of *attenuatus* and *pusillus* and on 113 other specimens.

The holotype of *subimpressus* and the lectotype of *subsimilis* were compared to long series from southern Mexico that are almost or are entirely identical. Nevertheless, series of this form and of *attenuatus* are sufficiently variable that it is uncertain as to whether *subsimilis* and *attenuatus* represent anything more than geographical variants of one another. Much more material should be studied before this problem can be resolved.

### 211. *Pityophthorus atomus* Wood

*Pityophthorus atomus* Wood, 1964, Great Basin Nat. 24:61 (Holotype, female; Veracruz, Veracruz, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *attenuatus* Blandford by the smaller size and stouter form, by the steeper elytral declivity, with its apex rounded, and by other characters.

FEMALE.— Length 0.8–1.1 mm, 2.7 times as long as wide; color very dark brown.

Frons as in *attenuatus* except setae slightly longer, some at least equal to one-third distance between eyes.

Pronotum and elytral disc about as in *attenuatus* except impressed points usually more conspicuously present; pronotal punctures variable in size from rather fine to coarse within series. Declivity not as steep, not at all acuminate at sutural apex; striae 2 more coarsely punctured, interstriae 2 less deeply impressed; vestiture similar but stouter.

MALE.— Similar to female except frons weakly convex with a weak transverse carina at upper level of eyes, surface rather coarsely punctured, vestiture short, inconspicuous.

DISTRIBUTION.— Veracruz to Oaxaca.

MEXICO: **Oaxaca**: 184 km S Oaxaca. **Veracruz**: Veracruz, 30-VI-53, S. L. Wood; Cerro Gordo, 6-VII-67, 300 m, No. 164, shrub, S. L. Wood.

BIOLOGY.— Specimens were taken from a small, common, semiherbaceous shrub that grew on sand dunes at the beach on the southern limits of the city.

NOTES.— The above treatment was based on the type series of 13 specimens.

### 212. *Pityophthorus dimidiatus* Blackman

*Pityophthorus dimidiatus* Blackman, 1942, Proc. U.S. Nat. Mus. 92:221 (Holotype, female; Mexico; U.S. Nat. Mus., 55995)

DIAGNOSIS.— This species is distinguished from *perexiguus* Wood by the different female frons as described below and by the more strongly sulcate elytral declivity, which is not as steep as in *atomus* Wood.

FEMALE.— Length 1.2–1.3 mm, 2.8 times as long as wide; color brown, elytra evidently lighter.

Frons as in *attenuatus* except flattened on a less extensive, narrower area (as in *atomus* except more finely punctured), vestiture as in *atomus*.

Pronotum as in *attenuatus* except strongly reticulate, punctures minute, shallow.

Elytra as in *atomus* except not quite as steep, sulcus slightly deeper, lateral convexities very slightly higher than suture, vestiture similar but finer.

MALE.— Similar to female except shallowly, transversely impressed from epistoma to upper level of eyes, a weak transverse carina at upper level of eyes; setae on declivity short, stout (almost subspatulate).

DISTRIBUTION.— "Mexico, 17-XI-38, Lot No. 38-17192" (intercepted at port of entry into the USA).

NOTES.— The above treatment was based on the holotype, allotype, and one female paratype.

### 213. *Pityophthorus timidus* Blandford

*Pityophthorus timidus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):241 (Holotype, female; Mexico, Salle Coll.; British Mus. Nat. Hist.)

The holotype fits my description of *dimidiatus* Blackman except that the vestiture on the female frons is shorter and perhaps less abundant, and the punctures on the pronotal disc apparently are larger. The holotype is 1.3 mm long and 2.9 times as long as wide. It is suspected that they represent the same species, but additional material for study is needed. The differences between the types appear to be no greater than the variations seen within populations of allied species. These comments were based on the holotype of *timidus* and my notes on the type of *dimidiatus*.

### 214. *Pityophthorus perexiguus* Wood

*Pityophthorus perexiguus* Wood, 1976, Great Basin Nat. 36:355 (Holotype, female; Dominical, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *atomus* Wood by the absence of a frontal carina in the male, by the steeper, more broadly impressed elytral declivity, and by other characters described below.

FEMALE.— Length 1.0–1.4 mm, 2.8 times as long as wide; color yellowish brown.

Frons weakly, transversely impressed from epistoma to upper level of eyes, all margins rounded, surface smooth, shining, sparsely, finely punctured; margins at sides and above with sparse, moderately long hair.

Pronotum as in *atomus* except pronotal punctures smaller.

Elytra as in *atomus* except declivity steeper, more broadly impressed, striae 2 more coarsely punctured, interstriae 2 more broadly, more deeply impressed, 3 with granules slightly larger, declivital setae much stouter.

MALE.— Similar to female except frons more strongly convex, transverse impression restricted to lower third, surface more coarsely, more closely punctured, without any long hair.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Cañas, Guanacaste, 13-VI-66, 50 m, No. 22, tree branch, S. L. Wood; Dominical, Puntarenas, 9-XII-63, 3 m, No. 297, tree branch, S. L. Wood. PANAMA: Limón Bay, Canal Zone, 30-XII-63, 3 m, No. 353, tree limb, S. L. Wood.

NOTES.— The above treatment was based on the type series of 48 specimens.

### 215. *Pityophthorus nugalis* Wood

*Pityophthorus nugalis* Wood, 1976, Great Basin Nat. 36:356 (Holotype, female; Volcán Pacaya, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the unique female frons, by the subacuminate apex of the elytra, and by other characters described below.

FEMALE.— Length 1.2–1.3 mm, 3.1 times as long as wide; color brown.

Frons moderately convex, epistomal area produced on median half into a premandibular lobe; surface subreticulate, punctures fine below, moderately coarse near upper level of eyes; vestiture of fine, long, yellow hair confined to area below upper level of eyes; distributed into three areas, lateral areas from base of mandible to upper

level of eye, median fourth from apex of premandibular process to upper level of eyes. Antennal club small, oval; sutures 1 and 2 straight, indicated at margins by septa and setae; most of anterior face glabrous.

Pronotum 1.2 times as long as wide; sides on basal half straight and parallel, broadly rounded in front; anterior margin armed by about 14 coarse serrations; summit at middle; anterior slope armed by two concentric rows of asperities, others near summit confused; posterior areas smooth, shining, small areas of reticulation in lateral areas sometimes present, with numerous fine, impressed points, punctures rather small, moderately abundant. Vestiture inconspicuous, confined to asperate area and lateral margins.

Elytra 2.0 times as long as wide, 1.8 times as long as pronotum; sides almost straight and parallel on basal three-fourths, broadly rounded behind except sutural apex moderately acuminate; striae not impressed, punctures in rows, rather small, shallow; interstriae twice as wide as striae, smooth, shining, with numerous impressed points, an occasional puncture near declivity. Declivity rather steep, moderately bisulcate; striae 1 impressed, punctures not clearly evident, 2 with fine, distinct punctures; interstriae 1 moderately, abruptly elevated, armed by two to four very fine granules, 2 moderately impressed, more strongly on median side, as wide as 1, with numerous impressed points, 3 as high as 1, broadly rounded, armed by about two fine granules. Vestiture of minute strial hair on posterior half, and sparse, moderately long interstrial setae on odd-numbered interstriae, mostly on declivity.

MALE.— Similar to female except frons convex, rather coarsely punctured, a fine, low, median carina, epistoma normal, vestiture sparse, inconspicuous; tubercles on elytral declivity distinctly larger.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán Pacaya, 1-VI-64, 1300 m, No. 656, woody vine 1 cm in diameter, S. L. Wood.

NOTES.— The above treatment was based on the type series of six specimens.

## 216. *Pityophthorus hermosus* Wood

*Pityophthorus hermosus* Wood, 1976, Great Basin Nat. 36:356 (Holotype, female; Yuscarán, Paraíso, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *minutalis* Wood by the long, abundant vestiture on the female frons, by the reticulate pronotum, and by other characters described below.

FEMALE.— Length 1.0–1.3 mm, 2.7 times as long as wide; color brown.

Frons flat from epistoma to vertex, lateral margins obtusely subangulate, separated from margin of eye by distance equal to width of two facets; surface obscured by dense brush of uniformly distributed long hair, marginal setae apparently slightly longer, longest setae equal in length to at least two-thirds distance between eyes.

Pronotum 1.13 times as long as wide; outline essentially as in *nugalis* Wood; first two rows of asperities usualy concentric, sometimes partly confused in median area; posterior areas strongly reticulate, punctures fine, moderately abundant. Vestiture confined to margins and asperate area, inconspicuous.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; outline basically as in *nugalis*; striae not impressed, punctures moderately coarse, rather deep; interstriae smooth, shining, a few minute, impressed points present, as wide as striae, impunctate except at margin of declivity. Declivity steep, rather strongly bisulcate; as in *nugalis* except sulcus slightly deeper, lateral margins on basal half slightly higher than suture, tubercles on interstriae 3 conspicuously larger. Vestiture confined to declivity, on all interstriae except restricted to basal margin on 2, of moderate length.

MALE.— Similar to female except frons transversely impressed from epistoma to upper level of eyes, transversely carinate at upper margin of impressed area, surface rather closely, finely punctured, pubescence of fine, short, moderately abundant hair.

DISTRIBUTION.— Honduras.

HONDURAS: Yuscarán, Paraíso, 23-IV-64, 800 m, No. 517, *Perymanium grande*, S. L. Wood; Zamorano, Morazán, 18-IV-64, 700 m, No. 565, *Eupatorium dalioides*, S. L. Wood.

NOTES.— The above treatment was based on the type series of 47 specimens.

## 217. *Pityophthorus minutalis* Wood

*Pityophthorus minutalis* Wood, 1976, Great Basin Nat. 36:357 (Holotype, female; Palín, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the small size and slender form, by the acuminate apex of the elytra, and by the distinctive frons as described below.

FEMALE.— Length 0.9–1.0 mm, 3.2 times as long as wide; color brown.

Frons plano-convex from epistoma to well above upper level of eyes, lateral margins obtusely subangulate, separated from margin of eye by width of two facets; surface smooth, shining, finely, closely punctured; vestiture uniformly distributed, of almost uniform length, longest setae equal in length to one-fourth distance between eyes.

Pronotum 1.2 times as long as wide; outline basically as in *nugalis* Wood, anterior slope with three concentric rows of asperities; posterior areas shining, almost smooth, punctures small, moderately close. Vestiture confined to lateral margins and asperate area, inconspicuous.

Elytra 2.0 times as long as wide, 1.8 times as long as pronotum; outline as in *nugalis*; striae not impressed, punctures small, deep, spaced within a row by twice diameter of a puncture; interstriae smooth, shining, impressed points sparse, a few weak, short, transverse lines, about one and one-half times as wide as striae, impunctate. Declivity steep, moderately bisulcate; as in *nugalis* except interstriae 2 without impressed points. Vestiture as in *nugalis*.

MALE.— Similar to female except frons shallowly, transversely impressed to upper level of eyes, upper margin of impressed area forming a weak, transverse carina, surface of impressed area with indistinct, fine punctures, vestiture fine, sparse, short, inconspicuous.

DISTRIBUTION.— Guatemala.

GUATEMALA: Palín, Esquintla, 19-V-64, 300 m, No. 587, shrub, S. L. Wood.

NOTES.— The above treatment was based on the type series of 12 specimens.

### 218. *Pityophthorus sobrinus* Wood

*Pityophthorus sobrinus* Wood, 1976, Great Basin Nat. 36:357 (Holotype, female; 3 km SE Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *minutalis* Wood by characters on the frons and declivity as described below.

FEMALE.— Length 1.5–1.7 mm, 3.0 times as long as wide; color dark brown.

Frons flattened on slightly more than upper half, ascending below toward epistomal margin, lateral margins obtusely angulate, separated from margin of eye by width of two facets; surface smooth, shining, finely, rather closely punctured except impunctate on a small median area on lower third; vestiture of fine hair of moderate length in central area, much longer on margins, longest setae equal in length to slightly more than half distance between eyes.

Pronotum 1.18 times as long as wide; outline as in *nugalis*; anterior slope with three concentric rows of asperities (sometimes slightly confused), others confused near summit; posterior areas smooth, shining, with numerous impressed points, punctures fine, rather close. Vestiture confined to lateral margins and asperate area, inconspicuous.

Elytra 2.0 times as long as wide, 1.7 times as long as pronotum; outline about as in *minutalis*; striae not impressed, punctures coarse, deep, close; interstriae as wide as striae, shining, smooth, with minute impressed points, impunctate except 1 with a few punctures on posterior third. Declivity steep, shallowly bisulcate; not as steep as in *minutalis*, more broadly impressed; interstriae 2 with minute impressed points. Vestiture confined to declivity on odd-numbered interstriae, fine, rather sparse, of moderate length.

MALE.— Similar to female except frons rather shallowly, transversely impressed from epistoma to upper level of eyes, its upper margin on median third marked by a subcarinate, transverse, impunctate elevation, surface smooth, shining, coarsely, rather closely punctured; declivital sulcus conspicuously deeper, tubercles slightly larger.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 3 km SE Cartago, Cartago, 2-VIII-63, 1300 m, No. 99, woody vine, S. L. Wood.

NOTES.— The above treatment was based on the type series of 32 specimens.

## GENUS *PITYOTRICHUS* WOOD

*Pityophilus* Blackman, 1928 (nec Brulle, 1884), Bull. New York St. Coll. For., Syracuse, Tech. Pub. 24:147 (Type-species: *Pityophilus barbatus* Blackman, original designation)

*Pityotrichus* Wood, 1962, Great Basin Nat. 22:76 (Replacement name for *Pityophilus* Blackman)

DIAGNOSIS.— As in *Pityophthorus* except pregula moderately enlarged and ornamented by a few long hairs in the male, enormously enlarged and ornamented by a large, dense tuft of hair in the female.

DESCRIPTION.— Length 1.4–1.8 mm, 2.5 times as long as wide; color very dark brown.

Frons slightly dimorphic, somewhat more broadly impressed and more finely punctured in female. Antennae, pronotum, elytra, and legs as in *Pityophthorus*.

DISTRIBUTION.— Arizona and New Mexico; two species are known.

BIOLOGY.— These monogamous species construct radiate tunnels in the phloem tissues without engraving the wood. The egg galleries are short, and the number of offspring produced by each pair is small. Shaded out twigs and small branches on living trees are selected for attack.

NOTES.— This genus is recognized as distinct from *Pityophthorus* on the basis of the unique pregula and biology that do not appear to intergrade. There is some question as to the validity of this action. Perhaps future collecting will determine whether or not continued generic recognition is justified.

Key to the Species of *Pityotrichus*

1. Male frons without a carina; interstrial setae present on all interstriae and two-thirds as long as distance between rows, at least twice as long as those of striae; Arizona and New Mexico; *Pinus edulis*; 1.3–1.6 mm ..... 1. **barbatus (Blackman)**

— Male frons armed by a median carina from epistoma almost to upper level of eyes; interstrial setae less than one-third as long as width of an interstriae, about equal in length to strial setae, except mostly absent on even-numbered interstriae; Arizona and New Mexico; *Pinus strobiformis*; 1.6–1.8 mm ..... 2. ***hesperius* Bright**

### 1. *Pityotrichus barbatus* (Blackman)

Figs. 208–209

*Pityophilus barbatus* Blackman, 1928, Bull. New York St. Coll. For., Syracuse, Tech. Pub. 25:147 (Holotype, female; Las Vegas Hot Springs, New Mexico; U.S. Nat. Mus., 41328)

DIAGNOSIS.— This species is distinguished from *hesperius* Bright by characters summarized in the above key.

FEMALE.— Length 1.3–1.6 mm, 2.5 times as long as wide; color very dark brown.

Frons basically convex, except median third flattened to feebly concave; surface shining, punctures fine, variable in size, moderately abundant; vestiture fine, rather sparse, moderately long on marginal areas, very short on impressed area; pregula greatly enlarged, ornamented by a dense brush of very long, yellow hair. Antennal club slightly longer than scape, 1.1 times as long as wide; sutures 1 and 2 septate, moderately procurved.

Pronotum 1.0 times as long as wide; widest on basal third, sides rather weakly arcuate on basal half, moderately rounded in front; anterior margin armed by six rather coarse serrations; summit at middle, a distinct, transverse impression behind summit; anterior slope rather coarsely asperate; posterior areas smooth, shining, punctures moderately coarse, deep, close, interspaces usually narrower than diameter of a puncture. Vestiture confined to sides and asperate area.

Elytra 1.5 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; striae not impressed, punctures fine, in rows on posterior half of disc, slightly confused on basal half, spaced by two to three diameters of a puncture; interstriae smooth, shining, four to six times as wide as striae, punctures similar to those of striae, rather widely spaced. Declivity convex, moderately steep, strial punctures minute, almost obsolete; interstriae 1 weakly elevated, 2 shallowly, broadly impressed, 3 as high as 1, 1 and 3 each with a row of very fine granules. Vestiture of rows of fine, short, strial hair and of rows of interstrial setae, each seta about two-thirds as long as distance between rows, twice as long as those of striae, absent on declivital interstriae 2.

MALE.— Similar to female except frons more broadly flattened, pregula less strongly enlarged, ornamented by less than a dozen long hairs.

DISTRIBUTION.— Arizona and New Mexico. USA: Arizona: Chiricahua Mts., Ash Canyon in Huachuca Mts. New Mexico: Capitan, Cloudcroft, Las Vegas Hot Springs, Lake Nogal, Meek.

HOSTS.— *Pinus cembroides, P. edulis.*

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotype and on 67 other specimens.

### 2. *Pityotrichus hesperius* Bright

*Pityotrichus hesperius* Bright, 1971, Pan Pacific Ent. 47:69 (Holotype, female; Pinaleno Mts., Graham Co., Arizona; Canadian Nat. Coll., 11445)

DIAGNOSIS.— This species is distinguished from *barbatus* (Blackman) by characters summarized in the above key.

FEMALE.— Length 1.6–1.8 mm, 2.5 times as long as wide; color very dark brown.

Frons as in *barbatus* except central area more distinctly impressed, setae of almost uniform, medium length.

Pronotum and elytra as in *barbatus* except surface weakly reticulate, interstrial punctures and setae largely obsolete on even-numbered interstriae, and interstrial setae much shorter, usually not longer than those of striae, length of none of them greater than one-third width of an interstriae.

MALE.— Similar to female except frons more broadly impressed, with a rather sharply elevated, low, median carina from epistoma almost to upper level of eyes.

DISTRIBUTION.— Arizona and New Mexico. USA: Arizona: Pinaleno Mts. in Graham Co., 15-VII-68, *Pinus strobiformis*, D. E. Bright. New Mexico: Cloudcroft Ski Area, 4-VI-69, 2800 m, No. 52, *P. strobiformis*, S. L. Wood; Sandia Peak, Bernalillo Co., 9-VII-68, *P. flexilis*, D. E. Bright.

HOST.— *Pinus flexilis, P. strobiformis.*

NOTES.— The above treatment was based on two topotypic paratypes and on 24 other specimens. The holotype was also examined.

## GENUS *GNATHOLEPTUS* BLACKMAN

*Gnatholeptus* Blackman, 1943, J. Washington Acad. Sci. 33:34 (Type-species: *Gnatholeptus mandibularis* Blackman = *Pityophthorus shannoni* Blackman, original designation)

DIAGNOSIS.— This genus is not clearly defined and eventually may be combined with *Pityophthorus.* It is distinguished from *Pityophthorus* by the slightly to enormously elongated female mandibles, by the very coarsely faceted eyes, and by other characters cited below.

DESCRIPTION.— Length 1.3–1.8 mm, 2.8–3.0 times as long as wide; color yellowish brown.

Frons sexually dimorphic, male convex, with mandibles normal, female somewhat flattened or variously impressed, with or without vestiture, with mandibles slightly to enormously elongate. Antenna as in *Pityophthorus.* Pronotum with summit rather indefinite, lateral margin usually not marked by a fine, raised line. Elytra finely sculptured, about as in *Pityophthorus*, declivity bisulcate, declivital interstriae 3 usually armed in male. Legs as in *Pityophthorus.*

DISTRIBUTION.— Costa Rica to northern South America; four species have been assigned to this genus, all occur in Central America.

BIOLOGY.— These polygamous species form radiate gallery systems as in most *Pityophthorus.* The hosts most commonly are of the genus *Protium*, but those of certain other genera are acceptable.

NOTES.— A majority of the South American species at hand that are assignable to this genus have not been named. They are allied to *subcribratus* Schedl and do not exhibit the remarkable female mandibular character. Although this group of species is distinctive, it is doubtful that generic rank is justified.

### Key to the Species of *Gnatholeptus*

1. Discal interstriae with numerous, minute punctures; pronotal asperities confused; hair on female frons abundant, long; female mandibles almost normal; Nicaragua to Panama; 1.4–1.8 mm ..... 1. ***subcribratus*** **(Schedl)**

— Discal interstriae impunctate; pronotal asperities mostly in concentric rows; female mandibles moderately to enormously elongate; vestiture on female frons shorter, less abundant ..... 2

2(1). Female without a premandibular epistomal lobe; female frons with moderately long, rather abundant vestiture extending to upper level of eyes; female declivital interstriae 3 armed as in male, 1 unarmed in both sexes; female mandible distinctly shorter than protibia; Panama to Colombia; *Dacreoides*; 1.3–1.6 mm . ..... 2. ***shannoni*** **(Blackman)**

— Female with conspicuous median premandibular epistomal lobe; female frons with vestiture restricted to lower half or absent; female elytral declivity unarmed; female mandible conspicuously longer than protibia ..... 3

3(2). Female premandibular process slender, almost pointed, equal in width to about two facets of eye, about three facets in length; female mandibles slender, sickle-shaped, ornamented on lateral face near base by a tuft of hair; declivital interstriae 2 twice as wide as 1 in both sexes, 1 with a row of tubercles in male; Costa Rica and Panama; 1.3–1.5 mm ..... 3. ***panameńsis*** **Blackman**

— Female premandibular process subquadrate, equal in width to about three facets, about six facets in length, widest near apex, apical half conspicuously ornamented by long hair; female mandibles very large, elongate, not ornamented by long hair; declivital interstriae 2 as wide as 1 in both sexes, 1 unarmed in male; Costa Rica to Colombia and Surinam; *Protium*, *Cedrella*; 1.4–1.8 mm ..... ..... 4. ***semiermis*** **(Nunberg)**

### 1. *Gnatholeptus subcribratus* (Schedl)

*Pityophthorus subcribratus* Schedl, 1937, Arch. Inst. Biol. Veget. Río de Janeiro 3:168 (Holotype, female; Hamburgfarm on Río Reventazón, Limón, Costa Rica; Schedl Coll.)

*Gnatholeptus subcribratus*: Bright, 1977, Canadian Ent. 109:513

*Pityophthorus zeteki* Blackman, 1942, Proc. U.S. Nat. Mus. 92:226 (Holotype, female; Trinidad River, Panama; U.S. Nat. Mus., 56014); Bright, 1977, Canadian Ent. 109:513. *Synonymy*

DIAGNOSIS.— This species is distinguished from other species in this genus by the confused pronotal asperities, by the punctured interstriae, and by the female frons and mandibles as described below.

FEMALE.— Length 1.4–1.8 mm, 3.0 times as long as wide; color yellowish to light reddish brown.

Frons almost flat from eye to eye from epistoma to slightly above eyes; surface almost smooth, very closely, rather finely punctured; vestiture of abundant, long, yellow hair, longer above, longest dorsal setae exceeding epistomal margin; epistomal margin almost straight, without a median lobe; mandibles normal, very slightly elongate. Antennal club as long as scape, sutures 1 and 2 straight, septate except on middle third.

Pronotum 1.15 times as long as wide; sides almost straight and parallel on basal half, very broadly rounded in front; anterior margin armed by 14 low serrations; summit slightly anterior to middle; anterior slope with fine, confused asperities; posterior areas almost smooth, punctures rather fine, shallow, on disc with fine and very fine punctures intermixed. Glabrous except in asperate area.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on basal two-thirds, subacutely acuminate behind; striae 1 weakly, others not impressed, punctures moderately coarse, rather deep, close; interstriae smooth, shining, almost twice as wide as striae, punctures minute, rather abundant, confused. Declivity very steep, convex; striae as on disc; interstriae 1 and 3 very slightly elevated, 1 with about four minute granules, 3 with two or three pointed denticles; apex rather strongly acuminate. Vestiture confined to declivity, of rather coarse, close interstrial bristles, each bristle about one and one-half times as long as distance between rows.

MALE.— Similar to female except mandibles normal, frons convex, more coarsely, deeply punctured, with vestiture sparse, short, inconspicuous; declivital interstriae 2 more distinctly impressed, narrower than 1, denticles on 3 distinctly larger, one or more smaller denticles also on 5 and 7; declivital vestiture stouter, absent on interstriae 2.

DISTRIBUTION.— Nicaragua to Panama.

NICARAGUA: Intercepted in cachimbo wood from Nicaragua at Valparaiso, Chile, 27-IX-45. COSTA RICA: Pandora, Limón, 23-VIII-63, 50 m, No. 137, limb, S. L. Wood; Hamburgfarm on Río Reventazón, Limón, 25-VIII-25, F. Nevermann. PANAMA: Limón Bay, Canal Zone, 30-XII-63, 3 m, No. 352, log (*Protium*?), S. L. Wood; Trinidad River, 2, 4-V-12, A. Busck; Alhajuelo, 5-IV-11, A. Busck.

BIOLOGY.— As mentioned for the genus.

NOTES.— The above treatment was based on the holotypes of *subcribratus* and *zeteki* and on 62 other specimens.

### 2. *Gnatholeptus shannoni* (Blackman)

Fig. 210

*Pityophthorus shannoni* Blackman, 1942, Proc. U.S. Nat. Mus. 92:224 (Holotype, female; Cano Saddle at Gatún Lake, Panama; U.S. Nat. Mus., 56015)

*Gnatholeptus mandibularis* Blackman, 1943, J. Washington Acad. Sci. 33:34 (Holotype, female; Barro Colorado Island, Canal Zone, Panama; U.S. Nat. Mus., 56418); Wood, 1979, Great Basin Nat. 39:134. *Synonymy*

*Pityophthorus gentilis* Schedl, 1961, Pan Pacific Ent. 37:225 (Holotype, male; Barro Colorado Island, Gatún Lake, Canal Zone, Panama; Cornell Univ.); Bright, 1977, Canadian Ent. 109:513 and Wood, 1979, Great Basin Nat. 39:134. *Synonymy*

DIAGNOSIS.— This species is distinguished from *panamensis* Blackman by the absence of a median epistomal lobe in the female, by the armed female elytral declivity, and by other characters cited in the above key and in the following description.

FEMALE.— Length 1.3–1.6 mm, 2.8 times as long as wide; color yellowish brown.

Frons flattened on slightly more than median half from epistoma to upper level of eyes; surface shining, very finely punctured; surface ornamented by abundant, uniformly distributed, moderately long setae of uniform length. Mandibles distinctly longer than normal. Antennal club as in *subcribratus* (Schedl) except sutures more distinctly procurved.

Pronotum outline as in *subcribratus*; asperities arranged in subconcentric rows, less definite near summit; summit distinctly anterior to middle; posterior areas weakly reticulate, punctures very fine, shallow, moderately close. Glabrous except on asperate area.

Elytra outline as in *subcribratus* except sutural apex less strongly acuminate; striae not impressed, punctures in indefinite rows; moderately coarse, close; interstriae smooth, shining, almost twice as wide as striae, impunctate except near declivity. Declivity very steep, shallowly sulcate; striae about as on disc, punctures slightly smaller; interstriae 1 distinctly, rather weakly elevated, unarmed, 2 as wide as 1, moderately impressed, 3 higher than 1, armed on middle half by two

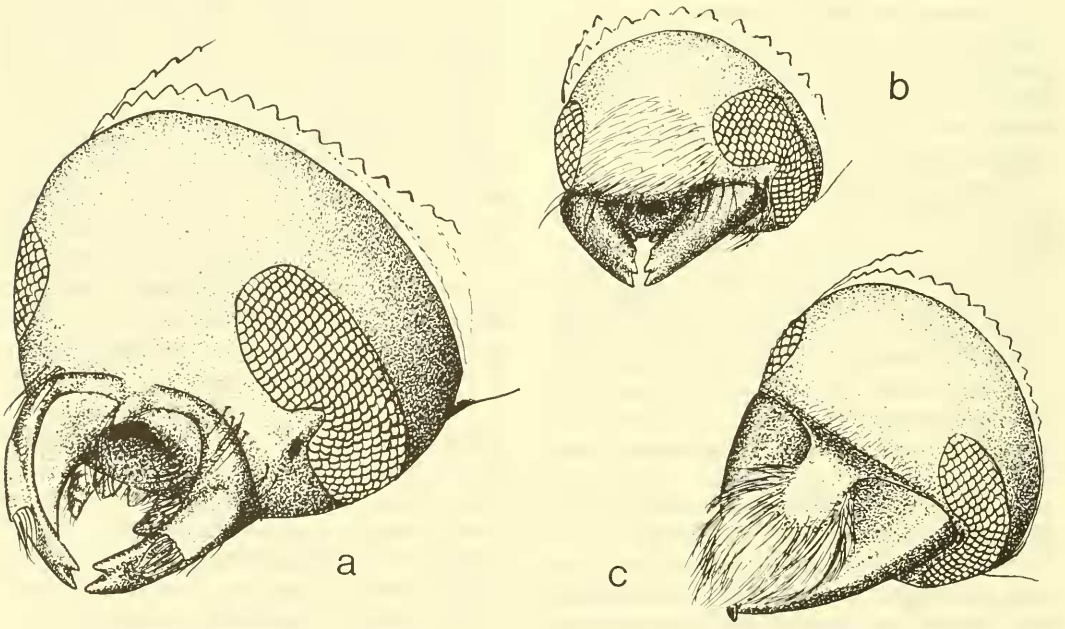



Fig. 210. *Gnatholeptus* spp., female heads: a, *panamensis*; b, *shannoni*; c, *semiermis*.

moderately coarse denticles, a third smaller denticle at junction of 3 and 7. Vestiture confined to declivity, similar to *subcribratus* except very short on 1, absent on 2.

MALE.— Similar to female except mandibles normal, frons more nearly convex, more coarsely punctured, vestiture sparse, short, inconspicuous; declivital setae stouter.

DISTRIBUTION.— Panama to Colombia.

PANAMA: Barro Colorado Island, Canal Zone, 27-XII-63, 70 m, No. 337, limb, S. L. Wood; Cano Saddle at Gatún Lake; Madden Forest, Canal Zone, 2-I-64, 70 m, No. 367, limb S. L. Wood. OTHER COUNTRIES: Colombia.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotypes of *shannoni*, *mandibularis*, and *gentilis* and on 61 other specimens.

### 3. *Gnatholeptus panamensis* Blackman
Fig. 210

*Gnatholeptus panamensis* Blackman, 1943, J. Washington Acad. Sci. 33:35 (Holotype, female; Barro Colorado Island, Canal Zone, Panama; U.S. Nat. Mus., 56419)

*Pityophthorus epistomalis* Schedl, 1961, Pan Pacific Ent. 37:224 (Holotype, female; Barro Colorado Island, Canal Zone, Panama; Cornell University); Wood, 1979, Great Basin Nat. 39:134. *Synonymy*

DIAGNOSIS.— This species is distinguished from *semiermis* (Nunberg) by the very different female frons and mandibles as described below, by the much wider declivital interstriae 3, and by the other characters cited below.

FEMALE.— Length 1.3–1.5 mm, 3.0 times as long as wide; color yellowish brown.

Frons convex, gradually, transversely impressed toward epistoma, impunctate on lower half, a few fine punctures above; vestiture sparse, minute; epistomal margin on median sixth bearing a premandibular lobe, lobe equal in width to one or two facets, length about equal to three facets of eye, narrower at apex than at base, apex usually bearing a few short setae. Mandibles slender, elongate, sickle-shaped, ornamented on anterolateral face by a conspicuous tuft of setae.

Pronotum as in *shannoni* (Blackman) except posterior areas not reticulate, minute impressed points present.

Elytra much as in *shannoni* except strial punctures distinctly larger, in definite rows, interstriae only slightly wider than striae, with minute impressed points, declivity weakly bisulcate, all interstriae unarmed; interstriae 2 twice as wide as 1. Odd-numbered interstriae each with about two to six slender bristles.

MALE.— Similar to female except frons convex, finely punctured throughout, epistoma and mandibles normal, declivital interstriae 1 armed by three or four small, pointed granules, 2 more strongly impressed, 3 weakly elevated and armed by denticles as in *shannoni*.

DISTRIBUTION.— Costa Rica to Panama and Surinam.

COSTA RICA: Río Damitas, Dota Mts., 18-II-64, 250 m, No. 439, tree branch, S. L. Wood. PANAMA: Barro Colorado Island, Canal Zone, 20-VI-41, at light, J. Zetek, also 26-III-24; Tres Ríos Plantation, Gatún Lake, 1931, T. O. Tschokke. OTHER COUNTRIES: Surinam.

BIOLOGY.— Habits are as described for the genus.

NOTES.— The above treatment was based on the holotypes of *panamensis* and *epistomalis* and on 29 other specimens.

### 4. *Gnatholeptus semiermis* (Nunberg)
Fig. 210

*Pityophthorus semiermis* Nunberg, 1963, Trans. Wisconsin Acad. Sci. 52:98 (Holotype, male; Finca La Lola, Limón, Costa Rica; Univ. Wisconsin)

*Gnatholeptus semiermis*: Bright, 1977, Canadian Ent. 109:513

DIAGNOSIS.— This species is distinguished from *panamensis* Blackman by the very large female epistomal lobe and mandibles, by the narrow declivital interstriae 2, and by other characters cited below.

FEMALE.— Length 1.4–1.8 mm, 2.8 times as long as wide; color yellowish brown.

Frons strongly, transversely impressed to epistomal margin on lower two-thrids of area below upper level of eyes, upper area strongly convex; surface almost smooth, impressed area finely, rather closely punctured; impressed area with moderately abundant, fine, short, rather inconspicuous setae; epistoma with an enormous subquadrate, premandibular, median lobe, its base equal in width to twice diameter of a facet of eye, its apex three times width of a facet, its length six times diameter of a facet, ornamented on its apical half by numerous very long subplumose setae. Mandibles enormously elongate, not ornamented by setae. Antennal club

obovate, 1.3 times as long as scape, 1.3 times as long as wide; sutures moderately procurved.

Pronotum essentially as in *shannoni* (Blackman) except posterior areas smooth, shining.

Elytra essentially as in *panamensis*; strial punctures smaller, moderately confused; declivity with strial punctures minute, striae 1 impressed, interstriae 1 distinctly, weakly elevated, 2 not wider than 1, median side impressed, ascending laterally to rounded summit on 3, 3 higher than 1, 3 with sparse punctures. Vestiture confined to declivity, of two to four fine bristles on each of odd-numbered interstriae.

MALE.— Similar to female except frons shallowly, transversely impressed, a distinct subcarinate median elevation at upper level of eyes, epistoma normal, slightly elevated toward margin, premandibular lobe absent; declivital interstriae 3 with one to three pointed granules.

DISTRIBUTION.— Costa Rica and Colombia to Surinam.

COSTA RICA: Peralta, Cartago, 10-III-64, 50 m, No. 465, *Protium*, S. L. Wood; Río Damitas, Dota Mts., 18-II-64, 250 m, No. 439, tree branch, S. L. Wood; Finca La Lola, Limón. OTHER COUNTRIES: Colombia, Surinam, Venezuela.

HOSTS.— *Protium* probably *copal.*

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotype and on 94 other specimens.

Several attempts were made to observe female boring activity. In spite of the inefficient, cumbersome appearance of their mandibles, they appear to excavate their tunnels at least as quickly as other species with normal mandibles.

## GENUS *PITYOBORUS* BLACKMAN

*Pityoborus* Blackman, 1922, Mississippi Agric. Expt. Sta. Tech. Bull. 11:96 (Type-species: *Crypturgus comatus* Zimmermann, monobasic); Wood, 1958, Great Basin Nat. 28:45–56 (Revision)

DIAGNOSIS.— This genus is distinguished from allied genera by the densely pubescent anterolateral areas of the female pronotum, by the absence of basal and lateral raised margins of the pronotum (obscurely developed in *secondus*), by the comparatively large antennal club, by the fine, conservative sculpture, by the monogamous habit, and by the distinctive gallery system.

DESCRIPTION.— Length 1.5–3.2 mm, 2.5–2.8 times as long as wide; color light yellowish brown to dark reddish brown.

Frons dimorphic, male moderately convex to feebly concave, with sparse to moderately abundant vestiture, female flat to rather strongly concave, with modest to elaborate ornamental vestiture. Eye emarginate. Antennal scape elongate; funicle 5-segmented; club rather large, twice as long as funicle, sutures 1 and 2 septate. Pronotum 0.9–1.0 times as long as wide; summit at middle, without a transverse impression posterior to summit; anterior margin armed by 12–18 serrations; anterior slope moderately asperate; posterior areas reticulate, rather finely to minutely punctured; basal and lateral margins rounded except obscurely marked by a fine raised line in one species; large anterolateral areas in female ornamented by dense, fine, moderately long pubescence. Elytra finely sculptured, strial punctures in rows or not, rather fine to minute; interstrial punctures usually reduced in number; declivity convex, moderately steep, conservative sculpture variable. Vestiture hairlike; comparatively sparse.

DISTRIBUTION.— Utah and North Carolina to Honduras; seven species are known.

BIOLOGY.— These monogamous species attack the shaded out branches 2–8 cm in diameter of healthy, standing trees of the genus *Pinus*. The gallery system engraves the wood deeply and consists of a nuptial chamber formed by the male and two transverse egg galleries formed by the female. In small branches the egg galleries tend to spiral slightly to avoid overlap. Egg niches are not always present. Each of the small number of larvae excavates a small chamber parallel to the grain of wood at least large enough to accommodate its adult body but never longer than 12 mm. The larvae and young adults may move in and out of these larval cradles and are commonly found in the egg gallery. There is no evidence of mycelial growth, although the short larval mines strongly suggest a symbiotic relationship. In addition to these tunnels, the parental adults and later the newly matured brood often form feeding tunnels that radiate from the nuptial chamber more or less parallel to the grain of the wood. In *secondus* these feeding tunnels may

exceed twice the combined lengths of the two egg galleries. The number of offspring produced by one pair rarely exceeds 20 and usually is less than 7. Because they accelerate the natural pruning of healthy trees, their economic effect probably is beneficial.

Key to the Species of *Pityoborus*
(Modified from Wood 1958)

1. Female frons flat or weakly impressed on a narrow median area, its margins ornamented by a sparse row of setae only slightly longer than those of central area; elytral striae often weakly impressed, punctures in definite rows; male frons never with a conspicuous brush of hair ..... 2

— Female frons concave from eye to eye, its margins ornamented by a dense row of long, curved setae; elytral striae never impressed, punctures on 1 and 2 confused or at least very irregular (if doubtful then male frons with frontal vestiture as in female) ..... 3

2(1). Smaller; elytral surface minutely irregular but not reticulate; elytral declivity more narrowly convex, interstriae 2 not impressed, granules very minute if evident; pubescent areas on female pronotum comparatively small; Mississippi and North Carolina to Florida; 1.5–2.0 mm ..... 1. ***comatus*** **(Zimmermann)**

— Larger; elytral surface finely, uniformly reticulate; elytral declivity more broadly convex, interstriae 2 feebly to moderately impressed, granules on 1 and 3 clearly evident; a variable species, both within and between series; Utah and New Mexico to Puebla and Veracruz; 1.8–2.7 mm ..... 2. ***secundus*** **Blackman**

3(1). Declivital interstriae 2 moderately impressed, impunctate, and devoid of erect setae, 1 and 3 armed by moderately coarse granules; strial punctures on disc larger, more strongly confused, interstrial punctures more numerous; larger species ..... 4

— Declivital interstriae 2 feebly if at all impressed, with a row of fine punctures or granules and bearing a row of erect setae as on 1 and 3, 1 and 3 feebly or not at all granulate; strial punctures on disc smaller and more nearly in rows, interstrial punctures less numerous; smaller species ..... 5

4(3). Discal surface of elytra usually obscurely reticulate, rarely with impressed points, strial punctures larger, interstriae about three to four times as wide as diameter of a puncture; female frons less strongly concave, setae on margins yellow, shorter, evidently less numerous; male frons usually without median elevation; Durango to Jalisco; 2.9–3.2 mm ..... 3. **hirtellus Wood**

— Discal surface of elytra smoother, with minute impressed points, punctures smaller, interstriae about six times as wide as striae; female frons more strongly concave, setae on margins reddish, longer, more numerous; male frons with a weak median carina; Chihuahua and Michoacán to Veracruz and Puebla; 2.8–3.2 mm ..... 4. ***rubentis*** **Wood**

5(3). Male frons weakly convex, vestiture rather sparse, shorter, uniformly distributed; declivital interstriae 2 feebly impressed, 1 and 3 armed by fine granules; Honduras to British Honduras; 1.8–2.1 mm ..... 5. ***hondurensis*** **Wood**

— Male frons flat to weakly concave, vestiture largely confined to margins, longer, declivital interstriae 2 not impressed, 1 and 2 unarmed or granules not larger than those on 2 ..... 6

6(5). Strial punctures on declivity small, deep, interstriae about one-fourth as wide as striae; female frons more deeply concave, vestiture finer, pale yellow; Oaxaca; 2.0 mm ..... 6. ***frontalis*** **Wood**

— Strial punctures on declivity very minute to obsolete; female frons less deeply concave, vestiture slightly coarser, reddish yellow; Jalisco; 1.9–2.1 mm ..... 7. ***velutinus*** **Wood**

### 1. *Pityoborus comatus* (Zimmermann)

Figs. 208–211

*Crypturgus comatus* Zimmermann, 1868, Trans. Amer. Ent. Soc. 2:143 (Holotype, female; South Carolina; Mus. Comp. Zool., 996)

*Pityoborus comatus*: Blackman, 1922, Mississippi Agric. Expt. Sta. Tech. Bull. 11:96

*Pityophthorus seriatus* LeConte, 1878, Proc. Amer. Philos. Soc. 17:432 (Holotype, male; Tampa, Florida; Mus. Comp. Zool.); Blackman, 1928, New York St. Coll. For., Syracuse, Tech. Bull. 25:146. *Synonymy*

DIAGNOSIS.— This species is distinguished from *secundus* Blackman by the smaller size, by the absence of reticulation on the elytra, by the more narrowly convex elytral declivity, with interstriae not impressed and granules on 1 and 2 very small or obsolete, and by the much smaller pubescent areas on the female pronotum.

FEMALE.— Length 1.5–2.0 mm, 2.7 times as long as wide; color yellowish to dark reddish brown.

Frons flat to upper level of eyes, slightly elevated toward epistoma; surface reticulate, sparsely, finely punctured in central area, lateral and upper margins more closely punctured; vestiture confined to margins, of rather abundant, fine, moderately long, yellow hair.

Pronotum 1.0 times as long as wide; widest at middle, sides weakly arcuate on more than posterior half, slightly constricted just behind broadly rounded anterior margin; anterior margin armed by about 14 rather coarse serrations; summit poorly developed, slightly anterior to middle; anterior slope rather coarsely, not closely asperate; posterior area rather strongly reticulate, punctures fine, shallow, rather sparse. Vestiture confined to a few setae on margins except anterolateral areas bearing rather large, oval areas of fine, dense, moderately long pubescence; pubescent areas not extending behind middle of pronotum.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; sides straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures fine, shallow, in rows; interstriae subshining, with numerous impressed points and a few obscure lines, punctures fine, shallow, sparse, irregularly placed. Declivity rather steep, convex; strial punctures much smaller than on disc, distinct, interstriae 1 feebly elevated, 2 impunctate, punctures on 1 and 3 fine, sometimes very feebly granulate. Vestiture of rows of minute strial hair and longer, erect, sparse setae on odd-numbered interstriae; usually abraded on disc.

MALE.— Similar to female except frons weakly convex, punctures larger and more evenly distributed, subglabrous; pubescent areas on pronotum absent, anterior margin of pronotum more coarsely serrate.

DISTRIBUTION.— Mississippi and North Carolina to Florida.

USA: **Florida**: Big Pine Key, Biscayne Bay, Dunedin, Everglades N.P., Lake Worth, Melbourne, Pensacola, Torreya St. Pk. in Liberty Co. **Georgia**: Kingsland. **Louisiana**: "Western Louisiana." **Mississippi**: Agricultural College, Gulf Port, Hattisburg, Laurel. **North Carolina**: Asheville, Cherokee. **South Carolina**: Florence, Poinsette St. Pk.

HOSTS.— *Pinus* sp.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotype and on 46 other specimens.

### 2. *Pityoborus secundus* Blackman

*Pityoborus secundus* Blackman, 1928, Bull. New York St. Coll. For., Syracuse, Tech. Pub. 25:146 (Holotype, female; La Sal Mts., Utah; U.S. Nat. Mus.)

*Pityoborus tertius* Blackman, 1942, U.S. Nat. Mus. 92:202 (Holotype, female; Chalco, D. F., Mexico;

U.S. Nat. Mus., 55980); Wood, 1973, Great Basin Nat. 33:182. *Synonymy*

*Pityoborus intonsus* Wood, 1958, Great Basin Nat. 18:54 (Holotype, female; 23 km or 14 miles W Texmelucan, Puebla, Mexico; Snow Ent. Mus., Univ. Kansas); Wood, 1973, Great Basin Nat. 33:182. *Synonymy*

*Pityoborus immitus* Bright, 1972, Canadian Ent. 104:1674 (Holotype, female; 68 km W Durango, Durango, Mexico; Canadian Nat. Coll.); Wood, 1973, Great Basin Nat. 33:182. *Synonymy*

*Pityoborus ramosus* Bright, 1972, Canadian Ent. 104:1677 (Holotype, female; 5.6 km or 3.5 miles S Suchixtepec, Oaxaca, Mexico; Canadian Nat. Coll.); Wood, 1973, Great Basin Nat. 33:182. *Synonymy*

DIAGNOSIS.— This variable species is distinguished from *comatus* (Zimmermann) by the larger size, by the at least partly reticulate elytra, by the more broadly convex, (usually) impressed elytral declivity, and by the much larger pubescent areas on the female pronotum.

FEMALE.— Length 1.8–2.7 mm, 2.8 times as long as wide; color dark reddish brown.

Frons essentially as in *comatus*. Pronotum as in *comatus* except punctures on posterior areas slightly larger, closer; pubescent areas much larger, extending well behind middle of pronotum.

Elytra as in *comatus* except surface shallowly, often indistinctly reticulate; strial punctures slightly larger; declivity more broadly convex, interstriae 2 varying from feebly to moderately impressed, impunctate, 1 and 3 each with a row of distinct granules. Vestiture as in *comatus*.

MALE.— Similar to female except feebly convex, punctures less conspicuous, less abundant, vestiture much less abundant but similarly arranged.

DISTRIBUTION.— Utah and New Mexico to Puebla and Veracruz.

USA: **Arizona**: Lakeside, Oak Creek Canyon, Prescott. **New Mexico**: Cloudcroft. **Utah**: La Sal Mts. MEXICO: **Durango**: 5 km, 17 km, and 37 km W El Salto. **Hidalgo**: 17 km N Jacala. **Michoacán**: Volcán Parícutin. **Puebla**: Texmelucan. **Veracruz**: Texcoco.

HOSTS.— *Pinus ayacahuite*, *P. leiophylla*, *P. ponderosa*, *P. pseudostrobus*, *P.* spp.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on holotypes of *secundus*, *tertuis*, and *intonsus*, on paratypes of *immitus* and *ramosus*, and on 161 other specimens. The specimens from Utah and New Mexico consistently have declivital interstriae 2 rather strongly impressed and 1 and 3 more coarsely granulate, and the frons is frequently more irregularly and more coarsely sculptured. The series from Arizona and Mexico are inconsistent in both features; the declivity has little or no impression in most specimens, but occasional specimens are as strongly impressed as those from Utah and New Mexico. The size of the declivital granules in specimens from Arizona and Mexico varied from minute to moderately large, independent of geographical




Fig. 211. Dorsal aspect of Corthylini spp.: 51, *Pityoborus comatus*, female, 52, same, male; 53, *Monarthrum fasciatum*; 54, *Monarthrum mali*. (After Blackman 1922:pl. X.)

origin or depth of the impression. The shape and size of the pubescent areas on the female pronotum varied from series to series apparently without a pattern associated with geographical origin. Because of this variation, the forms represented by *tertuis*, *intonsus*, *immitus*, and *ramosus*, were placed in synonymy.

### 3. *Pityoborus hirtellus* Wood

*Pityoborus hirtellus* Wood, 1958, Great Basin Nat. 18:50 (Holotype, female; 14 miles or 23 km NW Guadalajara, Jalisco, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *rubentis* Wood by the more slender body form, by the reticulate elytral surface, with elytral punctures slightly larger, by the less strongly concave frons with shorter, yellow, less abundant vestiture, and by the absence of a median elevation on the male frons.

FEMALE.— Length 2.9–3.2 mm, 2.7 times as long as wide; color dark brown, often with a yellowish caste.

Frons broadly, moderately, evenly concave from epistoma to above eyes; surface subreticulate, punctures fine, shallow, sparse near central area, more numerous toward margins; vestiture in central area fine, sparse, short, on margins dense, very long, longest setae on vertex, their tips almost attaining epistoma.

Pronotum 0.96 times as long as wide; essentially as in *secundus* Blackman.

Elytra 1.7 times as long as wide, 1.9 times as long as pronotum; outline as in *secundus*; striae not impressed, punctures in irregular rows except confused on basal third of disc; interstriae obscurely subreticulate in most specimens, punctures in rows, similar to those of striae, small, shallow, not sharply defined. Declivity rather steep, rather broadly convex; strial punctures in rows, minute, almost obsolete; interstriae 1 and 3 feebly elevated, 2 weakly impressed, 1 and 3 each armed by a row of fine granules. Vestiture of rows of fine, minute strial hair, and rows of fine, very long interstrial hair on all except declivital interstriae 2, those on disc one to two times as long as distance between rows, three to five times as long on declivity.

MALE.— Similar to female except frons weakly convex, more strongly reticulate, vestiture more uniformly distributed, shorter, less abundant, a few of those on margins longer; pubescent areas on pronotum absent.

DISTRIBUTION.— Durango to Jalisco.

MEXICO: **Durango**: 17 km, No. 39a, and 29 km, No. 39b, W El Salto, 7-VI-65, 2500 m, *Pinus pseudostrobus*, S. L. Wood. **Jalisco**: Guadalajara, 19-VI-53, *Pinus*, S. L. Wood.

HOSTS.— *Pinus pseudostrobus*, *P.* sp.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the female paratype and on 84 other specimens.

### 4. *Pityoborus rubentis* Wood

*Pityoborus rubentis* Wood, 1958, Great Basin Nat. 18:51 (Holotype, female; 14 miles or 23 km W Texmelucan, Puebla, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *hirtellus* Wood by the slightly stouter body form, by the smoother elytra, with numerous impressed points, by the more strongly concave frons with longer, more abundant, reddish vestiture, and by the presence of a small median elevation on the male frons.

FEMALE.— Length 2.8–3.2 mm, 2.5 times as long as wide; color dark reddish brown.

Frons as in *hirtellus* except more strongly impressed, vestiture on margins reddish yellow, slightly longer and more abundant. Pronotum as in *hirtellus* except anterior margin less coarsely, less regularly serrate, punctures on posterior area usually smaller. Elytra 1.6 times as long as wide; as in *hirtellus* except discal surface smooth, with numerous minute impressed points, strial punctures usually more confused; vestiture usually less abundant and slightly shorter.

MALE.— Similar to female except frons weakly concave, more strongly reticulate, with a weak median carina on lower half; pubescent areas on pronotum absent.

DISTRIBUTION.— Chihuahua and Michoacán to Veracruz and Puebla.

MEXICO: **Chihuahua**: La Magdalena, 26-IV-77, Hopk. 60607-A, M. M. Furniss. **Durango**: 5 km W El Salto, 7-VI-65, No. 40, *Pinus*, S. L. Wood; 37 km W Durango, 4-VI-65, No. 14, *Pinus*, S. L. Wood. **Michoacán**: 10 km E Volcán Parícutin, 19-VI-65, 2500 m, No. 89, *Pinus*, S. L. Wood. **Puebla**: 23 km W Texmelucan, 14-VII-53, 2800 m, *Pinus*, S. L. Wood. **Veracruz**: Texcoco, km 20, 5-II-62, *Pinus*, R. Coronado.

HOST.— *Pinus* spp.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on a female paratype and on 38 other specimens.

### 5. *Pityoborus hondurensis* Wood

*Pityoborus hondurensis* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):49 (Holotype, female; Yuscarán, Paraíso, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *velutinus* Wood by the weakly impressed declivital interstriae 2, with fine granules on 1 and 3, and by the weakly convex male frons, with the vestiture rather sparse, shorter, and uniformly distributed.

FEMALE.— Length 1.8–2.1 mm, 2.6 times as long as wide; color réddish brown.

Frons as in *velutinus* except very slightly less strongly impressed on a narrower area, with fine, sparse punctures; lateral vestiture finer, less abundant, much shorter. Pronotum as in *velutinus* except pilose areas distinctly smaller; posterior area with moderately abundant, small, shallow punctures clearly evident.

Elytra as in *velutinus* except punctures on disc deeper, slightly larger, with a few more interstrial punctures particularly on posterior half; declivital punctures smaller than on disc but much larger and deeper than in *velutinus,* interstriae 1 distinctly elevated, strial and interstrial punctures in somewhat indistinct rows; sparse vestiture on declivity more abundant than in *velutinus.*

MALE.— Similar to female except frons not at all concave, vestiture greatly reduced; pilose areas on pronotum absent; pronotal punctures less distinct; punctures on discal striae slightly larger; declivital interstriae 1 and 3 with minute granules.

DISTRIBUTION.— Honduras and British Honduras.

HONDURAS: Yuscarán, Paraíso, 23-IV-64, 800 m, No. 518, *Pinus caribaea*, No. 519, *P. oocarpa*, S. L. Wood. BRITISH HONDURAS: Río Privassion, Cayo Distr. Belise, 9-VII-73, Y. S. Sedman.

HOSTS.— *Pinus caribaea, P. oocarpa.*

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the type series of 13 specimens and on 2 other specimens.

### 6. *Pityoborus frontalis* Wood

*Pityoborus frontalis* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):49 (Holotype, female; 13 km S El Cameron, Oaxaca, Mexico; Wood Coll.)

*Pityoborus severus* Bright, 1972, Canadian Ent. 104:1676 (Holotype, female, 5 km or 3 miles N Suchixtepec, Oaxaca, Mexico; Canadian Nat. Coll.); Wood, 1973, Great Basin Nat. 33:182. *Synonymy*

DIAGNOSIS.— This species is distinguished from *velutinus* Wood by the more deeply concave female frons, with the frontal vestiture finer and pale yellow in color, and by the much larger, deeper strial punctures on the declivity.

FEMALE.— Length 2.0–2.6 times as long as wide; color rather dark reddish brown.

Frons as in *velutinus* except much more deeply concave on a narrower circular area; vestiture in lateral areas much finer, pale yellow in color. Pronotum as in *velutinus* except reticulation stronger, punctures more clearly evident.

Elytra as in *velutinus* except reticulation stronger, declivity more nearly shining; strial punctures on declivity larger, deeply impressed.

MALE.— As in female except frons not concave, feebly impressed, surface reticulate, vestiture on lateral and upper margins similar but slightly less abundant; pilose areas on pronotum absent.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 13 km SE El Cameron, 21-VI-67, No. 75, *Pinus*, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotype and allotype.

### 7. *Pityoborus velutinus* Wood

*Pityoborus velutinus* Wood, 1958, Great Basin Nat. 18:48 (Holotype, female; 14 miles or 23 km NW Guadalajara, Jalisco, Mexico; Snow Ent. Mus., Univ. Kansas)

DIAGNOSIS.— This species is distinguished from *hondurensis* Wood and *frontalis* Wood by characters indicated in the above key and in the diagnosis of the two allied species.

FEMALE.— Length 1.9–2.1 mm, 2.6 times as long as wide; color yellowish to rather dark reddish brown.

Frons rather strongly concave on median three-fourths from epistoma to distinctly

above eyes; surface subshining, minutely irregular, devoid of punctures in concave area; margins ornamented by a moderately dense row of long yellow hair.

Pronotum 0.98 times as long as wide; essentially as in *hirtellus* Wood except punctures on posterior areas usually obsolete.

Elytra 1.6 times as long as wide, 1.7 times as long as pronotum; outline as in *hirtellus*; strial punctures small, in rows posteriorly, rather irregular on basal third; interstriae reticulate, punctures small, rather widely, regularly spaced. Declivity steep, narrowly convex; strial punctures minute, almost obsolete, in rows; interstriae 1 to 3 similarly sculptured, interstrial punctures minute (including 2). Minute strial hair usually absent; vestiture of rows of erect interstrial setae on all interstriae, including 2 on declivity, each seta about as long as distance between rows, similarly or more widely spaced within a row.

MALE.— Similar to female except frons feebly concave at least on upper half, strongly reticulate, sparsely, shallowly punctured, vestiture similar but much less abundant, shorter; pubescent areas on pronotum absent.

DISTRIBUTION.— Jalisco.

MEXICO: Jalisco: 23 km NW Guadalajara, 19-VII-53, *Pinus*, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on 25 paratypes.

## GENUS *DACNOPHTHORUS* WOOD

*Dacnophthorus* Wood, 1975, Great Basin Nat. 35:394 (Type-species: *Gnathophthorus clematis* Wood, original designation)

DIAGNOSIS.— This genus is distinguished from *Pityophthorus* Eichhoff by the very slender body form, by the very large, coarsely faceted eyes, by the large antennal club which has three distinct sutures, the third marked only by setae, by the summit being anterior to the middle of the pronotum and without a transverse impression behind it, by the slightly different elytral declivity, and by the very different habits.

DESCRIPTION.— Length 1.1–2.0 mm, 3.7–3.8 times as long as wide; color pale yellow to bicolored with yellow and dark brown, almost black in a Colombian species.

Frons dimorphic, male convex above, impressed below, female uniformly shallowly concave to lower third, then weakly convex and upper area variously sculptured and ornamented by hair; eye very large, coarsely faceted, emarginate. Antennal scape slender, elongate; funicle 5-segmented, some specimens apparently 4-segmented; club large, much longer than scape, sutures 1 and 2 partly septate, 3 clearly indicated by setae and rather remote from apex. Pronotum elongate, summit anterior to middle, without a transverse impression behind summit. Scutellum rather large, flat. Elytra striate; declivity rather short, steep. Legs as in *Pityophthorus*.

DISTRIBUTION.— Colima to Brazil; six species are known; two occur in Mexico and Central America.

BIOLOGY.— Four of the known species infest cut or broken vines of *Clematis* and an undetermined Bignoniaceae. The monogamous beetles construct transverse biramous egg galleries in the cambium region in *Clematis*. In Bignoniaceae the vine structure was made up of numerous concentric layers and a pair of beetles bored from the outer surface to a depth of six or more layers and constructed a transverse, biramous pair of egg tunnels at each layer. Larval mines are straight, rather short, parallel to one another, and follow the grain of the wood or fiber. Ambrosial fungi were not observed, although the discoloration of parental galleries suggested they might be present. The entire gallery system suggested a stage intermediate between a phloeophagous and a mycetophagous habit.

### Key to the Species of *Dacnophthorus*

1. Larger; pronotal and strial punctures moderately large, rather deep; declivital interstriae 2 rather strongly impressed, 1 and 3 distinctly elevated, granules on 3 minute or absent; pile on upper area of female frons very short, not obscuring surface; Jalisco to Panama; *Clematis*; 1.4–2.0 mm ..... 1. ***clematis* (Wood)**

— Smaller; pronotal and strial punctures minute, shallow; declivital interstriae 1 not elevated or granulate, 3 moderately elevated and armed by a row of conspicuous granules; pile on upper area of female frons dense, moderately long; Honduras; 1.2 mm ..... 2. ***cracens*** **(Wood)**

### 1. *Dacnophthorus clematis* (Wood)
Fig. 212

*Gnathophthorus clematis* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):51 (Holotype, female; Volcán Colima, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the slender body form, by the very different female frons, by the steep, strongly impressed elytral declivity, and by other characters.

FEMALE.— Length 1.4–2.0 mm, 3.8 times as long as wide; color light yellowish brown, pronotum and elytral declivity slightly darker.

Frons flattened from just above epistoma to vertex, transversely divided at upper level of eyes by a feeble summit; lower area coarsely, shallowly, closely punctured, with sparse, uniformly distributed, inconspicuous, hairlike pubescence; upper area appearing somewhat spongy, very minutely, densely punctured, with microscopic pilelike pubescence and with a marginal fringe of short hair of uniform length, little if any longer than setae on lower frons. Eye large, emarginate, coarsely faceted. Antennal funicle 5-segmented, last four segments crowded, indistinct, club very large, with three moderately procurved, nonseptate sutures.

Pronotum 1.4 times as long as wide; sides on basal half straight and parallel, constricted slightly in front of middle then weakly arcuate to broadly rounded anterior margin; anterior margin armed by eight widely spaced, coarse teeth; summit on anterior third, indefinite; anterior third rather finely asperate; posterior area smooth, with fine, deep, sparse punctures. Glabrous except for scattered hair near lateral margins.

Elytra 2.4 times as long as wide, 1.8 times as long as pronotum; sides straight and parallel on more than basal three-fourths, broadly rounded behind; declivity confined to posterior one-sixth; striae not impressed, punctures minute, scarcely indicated on surface; interstriae almost smooth, impunctate. Declivity steep, rather strongly excavated; striae obsolete; interstriae 1 moderately elevated, with a row of moderately coarse punctures; area of interstriae 2 strongly impressed, widened at middle; lateral areas strongly elevated on upper two-thirds, summit broadly rounded, with rather coarse, confused punctures, two very feeble granules on upper margin of elevated area. Disc glabrous; moderately abundant, coarse hair on declivity.

MALE.— Similar to female except frons convex above, lower half abruptly impressed, subreticulate, punctures rather coarse, vestiture sparse, inconspicuous; granules on elytral declivity larger, pointed.

DISTRIBUTION.— Jalisco to Panama.

MEXICO: Jalisco: Volcán Colima, 23-VI-65, 2500 m, No. 100, *Clematis*, S. L. Wood. HONDURAS: La Ceiba, Atlántida, 20-V-49, at light, E. C. Becker. COSTA RICA: Tapantí, Cartago, 17-IX-63, 1300 m, No. 183, *Clematis*, S. L. Wood; Volcán Irazu, Cartago, 26-IX-63, 2300 m, No. 238, *Clematis*, S. L. Cood. PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1700 m, No. 409, *Clematis*, S. L. Wood.

HOSTS.— *Clematis* sp.

BIOLOGY.— These monogamous beetles infest cut or injured vines larger than 2 cm in diameter. The biramous transverse egg galleries are formed in the cambium region. The

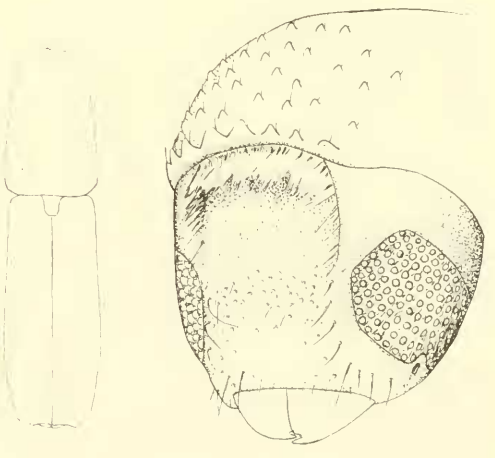


Fig. 212. *Dacnophthorus clematus*, female outline from dorsal aspect and head. (After Wood 1971:52.)

short, longitudinal larval mines are formed between the coarse fibers of the host.

NOTES.— The above treatment was based on the type series of 106 specimens and on 92 other specimens.

### 2. *Dacnophthorus cracens* (Wood)

*Gnathophthorus cracens* Wood, 1971, Brigham Young Univ. Sci. Bull., Biol. Ser. 15(3):53 (Holotype, female; La Ceiba, Atlántida, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *clematis* (Wood) by the smaller size, by the serrate elytral declivity, and by the different female frons.

FEMALE.— Length 1.2 mm, about 3.8 times as long as wide; color yellowish brown.

Frons as in *clematis* except lower area flat, very finely, sparsely punctured, ending well below upper level of eyes; upper area slightly more extensive, pile long, dense, setae on marginal fringe on upper margin only, much longer, tips reaching middle of pilose area. Pronotum as in *clematis* except anterior margin armed by 10 teeth; punctures on posterior area minute.

Elytra as in *clematis* except declivity narrowly, deeply sulcate; sutural interstriae feebly elevated; lateral areas abruptly elevated from position of striae 2, summit armed by five or six small, laterally compressed teeth.

DISTRIBUTION.— Honduras.

HONDURAS: La Ceiba, Atlántida, 15-V-49, at light, E. C. Becker.

NOTES.— The above treatment was based on the unique holotype.

## Genus *GNATHOTRICHUS* Eichhoff

*Gnathotrichus* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:275 (Type-species: *Gnathotrichus corthyloides* Eichhoff, 1869 = *Tomicus materiarius* Fitch, 1858, monobasic)

*Gnathotrichoides* Blackman, 1931, J. Washington Acad. Sci. 21:267 (Type-species: *Cryphalus sulcatus* LeConte, present designation). *New synonymy*

*Ancyloderes* Blackman, 1938, Proc. Ent. Soc. Washington 40:205 (Type-species: *Cryphalus pilosus* LeConte, original designation); Wood, 1973, Great Basin Nat. 33:172. *Synonymy*

*Paraxyleborus* Hoffmann, 1942, Bull. Soc. Ent. France 47:72 (Type-species: *Xyleborus duprezi* Hoffmann = *Tomicus materiarius* Fitch, monobasic); Balachowsky, 1949, Faune de France 50:241. *Synonymy*

*Prognathotrichus* Bright, 1972, Canadian Ent. 104:1678 (Type-species: *Prognathatrichus primus* Bright, original designation); Wood, 1973, Great Basin Nat. 33:172. *Synonymy*

Diagnosis.— This genus is distinguished from the closely allied *Gnathotrupes* Schedl by the less strongly arcuate, less deeply marked, and more sparsely pubescent sutures of the antennal club (the larger segment 1 may also be a character), by the more gradual, convex elytral declivity, with the posterior margin more broadly, often narrowly rounded and the costal margin more strongly elevated near the apex, and by the distribution.

Description.— Length 2.0–3.7 mm, 2.9–3.3 times as long as wide; color light brown to almost black. Vestiture hairlike.

Frons weakly to strongly convex, conservatively sculptured, sexually dimorphic or not; eye oval, emarginate; finely granulate. Antennal scape elongate; funicle 5-segmented; club moderately large, rather sparsely pubescent, a few very long setae (a female character), sutures modestly impressed, septate, almost straight to moderately arcuate. Pronotum elongate, summit anterior to middle, poorly defined; anterior slope rather finely asperate, anterior margin elevated and serrate; posterior areas finely sculptured. Scutellum rather large, flat. Elytra elongate, striate or not; declivity moderately steep, convex, often sulcate or bisulcate, rather conservatively scuptured; sutural apex normally entire, costal margin near apex moderately to very strongly, acutely elevated. Anterior tibiae with two or more socketed teeth at or near apex of lateral margin, lateral margin also usually armed by a row of serrations to near base.

Distribution.— North and Central America; 13 species are recognized.

Hosts.— Pinaceae, *Quercus*, and rarely in other hosts.

Biology.— Dying, standing trees or recently cut or fallen logs are selected for attack by these monogamous beetles. The male constructs a radial entrance tunnel that extends through the bark and into the wood. The male inoculates the tunnel wall with fungal spores carried in the coxal cavities (Farris 1963) and is joined by a female. One or more transverse egg tunnels branch on the same plane as the entrance tunnel, following growth rings in the wood. The egg tunnels may follow a growth ring in one or both directions from the entrance tunnel at one or several levels of growth rings. Eggs are deposited individually in large egg niches formed by the female parent. The larva enlarges the niche to accommodate its growth until it is just large enough for the adult state. Pupation occurs in the larval cradles and the young adults emerge through the parental tunnels. The larval food evidently consists of the ambrosial fungus, although some xylem may also be utilized.

The above notes were based on field observations of all included species except *pilosus* (LeConte). Confirmation, in part, is found in Doane and Gilliland (1929), and Prebble and Graham (1957).

Notes.— Several South American species of *Gnathotrichus* have been named. Of the 13 described and undescribed South American species in this generic complex before me, all

are more appropriately placed in *Gnathotrupes* Schedl. It is assumed, therefore, that *Gnathotrichus* (s. str.) does not occur in South America.

Key to the Species of *Gnathotrichus*

1. Punctures of striae and interstriae on elytral disc rather abundant, close, strongly confused, impressed points also evident; elytral vestiture of fine, abundant hair to base; host *Quercus* ..... 2

— Strial punctures on disc in rows, interstriae impunctate except for impressed points (except *deleoni* striae obsolete, confused impressed points rather large); elytral disc glabrous or nearly so; in coniferous hosts except for two tropical species ..... 6

2(1). Elytral disc minutely, regularly reticulate, punctures minute, obscure, almost obsolete; declivity of female feebly impressed, all interstriae with minute granules; frons very broad, broadly convex, finely aciculate on at least lower half, punctured above, female with a broad, strong, blunt, median carina on upper area ..... 3

— Elytral surface rather smooth, with a few impressed lines; female frons never with a median carina; elytral declivity variously sculptured ..... 4

3(2). Frons aciculate on lower half, female median carina commencing well below upper level of eyes and extending toward vertex; declivity steeper, less broadly convex; female elytral vestiture less abundant, shorter; Tlaxcala to Puebla; *Quercus*; 2.5 mm ..... 1. ***obscurus*** **Wood**

— Frons aciculate to upper level of eyes, female median carina above upper level of eyes; female elytral vestiture more abundant, much longer; Chiapas; 3.0–3.3 mm ..... 2. ***primus*** **(Bright)**

4(2). Larger; elytral declivity subsulcate on upper half, lateral margin in female armed by a pair of very coarse spines (often with two or more points), male with one or two much smaller denticles; female frons with a small, transverse carina at or slightly above upper level of eyes; male frons and lower half of female frons finely aciculate; Durango and Michoacán; *Quercus*; 3.1–3.6 mm ..... 3. ***dentatus*** **Wood**

— Smaller; elytral declivity convex, with a very feeble impression in both sexes or with female deeply, narrowly sulcate, several small granules on interstriae 3; elytral apex less strongly produced; pronotal punctures coarser ..... 5

5(4). Costal margin at apex of elytra moderately produced; female elytral declivity strongly sulcate, male declivity feebly impressed; anterolateral angles of male pronotum bearing a small tuft of hair; female frons strongly convex, aciculate only on lower third; Arizona to Puebla; *Quercus*; 2.5–3.0 mm ..... 4. ***nimifrons*** **Wood**

— Costal margin at apex of elytra rather weakly produced; elytral declivity feebly impressed in both sexes; male pronotum without a special tuft of hair; frons aciculate in both sexes; California and Arizona to Durango; 2.0–2.3 mm ..... 5. ***pilosus*** **(LeConte)**

6(1). Pregula protuberant, projecting slightly anteroventrad; sutures of antennal club usually less strongly arcuate; frons usually less strongly aciculate to smooth (except strongly aciculate in *perniciosus*) ..... 7

— Pregula not projecting beyond margin of oral cavity; sutures of antennal club usually more strongly arcuate; frons usually more strongly, convergently aciculate ..... 12

7(6). Elytral declivity evenly convex to feebly bisulcate, suture at least as high as lateral convexities; frons smooth, with no indications of aciculation (except some *deleoni*) ..... 8

– Elytral declivity moderately to rather strongly sulcate, lateral convexities conspicuously higher than suture; frons often aciculate ..... 10

8(7). Strial punctures on disc regularly impressed, in definite rows, fine to moderately coarse, interstriae about two to four times as wide as striae; surface of declivity shagreened, somewhat dull; South Dakota and Maine to Texas and Florida; *Pinus*, etc.; 1.7–3.1 mm ..... 6. ***materiarius*** **(Fitch)**

– Strial punctures on disc minute to obsolete, rows regular or interrupted, interstriae four to six or more times as wide as striae ..... 9

9(8). Elytral declivity shagreened (somewhat dull), more narrowly convex, sutures weakly elevated on lower half, feebly sulcate; strial punctures minute, in regular rows; frons usually with a definite, subangular, median, smooth, impunctate summit; Durango and Hidalgo to Guatemala; *Pinus*; 2.7–3.0 mm ..... 7. ***nitidifrons*** **Hopkins**

– Elytral declivity more broadly, evenly convex, surface shining; strial punctures usually obsolete, occasionally in interrupted or complete rows; female frons evenly convex or feebly, transversely impressed, rarely impunctate at median line; male weakly aciculate; Durango to Mexico and Tlaxcala; *Pinus*; 2.8–3.3 mm ..... 8. ***deleoni*** **Blackman**

10(7). Smaller; frons rather strongly aciculate; elytral declivity with sulcus rather shallow, narrow, granules on lateral convexities very small; Sinaloa and Chihuahua to Honduras; *Pinus*; 2.2–2.6 mm ..... 9. ***perniciosus*** **Wood**

– Larger; frons feebly if at all aciculate; declivital sulcus deeper, wider, granules on lateral convexities larger ..... 11

11(10). Frons weakly aciculate in median area of lower half; declivital sulcus deeper, lateral convexities more abruptly elevated; British Columbia and NW Utah to Baja California; various conifers; 3.3–3.7 mm ..... 10. ***retusus*** **(LeConte)**

– Frons smooth, no indication of aciculation; declivital sulcus not quite as deep, lateral convexities rise less abruptly; E Utah and South Dakota to Michoacán, Puebla; *Pinus*; 2.8–3.3 mm ..... 11. ***denticulatus*** **Blackman**

12(6). Pronotal disc smooth, punctures moderately coarse; frons shallowly, arcuately, transversely impressed at upper level of eyes; elytral declivity steeper, more broadly rounded behind, costal margin at apex poorly developed; Arizona and New Mexico to Durango and Hidalgo; *Pinus*; 2.8–3.1 mm ..... 12. ***imitans*** **Wood**

– Pronotal disc rather strongly reticulate, punctures fine; frons without a transverse impression; elytral declivity not as steep, more narrowly rounded behind, costal margin at apex more conspicuously elevated ..... 13

13(12). Strial punctures on declivity very small, in rows; declivity moderately to rather shallowly but distinctly sulcate; British Columbia and South Dakota to Honduras; coniferous hosts; 2.8–3.5 mm ..... 13. ***sulcatus*** **(LeConte)**

– Strial punctures almost obsolete and confused on declivity; elytral declivity feebly if at all impressed ..... 14

14(13). Elytral declivity with interstriae 3 unarmed or with very minute, rounded granules; Guatemala to Costa Rica; nonconiferous hosts; 3.3–3.6 mm ..... 14. ***omissus*** **Wood**

– Elytral declivity armed at base on interstriae 3 by two closely set pairs of sharply pointed small denticles; Chiapas to Guatemala; 4.1–4.3 mm ..... 15. ***consentaneus*** **Blandford**

### 1. *Gnathotrichus obscurus* Wood

*Gnathotrichus obscurus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):55 (Holotype, female; 6 miles or 9 km NE Teziutlan, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This and *primus* (Bright) are the only species in the genus having confused punctures on the elytral disc that have the elytral surface minutely reticulate and rows of minute granules on all declivital interstriae. It is distinguished from *primus* as indicated in the above key.

FEMALE.— Length 2.5 mm, 3.0 times as long as wide; color reddish brown.

Frons broad, broadly convex, surface shining, finely, convergently aciculate on lower two-thirds, rather finely, sparsely punctured above, a strongly developed rather low median carina from middle to upper level of eyes (concealed by pronotum above eyes on type). Vestiture of fine, rather sparse hair.

Pronotum 1.24 times as long as wide; as in *dentatus* Wood except posterior areas reticulate, finely, closely, rather deeply punctured.

Elytra 1.7 times as long as wide; sides straight and parallel on basal two-thirds, narrowly rounded behind; striae obsolete; surface minutely reticulate, punctures minute, obscure, confused, a few granules on interstriae 3 near declivity. Declivity steep, broadly convex; very feebly sulcate on upper half, strial punctures not evident, interstriae marked by rows of very small granules, slightly larger on 3; costal margin at apex rather strongly elevated. Vestiture of fine hair, on disc of short, moderately abundant hair and interstrial rows of long, fine hair; all hair on declivity long, moderately abundant, length of longest setae about equal to one-fifth width of body.

DISTRIBUTION.— Tlaxcala to Puebla.

MEXICO: **Puebla**: 9 km NE Teziutlan, 2-VII-67, 1600 m, No. 152, *Quercus*, S. L. Wood. **Tlaxcala**: Villareal, 4-VII-78, pheromone trap, M. M. Furniss.

HOST.— *Quercus* sp.

BIOLOGY.— The holotype was taken from a log 15 cm in diameter.

NOTES.— The above treatment was based on the holotype and on one other female.

### 2. *Gnathotrichus primus* (Bright)

*Prognathotrichus primus* Bright, 1972, Canadian Ent. 104:1678 (Holotype, male; Mt. Tzontehuitz, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *obscurus* Wood by the more extensively aciculate female frons, with the punctures almost obsolete, and the median carina visible only above the upper level of the eyes, by the more finely, less distinctly punctured pronotal disc, and by the more abundant, much longer elytral vestiture.

FEMALE.— Length 3.0–3.3 mm, 2.9 times as long as wide; color rather dark yellowish brown.

Frons as in *obscurus* except aciculation extending to upper level of eyes, carina commencing at upper level of eyes and extending toward vertex, vestiture longer, slightly more abundant.

Pronotum as in *obscurus* except more finely, less deeply punctured.

Elytra as in *obscurus* except declivity not as steep, more broadly rounded; vestiture more abundant and considerably longer, longest setae on declivity equal in length to one-third width of body (about one-fifth width of body in *obscurus*).

MALE.— Similar to female except aciculation on frons more strongly developed, carina absent; elytral vestiture shorter, less abundant (as in female *obscurus*).

DISTRIBUTION.— Chiapas.

MEXICO: **Chiapas**: Mt. Tzontehuitz, 26-V-69, 3100 m, D. E. Bright.

NOTES.— The above treatment was based on the holotype and on two paratypes.

### 3. *Gnathotrichus dentatus* Wood

Fig. 216

*Gnathotrichus dentatus* Wood, 1967, Great Basin Nat. 27:45 (Holotype, female; 18 miles or 29 km W El Salto, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nimifrons* Wood by the larger size, by the small transverse frontal carina in the female, and by the impressed and armed female declivity.

FEMALE.— Length 3.1–3.6 mm, 3.1 times as long as wide; color dark brown.

Frons very broad, convex; surface rather coarsely, shallowly punctured, becoming increasingly aciculate on lower half toward

median portion of epistoma; a short, transverse, elevated carina in median area at upper level of eyes and from it an impunctate line extending dorsad; vestiture short, inconspicuous.

Pronotum 1.2 times as long as wide; sides straight and parallel on basal half, rather broadly rounded in front; anterior margin armed by 10 low serrations; summit indefinite, in front of middle; posterior area smooth, subshining, finely, shallowly, rather sparsely punctured; vestiture fine, short, rather abundant on sides.

Elytra 2.0 times as long as wide; sides almost straight and parallel on basal three-fourths, narrowly rounded behind and narrowly notched at suture; punctures obsolete, striae and interstriae not indicated; surface very finely marked by surface lines and indefinite, shallow punctures, dull. Declivity with a broad, moderately deep sulcus between pair of prominent processes borne on interstriae 3; lateral processes supported on prominent lateral elevations, processes arising from median edge of elevation and bearing on their dorsal margins a series of (two or) three rather large teeth; teeth directed caudad and somewhat mesad, increasing slightly in size posteriorly; about three small dentations on interstriae 3 anterior to process, and with three similar small tubercles on interstriae 1 at base of declivity; elytral apex explanate and narrowly notched. Vestiture consisting of rather abundant minute hairs and some longer, erect, coarse, hairlike setae.

MALE.— Similar to female except frons less strongly convex and devoid of carina; anterolateral angles of pronotum with a small tuft of hair; and elytral declivity with sulcus shallow, lateral processes not strongly developed, and dentations absent except for one or two small, rounded granules.

DISTRIBUTION.— Durango to Michoacán.

MEXICO: **Durango**: 5 km, 16 km, and 29 km W El Salto, 7-VII–65, *Quercus*, S. L. Wood. **Michoacán**: 53 km E Morelia, 14-VII-65, *Quercus*, S. L. Wood.

HOSTS.— *Quercus* spp.

BIOLOGY.— As described for the genus. Stems larger than 20 cm in diameter are attacked. The tunnels appeared to be similar to those of other representatives of the genus.

NOTES.— The above treatment was based on the type series of 61 specimens. The sexes were reversed in the original description.

### 4. *Gnathotrichus nimifrons* Wood

*Gnathotrichus nimifrons* Wood, 1967, Great Basin Nat. 27:47 (Holotype, female; 18 miles or 29 km W El Salto, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *dentatus* Wood by the smaller size, by the absence of a female frontal carina, and by the very different elytral declivity.

FEMALE.— Length 2.5–3.0 mm, 3.3 times as long as wide; color brown.

Frons very broad, strongly convex; surface smooth and shining in central area, shallowly punctured laterally, weakly aciculate toward epistoma; vestiture sparse, inconspicuous.

Pronotum 1.3 times as long as wide; as *dentatus* except posterior areas more finely, shallowly, closely punctured.

Elytra 1.9 times as long as wide; sides straight and subparallel on basal three-fourths, rather narrowly rounded behind, shallowly notched at suture; striae and interstriae not indicated; surface minutely irregular, with rather sparse, shallow, fine punctures. Declivity rather narrowly, deeply sulcate, moderately steep; suture not raised, lateral area including interstriae 3 strongly elevated from declivital base about two-thirds distance to apex, crest armed by about seven small, pointed granules; elytral apex explanate, narrowly notched. Vestiture consisting of fine, short, hairlike setae on disc and sides, becoming much longer and abundant on declivity.

MALE.— Similar to female except frons less strongly convex and with fine aciculate lines extending at least to upper level of eyes; declivity shallowly sulcate, lateral elevations poorly developed, granules fewer in number and smaller.

DISTRIBUTION.— Arizona and Puebla.

USA: **Arizona**: Carr Canyon, 8-VIII-62, at light, S. L. Wood. MEXICO: **Durango**: 29 km W El Salto, 7-VI-65, 2500 m, No. 37, *Quercus*, S. L. Wood. **Puebla**: 9 km NE Teziutlan, 2-VII-67, 1600 m, No. 152, *Quercus*, S. L. Wood.

HOSTS.— *Quercus* spp.

BIOLOGY.— As described for the genus. Specimens were taken from material 15–60 cm in diameter.

NOTES.— The above treatment was based on the type series of four specimens, and on two other specimens.

### 5. *Gnathotrichus pilosus* (LeConte)

*Cryphalus pilosus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:156 (Lectotype, sex?; middle California; Mus. Comp. Zool., 1006, present designation); Blackman, 1938, Proc. Ent. Soc. Washington 40:204 (*pilosus* not *pilosulus*, corrected spelling)

*Gnathotrichus pilosus*: Wood, 1973, Great Basin Nat. 33:172

*Ancylodcres saltoni* Blackman, 1938, Proc. Ent. Soc. Washington 40:206 (Holotype, sex?; Flagstaff, Arizona; U.S. Nat. Mus., 52849); Wood, 1966, Great Basin Nat. 26:21. *Synonymy*

DIAGNOSIS.— This species is distinguished from *nimifrons* Wood by the smaller size, by the more narrowly convex, finely aciculate frons in both sexes, and by the feebly impressed elytral declivity in both sexes.

FEMALE.— Length 2.0–2.3 mm, 3.0 times as long as wide; color yellowish to reddish brown.

Frons rather broadly convex, moderately shining, convergently aciculate from above eyes to epistomal margin, a few small punctures interspersed on upper half; vestiture fine, rather sparse, inconspicuous. Antennal club oval, sutures 1 and 2 partly septate, almost straight.

Pronotum 1.3 times as long as wide; sides almost straight and parallel on basal half, moderately rounded in front; anterior margin armed by about 12 low serrations; summit rather indefinite, anterior to middle; anterior slope rather finely asperate; posterior areas minutely reticulate, punctures rather coarse, moderately deep, rather close. Vestiture of fine, short, moderately abundant hair, usually abraded.

Elytra 1.8 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, slightly tapered, then somewhat broadly rounded behind; surface shining, with a few impressed, irregular lines, some impressed points, punctures small, rather shallow, confused. Declivity rather steep, broadly convex; sculpture about as on disc except feebly impressed between interstriae 3, interstriae 1 to 3 with rows of very minute granules; costal margin at apex distinctly but rather weakly elevated. Vestiture of moderately abundant fine hair, short on disc and sides, moderately long on declivity.

MALE.— Similar to female except elytral declivity more strongly but rather weakly impressed, granules on interstriae 3 distinctly larger.

DISTRIBUTION.— California and Arizona to Durango.

USA: **Arizona**: Baboquivari, Flagstaff, Florence Junction, Oak Creek Canyon, Patagonia. **California**: Faunskin, Mt. Laguna, North Fork, Ojai, Pasadena, Pomona, Santa Barbara, Yosemite. **Nevada**: Beaver Dam St. Pk. **New Mexico**: Pinos Altos in Grant Co. MEXICO: **Durango**: El Salto.

HOST.— Unknown, probably *Quercus*.

BIOLOGY.— All known specimens were taken in flight; some were attracted to light. All allied species breed in oak.

NOTES.— The two syntypes of *pilosus*, the holotype of *saltoni* Blackman, and 32 other specimens were examined. The principal differences in this material appear to be secondary sexual characters. The first syntype in the LeConte collection is here designated as the lectotype. It was labeled "Type" many years ago, but was never officially so designated.

### 6. *Gnathotrichus materiarius* (Fitch)

Figs. 201, 207

*Tomicus materiarius* Fitch, 1858, Trans. New York State Agric. Soc. 17:726 (Holotype, female; New York; U.S. Nat. Mus., 42806)

*Gnathotrichus materiarius*: Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:406.

*Gnathotrichus corthyloides* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:275 (Syntypes ?; Carolina; presumably lost with Hamburg Mus.); Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:406. *Synonymy*

*Xyleborus duprezi* Hoffmann, 1936, Misc. Ent. 37:43 (Holotype, female; Forêt du Rouvay, Seine-Inferieure, France; repository?); Balachowsky, 1949, Fauna de France 50:242. *Synonymy*

DIAGNOSIS.— This species is distinguished by the protruding pregula, by the feebly sulcate elytral declivity, with the surface shagreened, by the absence of frontal aciculation, and by the fine, distinct strial punctures.

FEMALE.— Length 1.7–3.1 mm, 3.1 times as long as wide; color dark brown.

Frons irregularly convex, a weak, transverse impression on upper half, epistomal area indistinctly elevated toward median line; surface smooth, subshining, punctures moderately coarse, shallow, irregularly distributed; vestiture sparse, inconspicuous. Antenna with a dozen or more long, hairlike setae.

Pronotum 1.3 times as long as wide; as in *pilosus* (LeConte) except summit more distinct; posterior areas finely reticulate, punctures very fine, widely spaced. Glabrous except at margins.

Elytra 1.8 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on basal two-thirds, rather narrowly rounded behind; striae not impressed, punctures fine, distinct, regular; interstriae subshining, with irregular lines, impressed points almost obsolete, punctures absent. Declivity rather steep, convex; surface somewhat shagreened, subshining; strial punctures almost obsolete, usually visible, impressed points obscure to rather conspicuous; shallowly, distinctly sulcate between interstriae 3, 3 with two or three small, rounded granules. Glabrous except for sparse hair on declivity and sides.

MALE.— Similar to female except antenna without long hair; declivital sulcus not as deep, granules on interstriae 3 smaller.

DISTRIBUTION.— South Dakota and Nova Scotia to Texas and Florida; Dominican Republic and France.

CANADA: New Brunswick, Nova Scotia, Ontario, Quebec. USA: Alabama, Arkansas, District of Columbia, Florida, Georgia, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, South Dakota, E Texas, Virginia, Vermont, West Virginia, Wisconsin. OTHER COUNTRIES: Dominican Republic, France.

HOSTS.— *Pinus echinata, P. ponderosa, P. strobus, P. taeda,* and *Picea* sp.

BIOLOGY.— As described for the genus.

NOTES.— A specimen in the U.S. National Museum obtained from the Fitch collection is believed to be the holotype of this species. The above treatment was based on the Fitch specimen, on my specimens compared to it, and on 662 other specimens.

### 7. *Gnathotrichus nitidifrons* Hopkins

*Gnathotrichus nitidifrons* Hopkins, 1905, preprint of Proc. Ent. Soc. Washington 7:72 (Holotype, female; Michoacán, Mexico; U.S. Nat. Mus., 7510)

DIAGNOSIS.— This species is distinguished from *materiarius* (Fitch) by the frons, by the more numerous, finer, impressed lines on the elytral disc, and by the declivity.

FEMALE.— Length 2.7–3.0 mm, 3.1 times as long as wide; color dark brown.

Frons as in *materiarius* except more brightly shining, median line broadly impunctate and largely or completely, broadly, weakly elevated.

Pronotum as in *materiarius* except punctures on disc more nearly obsolete.

Elytra as in *materiarius* except strial punctures smaller, impressed lines on disc finer, more numerous, declivity feebly bisulcate, suture as high as lateral convexities on upper half, higher on lower half, interstrial granules smaller, more numerous, surface usually more brightly shining.

MALE.— Similar to female except setae on antennae much shorter.

DISTRIBUTION.— Durango and Hidalgo to Guatemala.

MEXICO: **Durango**: 16 km W El Salto, VII-64, *Pinus cooperi*, J. B. Thomas. **Hidalgo**: 8 km W Tulancingo, 11-VI-67, *P. leiophylla*, S. L. Wood. **Mexico**: San Rafael, 11-IX-49, *P. leiophylla*, J. P. Perry; El Telar, 15-I-69, *P. montezumae*, R. Rodrequez; Tlalmonalco, 20-XI-49, *P. leiophylla*, J. P. Perry. **Michoacán**: Uruapan. GUATEMALA: Cerro Zunil; San Gerónimo.

HOSTS.— *Pinus cooperi, P. leiophylla, P. montezumae.*

BIOLOGY.— Specimens were taken from logs. The habits apparently are as described for the genus.

NOTES.— The above treatment was based on the holotype and on eight other specimens.

### 8. *Gnathotrichus deleoni* Blackman

*Gnathotrichus deleoni* Blackman, 1942, Proc. U.S. Nat. Mus. 92:227 (Holotype, male; Chalco, Distrito Federal, Mexico; U.S. Nat. Mus., 55997)

DIAGNOSIS.— This species is distinguished from *nitidifrons* Hopkins by characters summarized in the above key.

FEMALE.— Length 2.8–3.3 mm, 3.0 times as long as wide; color dark brown.

Frons similar to *nitidifrons* but more evenly convex, median area not elevated, often

impunctate. Pronotum 1.1 times as long as wide, as in *nitidifrons* except sides more nearly arcuate and summit much less definite.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; sides straight and parallel on basal two-thirds, rather narrowly subangulate behind; striae not impressed, variable, punctures minute to obsolete, usually visible toward base, often obsolete toward declivity; interstriae shining, irregular lines and impressed points rather abundant. Declivity rather steep, evenly convex; not at all sulcate; strial punctures obsolete; minute granules evident on interstriae 2 and 3, impressed points conspicuous; suture feebly elevated on lower third. Vestiture of sparse, fine, long hair on declivity.

MALE.— Similar to female except antenna without long hair; frons finely aciculate from upper level of eyes to epistoma; discal striae usually less distinct.

DISTRIBUTION.— Durango to Mexico and Tlaxcala.

MEXICO: **Distrito Federal**: Chalco, *Pinus leiophylla*, D. DeLeon. **Durango**: 9 km NE El Salto, 23-VII-53, *Pinus*, S. L. Wood; 5 km W (No. 40) and 29 km W (No. 39) El Salto, 7-VI-65, 2500 m, *Pinus*, S. L. Wood. **Mexico**: San Rafael, 16-IX-49, *P. leiophylla*, P. J. Perry; Tlalmanalco, 10-VII-49, *P. leiophylla*, P. J. Perry. **Tlaxcala**: Villareal, 4-VIII-78, pheromone trap, M. M. Furniss.

HOSTS.— *Pinus leiophylla, P.* sp.

BIOLOGY.— Specimens were taken from shaded out limbs 5 to 10 cm in diameter. Otherwise the habits are as described for the genus.

NOTES.— The above treatment was based on the holotype and on 42 other specimens.

### 9. *Gnathotrichus perniciosus* Wood

*Gnathotrichus perniciosus* Wood, 1967, Great Basin Nat. 27:47 (Holotype, male; 6 miles or 9 km S Carapan, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *retosus* (LeConte) and *denticulatus* Blackman by the smaller size, by the less strongly impressed declivity, and by the strongly aciculate frons.

MALE.— Length 2.2–2.6 mm, 3.2 times as long as wide; color dark brown, elytral bases somewhat lighter.

Frons moderately convex; surface convergently aciculate from upper level of eyes to median point on epistoma, two of these ridges on median line (one in some paratypes) more strongly raised, particularly above, grooves between ridges and above aciculate area rather sparsely, deeply, coarsely punctured.

Pronotum 1.2 times as long as wide; widest at base, sides straight, converging very slightly on basal three-fourths, then broadly rounded in front; anterior margin armed by about 12 low, blunt serrations; summit well in front of middle, marked by a raised transverse line; posterior area finely reticulate, dull, very finely, rather sparsely punctured; vestiture inconspicuous, confined to sides.

Elytra 1.8 times as long as wide; sides almost straight and parallel on basal three-fourths, narrowly rounded behind, with a very small notch at suture; striae not impressed, punctures in semidefinite rows, small, shallow; interstriae with surface lines, points, and an occasional puncture, subshining. Declivity steep, narrowly, shallowly sulcate; striae 1 and 2 indicated by fine, shallow punctures; interstriae 1 and 2 very narrow, impressed, 3 moderately, rather abruptly elevated and armed by about four small, rounded granules. Vestiture limited to declivity, fine, hairlike, short and a few longer setae intermixed.

FEMALE.— Similar to male except outer margin of antennal funicle and club bearing a few long setae.

DISTRIBUTION.— Sinaloa and Chihuahua to Honduras.

MEXICO: **Chiapas**: Bochil, Lagos des Colores, San Cristóbal de las Casas. **Chihuahua**: Tres Ríos. **Distrito Federal**: El Guarda. **Jalisco**: Mazamitla. **Michoacán**: Carapan, Mt. Colima. **Morelos**: Cuernavaca. HONDURAS: Cerro Peña Blanca, San Lucas and Yuscarán in Paraíso.

HOSTS.— *Pinus chiapensis, P. leiophylla, P. montezuma, P. oocarpa, P. pseudostrobus, P.* spp.

BIOLOGY.— As described for the genus; most specimens were taken from the bole of standing, dying trees larger than 20 cm in diameter.

NOTES.— The above treatment was based on the type series of 81 specimens, and on 12 other specimens.

### 10. *Gnathotrichus retusus* (LeConte)

*Cryphalus retusus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:155 (Lectotype, female; California; Mus. Comp. Zool., 1010, present designation)

*Gnathotrichus retusus*: Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:407

*Gnathotrichus alni* Blackman, 1931, J. Washington Acad. Sci. 21:271 (Holotype, female; Hoquiam, Washington; U.S. Nat. Mus., 43431); Wood, 1977, Great Basin Nat. 37:512. *Synonymy*

DIAGNOSIS.— This species is distinguished from *denticulatus* Blackman by the weakly aciculate frons near the epistoma, by the more deeply sulcate declivity, with more abruptly elevated lateral convexities, by the slightly larger average size, and by the distribution.

FEMALE.— Length 3.3–3.7 mm, 3.1 times as long as wide; color dark brown.

Frons broadly convex, ascending slightly toward median area of epistoma, elevated area weakly aciculate, surface subshining, smooth, punctures rather small, moderately abundant; vestiture of fine, sparse, inconspicuous hair.

Pronotum 1.3 times as long as wide; outline as in *nitidifrons* Hopkins; summit transversely subcarinate; posterior area finely reticulate, punctures rather fine, not close.

Elytra 1.9 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on more than basal two-thirds, rather broadly rounded behind; striae not impressed, punctures rather small, deep, regular, in rows; interstriae smooth, shining, at least four times as wide as striae, with numerous impressed points, punctures absent. Declivity steep, rather deeply sulcate; strial punctures much smaller than on declivity, surface densely marked by impressed points; sulcus deep, lateral areas rising abruptly from striae 1, summit on 3 armed by a row of rather coarse, pointed granules. Vestiture largely confined to declivity, of sparse, coarse hair.

MALE.— Similar to female except antenna without long hair.

DISTRIBUTION.— British Columbia and northwestern Utah to Baja California.

CANADA: **British Columbia**: Agassiz, Bowser, Creston, Duncan, Lake Cowichan, Merritt, Nelson, Pender Harbor, Terrace, Trenchan, Todd Inlet, Trinity Valley, Victoria. USA: **California**: more than 100 localities. **Idaho**: Cedar Mt., Centerville, Coeur d'Alene, Moscow, Pierce, Smiths Ferry, Troy, Westmond, Whitebird Pass. **Montana**: Sula. **Nevada**: Carson City, Kyle Canyon in Clark Co. **Oregon**: more than 40 localities. **Utah**: Logan Canyon. **Washington**: more than 35 localities. MEXICO: **Baja California**: Laguna Hanson, San Juárez, San Pedro Mártir.

HOSTS.— *Alnus* sp. (seven series in Oregon and Washington), *Picea engelmannii*, *Pinus contorta*, *P. flexilis*, *P. jeffreyi*, *P. radiata*, *P. ponderosa*, *Populus trichocarpa* (one series from Longmire, Washington), and *Pseudotsuga menziesii*.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the 2 syntypes of *retusus* in the LeConte collection, on the holotype of *alni*, and on 994 other specimens. The first syntype in the LeConte collection, a female from California, is here designated as the lectotype of *retusus* LeConte. It was labeled "Type" many years ago, but was never officially so designated.

Long series from alder and from coniferous hosts from Oregon and Washington were compared, but I fail to see characters that distinguish species. The possibility that a sibling species exists in alder requires further investigation. It is also possible that *retusus* and *denticulatus* intergrade in Utah or Wyoming; however, these species are very rare in this area, and specimens even suggesting intergradation were not seen.

### 11. *Gnathotrichus denticulatus* Blackman

*Gnathotrichus denticulatus* Blackman, 1931, J. Washington Acad. Sci. 21:270 (Holotype, female; Cloudcroft, New Mexico; U.S. Nat. Mus., 43430)

DIAGNOSIS.— This species is distinguished from *retusus* (LeConte) by the entirely smooth, nonaciculate frons, by the less strongly sulcate declivity, by the smaller average size, and by the distribution.

FEMALE.— Length 2.8–3.3 mm, 3.1 times as long as wide; color dark brown.

Frons as in *retusus* except entirely devoid of all traces of aciculation. Pronotum and elytra as in *retusus* except elytral declivity much less strongly sulcate.

MALE.— Similar to female except antenna without long hair.

DISTRIBUTION.— E Utah and South Dakota to Michoacán and Puebla.

USA: **Arizona**: Chiricahua Mts., Flagstaff, Jerome, Kaibab N.F., Paradise, Prescott N.F., Rincon Mts., San Francisco Peak, Santa Catalina Mts., Sitgreaves N.F., White River, Williams. **Colorado**: Colorado N.F., Colorado Springs, Estes Park, Evergreen, Fort Collins,

Glennhaven, Gunnison, Norwood, Ouray, Uncompahgre N.F., Waldo Canyon. **New Mexico**: Capitan, Cloudcroft, Magdelena, Meek, Vermejo. **South Dakota**: Black Hills, Cheyenne Crossing, Elmore, Hill City. **Texas**: Davis Mts. **Utah**: Dixie N.F., Elk Park in Ashley N.F., Long Hollow in Dixie N.F., Panguitch. MEXICO: **Chihuahua**: Ojinaga. **Distrito Federal**: El Guarda. **Durango**: Durango, El Salto. **Guerrero**: Acapulco. **Michoacán**: Carapan. **Puebla**: Texmelucán. **San Luis Potosí**: San Luis Potosí.

HOSTS.— *Picea engelmannii* (accidental?), *Pinus ponderosa, P.* spp.

BIOLOGY.— As described for the genus. Most specimens were taken from the stump of standing, dying trees.

NOTES.— The above treatment was based on the holotype and on 216 other specimens.

### 12. *Gnathotrichus imitans* Wood

*Gnathotrichus imitans* Wood, 1967, Great Basin Nat. 27:48 (Holotype, male; 3 miles or 5 km W El Salto, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *omissus* Wood and *sulcatus* (LeConte) by the smooth, shining pronotal disc, with much larger punctures, by the arcuate impression on the upper frons, and by the steeper, more broadly rounded elytral declivity.

FEMALE.— Length 2.8–3.1 mm, 3.3 times as long as wide; color brown to almost black.

Frons impressed on more than median half from upper level of eyes to epistoma, convergently aciculate toward median point on epistomal margin on most of impressed area; surface coarsely, rather sparsely, deeply punctured over most of front of head to vertex; a median carina extending dorsal from upper level of eyes; vestiture sparse, inconspicuous.

Pronotum 1.4 times as long as wide; widest at base, sides almost straight on basal three-fourths and slightly converging anteriorly, rather broadly rounded in front; anterior margin with an irregular, indistinctly serrate, raised rim; summit well in front of middle, clearly marked by a transverse elevation; posterior area almost smooth and shining, rather closely, deeply, finely punctured; vestiture restricted to sides.

Elytra 1.9 times as long as wide; sides straight and subparallel on basal three-fourths, rather narrowly rounded behind; striae not impressed, punctures small, deep; interstriae little wider than striae, marked by a few surface lines and points, subshining. Declivity moderately steep, convex; all punctures minute, not clearly impressed; interstriae 1 weakly elevated, 2 impressed, 3 slightly elevated and armed by a series of about five very small granules; apical margin not extended as in most representative of the genus. Vestiture confined to sides and declivity; longer and in distinct rows on declivital interstriae 3 and 4.

MALE.— Similar to female in all respects.

DISTRIBUTION.— Arizona and New Mexico to Durango and Hidalgo.

USA: **Arizona**: Onion Saddle, Chiricahua Mts., 30-VI-53, W. F. Barr; Williams, 1-VII, J. N. Knull. **New Mexico**: Cloudcroft, 2-VIII-51, Hopk. U.S. 34218D4, *Pinus ponderosa*. MEXICO: **Durango**: 5 km W El Salto, 7-VI-65, 2500 m, in flight, S. L. Wood, also 3-VI-37, Juan Manuel, also 16 km W, VII-64, in flight, J. B. Thomas. **Hidalgo**: 31 km E Tulancingo, 10-VII-67, 2300 m, No. 185, *Pinus*, S. L. Wood.

HOST.— *Pinus ponderosa, P.* sp.

BIOLOGY.— Specimens taken by me were in a log 40 cm in diameter.

NOTES.— The above treatment was based on the type series of 80 specimens and on 16 other specimens.

### 13. *Gnathotrichus sulcatus* (LeConte)

*Cryphalus sulcatus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:155 (Holotype, female; middle California; Mus. Comp. Zool., 1001)

*Gnathotrichus sulcatus*: Eichhoff, 1878, Mém. Soc. Roy. Sci. Liége (2)8:407

*Gnathotrichus aciculatus* Blackman, 1931, J. Washington Acad. Sci. 21:272 (Holotype, female; Cloudcroft, New Mexico; U.S. Nat. Mus., 43432); Wood, 1977, Great Basin Nat. 37:513. *Synonymy*

DIAGNOSIS.— This species is distinguished from *omissus* Wood by the more coarsely aciculate female frons, by the more finely sculptured elytral disc, by the more deeply impressed elytral declivity, with more conspicuously marked striae, and by the hosts and distribution.

FEMALE.— Length 2.8–3.5 mm, 3.1 times as long as wide; color dark brown.

Frons convex, shining, rather strongly aciculate on more than medium half to well above eyes, small punctures interspersed; vestiture of sparse, fine, inconspicuous hair.

Pronotum as in *omissus* except summit more conspicuous, transversely subcarinate.

Elytra as in *omissus* except punctures slightly smaller, impressed lines less

conspicuous, evidently less numerous, impressed points smaller; declivital sulcus rather strongly impressed, granules larger, strial punctures more distinct, in rows.

MALE.— Similar to female except antenna without long hair; anterolateral angles of pronotum with a small, obscure tuft of hair.

DISTRIBUTION.— British Columbia and South Dakota to Honduras.

CANADA: **British Columbia**: Duncan, Genoa Bay, New Westminster, Pender Harbor, Vancouver, Victoria. USA: **Arizona**: Chiricahua Mts., Flagstaff, Graham Mts., Huachuca Mts., Jacob's Lake, Kaibab N.F., Santa Catalina Mts., Williams. **California**: The counties of Eldorado, Fresno, Humboldt, Lassen, Marin, Mendocino, Modoc, Monterey, Nevada, Dumas, San Mateo, Santa Cruz, Siskiyou, Trinity, Tulare. **Colorado**: Pitkin, Poudre Canyon in Larimer Co. **Idaho**: Coeur d'Alene, Krassel. **Nevada**: Lake Tahoe. **New Mexico**: Albuquerque, Cloudcroft, Las Vegas Hot Springs, Sandia Mts. **Oregon**: Ashland, Astoria, Bly, Burn, Corvallis, Grants Pass, Mary's Peak, Marshfield, North Plains, Portland. **South Dakota**: Black Hills, Elmore. **Utah**: Beaver, Sanford Canyon in Dixie N.F., Payson Canyon. **Washington**: Aberdeen, Buckeye, Hoquiam, Kent, Olympic N.F., Satsop. MEXICO: **Distrito Federal**: El Guarda. **Durango**: Durango, El Salto. **Hidalgo**: Tulancingo, Zacatlán. **Michoacán**: Ciudad Hidalgo, Morelia. **Oaxaca**: Oaxaca. **Puebla**: Texmelucán. **Tlaxcala**: Tlaxco. **Veracruz**: Jalapa, Perote. GUATEMALA: Solola. HONDURAS: Cerro Peña Blanca.

HOSTS.— *Abies concolor, A. magnifica, A. religiosa, Pinus leiophylla, P. ponderosa, P. pseudostrobus, P.* spp., *Pseudotsuga menziesii, Tsuga heterophylla.*

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on the holotypes of *sulcatus* and *aciculatus*, and on 594 other specimens. Blackman named *aciculatus* from specimens having the declivital sulcus much more conspicuously impressed than in most specimens. This character apparently varies within and between series. With the material at hand, this character could not be correlated with other factors useful in separating species. There is a possibility that geographical races exist having distributions approximately as in *retusus* and *denticulatus*, but they must be defined by characters other than those used by Blackman for *sulcatus* and *aciculatus*.

### 14. *Gnathotrichus omissus* Wood

*Gnathotrichus omissus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):57 (Holotype, female; Volcán Irazu, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *sulcatus* (LeConte) by the minute to obsolete strial punctures on the disc, by the confused punctures on the elytral declivity, by the feebly impressed elytral declivity, by the much less strongly aciculate female frons, and by the hosts.

FEMALE.— Length 3.3–3.6 mm, 3.2 times as long as wide; color dark brown, usually with pale areas on anterior pronotum and basal and declivital areas of elytra.

Frons convex, median line obscurely elevated, surface smooth, shining, sparsely, finely punctured, median third below upper level of eyes finely aciculate; vestiture fine, sparse, inconspicuous.

Pronotum 1.3 times as long as wide; essentially as in *materiarius* (Fitch) except serrations on anterior margin coarse.

Elytra 1.8 times as long as wide, 1.5 times as long as pronotum; outline as in *materiarius*; striae not impressed, punctures small, in slightly irregular rows; interstriae smooth, shining, impressed lines and points moderately abundant. Declivity rather steep, convex; weakly, rather narrowly sulcate; strial punctures obsolete or nearly so, evidently confused; lateral convexities distinctly higher than suture, summit armed by two or three small granules. Vestiture confined to declivity, consisting of sparse hair.

MALE.— Similar to female except frontal aciculation much stronger and distributed almost from eye to eye to well above eyes; antenna without long hair; anterolateral angles of pronotum bearing a small tuft of hair.

DISTRIBUTION.— Guatemala to Costa Rica.

GUATEMALA: Volcán Pacaya, Esquintla, 1-VI-64, 1300 m, No. 688, Caldo de Frijol, S. L. Wood. COSTA RICA: Volcán Irazu, Cartago, 26-IX-63, 2300 m, No. 207, *Oreopanax nubigenus*, S. L. Wood.

HOSTS.— *Oreopanax nubigenus*, etc.

BIOLOGY.— Specimens were attacking limbs 15 cm in diameter.

NOTES.— The above treatment was based on the type series of 40 specimens and on one other specimen.

### 15. *Gnathotrichus consentaneus* Blandford

*Gnathotrichus consentaneus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):247 (Lectotype, male; Totonicipan, Guatemala; British Mus. Nat. Hist., designated by Wood, 1973, Great Basin Nat. 33:176)

DIAGNOSIS.— This species is distinguished from *omissus* Wood by the much larger size, by the larger, pointed, recurved declivital tubercles, and by the more broadly impressed elytral declivity.

FEMALE.— Length 4.1–4.3 mm, 3.6 times as long as wide; color dark brown, basal half of elytral disc lighter.

As in *omissus* except elytral declivity somewhat more broadly impressed, and interstriae 3 at base armed by two pairs of small, sharply pointed, recurved (hooked) denticles.

MALE.— Similar to female except antenna without long hair.

DISTRIBUTION.— Chiapas to Guatemala.

MEXICO: Chiapas: Mt. Tzontehuiz. GUATEMALA: Totonicipan, G. C. Champion.

NOTES.— Blandford included at least 18 specimens under this name when it was described, but stated that it was named from the Totonicipan series. Pins 1, 7, and 8 bear specimens from Totonicipan and are *consentaneus*; pins 3 and 5 and one in the Schedl collection bear specimens from Totonicipan of *sulcatus* (LeConte); pin 4 from Teapa, pins 6 and 15 from Mexico by Truqui, pin 11 from the Quiché Mts., and pin 14 from Volcán de Agua bear specimens of *sulcatus*; pin 9 from Cerro Zunil and pin 13 (2 specimens) from San Geronimo bear specimens of *nitidifrons* Hopkins; pin 10 from Cerro Zunil and pin 12 from Omilteme bear specimens of *perniciosus* Wood; and pin 2 (2 specimens) from Mercedes bears specimens *Xyleborus declivis* Eichhoff. The first specimen in the series, a male from Totonicipan, bears a type label and has been regarded as the type for many years; it was designated as the lectotype of *consentaneus* Blandford as cited above.

This large species probably infests a nonconiferous host.

## GENUS *GNATHOTRUPES* SCHEDL

*Gnathotrupes* Schedl, 1951, Dusenia 2:125 (Type-species: *Gnathotrupes bolivianus* Schedl, monobasic)

*Gnathotrypanus* Wood, 1968, Great Basin Nat. 28:9 (Type-species: *Gnathotrypanus terebratus* Wood, original designation); Wood, 1973, Great Basin Nat. 33:172. *Synonymy*

DIAGNOSIS.— This genus is distinguished from *Gnathotrichus* Eichhoff by the more strongly arched sutures of the antennal club, which are more closely, more conspicuously marked by rows of setae, by the smaller segment 1 of the antennal club, by the abrupt, flattened elytral declivity, with the sutural apex broadly angulate, the costal margin near the sutural apex not elevated, and by the distribution.

DESCRIPTION.— Length 1.3–2.6 mm (some South American species much larger), 2.4–3.2 times as long as wide; color dark brown.

Frons indistinctly to profoundly dimorphic, males convex, females convex with sparse setae to strongly concave and elaborately ornamented by hair; eye shallowly to moderately emarginate; pregula normal to variously extended toward the occipital foramen, several species with well-developed gula marked off by two completely separate gular sutures. Antennal scape elongate, club shaped; funicle 5-segmented; club subcircular to elongate, sutures 1 and 2 strongly arcuate to angulate, segment 1 usually small. Pronotum much longer than wide, summit anterior to middle, usually indefinite; anterior slope moderately asperate, anterior margin serrate; posterior areas very finely sculptured. Scutellum rather large, flat. Elytra elongate, declivity steep, costal margin ascending from base of declivity to sutural apex, its margin not acutely elevated near suture. Prothoracic precoxal piece forming a simple transverse partition between head and coxae, not extended between coxae (an extension does occur in some South American species). Legs as in *Gnathotrichus*.

DISTRIBUTION.— Guatemala to Argentina; 15 species are known; 5 occur in Central America.

BIOLOGY.— Apparently as described for *Gnathotrichus*.

NOTES.— All South American species of *Gnathotrichus* have been referred to *Gnathotrupes* (Wood 1973:172). Of the 13 species of *Gnathotrupes* before me, 5 species have a complete gula extending from pregula to postgula, with two completely separate gular sutures, 5 species have the pregula extending more than half the distance from its normal position to the foramen magnum, and 3 species have a normal pregula. This is the only genus of Scolytidae known to me in which there is a complete gula.

Key to the Species of *Gnathotrupes*

1. Strial punctures small, in definite rows; upper third or more of elytral declivity sulcate, its lateral convexities armed by pointed granules; body stouter, not more than 2.5 times as long as wide (except *bituberculatus*); anterolateral angles of female pronotum usually bearing a conspicuous tuft of hair; erect declivital setae stout, almost scalelike ..... 2

— Elytral punctures on disc confused or not; declivity flat or slightly convex, not at all sulcate, lateral areas armed or not; costal margin of elytra ascending from basal margin of declivity to sutural apex; body slender, more than 3.0 times as long as wide; anterolateral angles of female pronotum without a tuft of hair ..... 4

2(1). Sutures of antennal club strongly procurved or angulate, 2 obsolete at its middle; elytral declivity more strongly sulcate almost to apex, lateral margins on interstriae 3 armed by a row of several (about five) granules, about half of them on lower half of declivity; Costa Rica; 2.4 mm ..... 2. ***electus*** **(Wood)**

— Sutures of antennal club straight to moderately procurved; declivital sulcus shallow, confined to basal half, interstriae 3 armed on basal half by fewer than five pairs of small tubercles ..... 3

3(2). Smaller; vestiture on elytral declivity of very fine, short hair and slightly longer scales; declivital interstriae 3 near base armed by a row of four or five small, pointed tubercles; sutural apex entire; female frons subglabrous; Costa Rica; 1.3–1.5 mm ..... 1. ***terebratus*** **(Wood)**

— Larger; vestiture on declivity of short, rather stout bristles; declivital interstriae 3 with a moderately large, blunt tubercle slightly above middle, one or two small granules on basal half; sutural apex moderately divaricate in female, strongly divaricate in male; female frons ornamented by long hair; Guatemala; 2.4–2.6 mm ..... 3. ***bituberculatus*** **(Blandford)**

4(1). Elytral declivity broadly convex, unarmed, with rather abundant, moderately long pubescence; punctures on frons sparse, rather coarse; Costa Rica; 1.6–1.7 mm ..... 4. ***dilutus*** **Wood**

— Elytral declivity flattened, interstriae 3 armed by two pairs of pointed denticles, pubescence short; punctures on frons sparse, minute; Costa Rica; 1.9–2.0 mm ..... 5. ***crecentis*** **Wood**

### 1. *Gnathotrupes terebratus* (Wood)

Fig. 218

*Gnathotrupanus terebratus* Wood, 1968, Great Basin Nat. 28:9 (Holotype, male; Volcán, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *electus* (Wood) by the smaller size, by the very different antennal club, and by the different elytral declivity.

FEMALE.— Length 1.30–1.45 mm, 2.5 times as long as wide; color dark reddish brown, pronotum yellowish brown.

Frons weakly convex to well above eyes on an area slightly less than distance between eyes, very feebly elevated toward a broad, low, median, longitudinal elevation; surface very obscurely reticulate with a few very coarse, deep punctures, except shining and impunctate on median elevation; vestiture inconspicuous. Eye half divided by an emargination. Antennal scape about as long as 5-segmented funicle, about half as long as club; club as long as wide, with two procurved, almost angulate sutures, 1 extending one-fourth club length from base, 2 extending slightly more than half club length from base, most of 1 and extreme margins of 2 septate.

Pronotum 1.1 times as long as wide; widest on basal half, sides almost parallel, very feebly arcuate to just before middle, then

distinctly converging to rather abrupt anterolateral angles, very broadly rounded, almost straight in front; anterior margin armed by about 14–16 low teeth; indefinite summit in front of middle, moderately declivous and finely asperate anterior to summit; posterior area minutely subreticulate, with an occasional minute puncture. A few hairlike setae in asperate area and on lateral areas; anterolateral angles bearing small tuft of yellow hair.

Elytra 1.4 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal three-fourths, very broadly rounded behind; striae not impressed, punctures minute, shallow; interstriae about three times as wide as striae, shining, marked by rather numerous lines, punctures not evident. Declivity steep, confined to posterior fourth of elytra; shallowly, subconcavely impressed on central two-thirds, except sutural area above impressed; striae obsolete; declivital face closely, minutely marked by indefinite, confused punctures; position of interstriae 2 near upper margin armed by a series of two or three small pointed tubercles, third tubercle almost one-fourth of declivital length from base of declivity; apical, costal margin near suture finely, weakly elevated. Vestiture confined to declivity, consisting of fine hair and erect, slightly longer scales in about equal numbers; rather sparse.

MALE.— Similar to female except frons flattened to well above eyes; frontal setae shorter; anterolateral angles of pronotum without tufts of hair.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán, Puntarenas, 11-XII-63, 1000 m, No. 307, Guarumo, S. L. Wood.

HOST.— Presumably *Pourouma aspera*.

BIOLOGY.— Specimens were just entering a recently cut bole 20 cm in diameter.

NOTES.— The above treatment was based on the type series of 26 specimens.

### 2. *Gnathotrupes electus* (Wood)

*Gnathotrypanus electus* Wood, 1968, Great Basin Nat. 28:10 (Holotype, female; Rincón de Osa, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *terebratus* (Wood) by the larger size, by the very different antennal club, and by the different elytral declivity.

FEMALE.— Length 2.4 mm, 2.4 times as long as wide; color reddish brown, with elytra much darker.

Frons moderately convex, with median line rather narrowly elevated, particularly toward epistomal margin; surface dull, very finely, rather closely punctured; vestiture inconspicuous, antennal club with sutures strongly procurved, more narrowly angulate than in *terebratus*.

Pronotum 1.1 times as long as wide; sides very feebly arcuate, almost parallel on basal half, rather broadly rounded in front; anterior margin not clearly armed, posterior area minutely reticulate, finely punctured. Subglabrous except at lateral and anterior margins; a moderately large patch of rather long, conspicuous, hairlike setae on anterolateral angle.

Elytra about 1.4 times as long as wide (elytra of holotype slightly spread), 1.2 times as long as pronotum; sides almost straight and evidently parallel on about basal three-fourths, very broadly rounded behind; striae not impressed, punctures small, distinct, shallow; interstriae about three times as wide as striae, surface shining, marked by lines and exceedingly minute points, with punctures similar in size and spacing to those of striae. Declivity steep, sulcate; striae not indicated, surface finely reticulate, with very obscure, confused, close punctures indicated; rather strongly impressed between third interstriae, lateral elevations moderately abrupt, broad, armed by one small, pointed tubercle near upper margin and four similar tubercles on middle third, upper one of these four larger. Vestiture confined to declivity, consisting of fine, semirecumbent hair and a few erect, slender scales.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-67, 30 m, No. 88, tree limb, S. L. Wood.

NOTES.— The above treatment was based on the unique holotype.

### 3. *Gnathotrupes bituberculatus* (Blandford)

*Gnathotrichus bituberculatus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):248 (Lectotype, female; Purulha, Baja Vera Paz, Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished as indicated in the above key.

FEMALE.— Length 2.6 mm (male 2.4 mm), 3.2 times as long as wide; color light brown, anterior third of pronotum and elytral declivity dark brown.

Frons very broad, weakly convex, evidently subreticulate; epistomal area slightly elevated, its median fourth shining; pubescent on median two-thirds except for glabrous central area, setae moderately long, rather abundant; upper half concealed on type by pronotum. Antennal club rather small, sutures very weakly procurved.

Pronotum 1.4 times as long as wide; sides straight and parallel on anterior three-fourths, very broadly rounded in front; serrations on anterior margin almost obsolete; summit on anterior third, indefinite; posterior areas reticulate, punctures very fine, obscure. Glabrous.

Elytra 1.9 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal five-sixths, rather abruptly, very broadly rounded behind; disc shining, almost smooth, strial punctures very small, not always clearly impressed, interstrial punctures obsolete. Declivity very steep, broadly, rather weakly convex, feebly sulcate on upper half; interstriae 3 armed by a conspicuous, rather small, blunt tubercle very slightly above middle, 1 to 4 minute tubercles on basal half of interstriae 3; lateral areas with several very minute granules; surface reticulate; sutural apex rather deeply divaricate. Vestiture confined to declivity, of coarse, short bristles.

MALE.— Similar to female except frons rather coarsely punctured, subglabrous; anterior margin of pronotum armed by 14 coarse serrations; elytral declivity with margins more abrupt, strial punctures clearly visible on upper third, major tubercles more nearly pointed, declivital surface smooth, shining, suture much more broadly, deeply notched, setae shorter, broader.

DISTRIBUTION.— Guatemala.

GUATEMALA: Purulhá, Baja Vera Paz, G. C. Champion.

NOTES.— The above treatment was based on the two syntypes. The female syntype is here designated as the lectotype of *Gnathotrichus bituberculatus* Blandford and this species is transferred to *Gnathotrupes*.

### 4. *Gnathotrupes dilutus* Wood

*Gnathotrupes dilutus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):56 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *crecentis* Wood by the broadly convex unarmed elytral declivity, with longer declivital pubescence, by the larger frontal punctures, and by the smaller size.

MALE.— Length 1.6–1.7 mm, 3.2 times as long as wide; color dark brown.

Frons broadly convex, shining, weakly reticulate; punctures sparse, moderately coarse, shallow; epistomal area distinctly impressed except on median line; vestiture sparse, hairlike, inconspicuous. Antennal club subcircular, three strongly arcuate sutures marked by grooves and rows of setae, segment 1 very small.

Pronotum 1.2 times as long as wide; sides feebly arcuate, subparallel on more than basal half, broadly rounded in front; anterior margin armed by 14 serrations; indefinite summit well in front of middle; anterior slope rather abrupt, rather coarsely asperate; posterior areas subreticulate (mostly wavy lines), punctures very minute, sparse. Glabrous.

Elytra 1.9 times as long as wide, 1.6 times as long as pronotum; sides almost straight and parallel on more than basal three-fourths, very broadly rounded behind; striae not impressed; surface shining, almost smooth, punctures minute, almost obsolete, confused. Declivity confined to less than posterior fourth, very steep, broadly convex; punctures larger and deeper than on disc, confused. Vestiture confined to declivity, of rather abundant, fine, short, and rather long hair.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 17-IX-63, 1300 m, No. 184, *Miconia caudata*, S. L. Wood.

BIOLOGY.— Males were just entering a recently cut branch 10 cm in diameter.

NOTES.— The above treatment was based on the type series of three males.

### 5. *Gnathotrupes crecentus* Wood

*Gnathotrupes crecentus* Wood, 1974, Brigham Young Univ. Sci. Bull. Biol. Ser. 19(1):56 (Holotype, female; Volcán, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *dilutus* Wood by the steep, almost flat

elytral declivity that is armed by two pairs of moderately large tubercles on interstriae 3, by the very short declivital vestiture, by the much finer frontal punctures, and by the smaller size.

FEMALE.— Length 1.9–2.0 mm, 3.0 times as long as wide; color dark brown.

Frons as in *dilutus* except punctures very fine; sparse setae very long. Pronotum as in *dilutus*.

Elytral outline as in *dilutus*; strial punctures very small, in definite rows; declivity steeper and much flatter than in *dilutus*, punctures larger, confused, interstriae 3 with two pointed denticles one-third and two-thirds declivital length from base. Vestiture mostly very short, a few longer hairs.

MALE.— Similar to female except lower half of frons more distinctly, transversely impressed, setae short; strial punctures minute, confused; declivital denticles slightly larger, punctures much smaller, vestiture shorter.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán, Puntarenas, 11-XII-63, 1000 m, No. 308, tree limb, S. L. Wood.

BIOLOGY.— Specimens were taken from the wood of a recently cut limb 10–15 cm in diameter.

NOTES.— The above treatment was based on the type series of 10 specimens.

## GENUS *TRICOLUS* BLANDFORD

*Tricolus* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):286 (Type-species: *Tricolus ovicollis* Blandford, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:131)

DIAGNOSIS.— This genus is distinguished from *Amphicranus* Erichson by the more broadly rounded posterior margin of the elytra, which is feebly if at all explanate and feebly if at all divaricate, by the presence of three pairs of spines on the declivity, and by the somewhat distinctive precoxal piece on the prothorax.

DESCRIPTION.— Length 1.5–3.9 mm, 2.4–3.4 times as long as wide; sexual dimorphism restricted to antennal vestiture; color uniformly brown or black to bicolored.

Frons convex, subglabrous, central area with a weakly elevated granular area, or rarely convergently aciculate; eye oval, emarginate, antennal socket in emargination; antennal scape elongate, funicle 3-segmented, club elongate-oval to broadly subtriangular, sutures 1 and 2 septate, weakly to strongly procurved. Pronotum longer than wide, lateral margins marked by a fine raised line; sculpture conservative; anterior margin variable. Elytral disc with punctures small, confused; posterior area strongly impressed, lateral margin of declivity armed by three pairs of denticles (almost obsolete in three species); posterior margin weakly if at all explanate, usually not at all divaricate. Precoxal piece on prothorax a thin, transversely straight partition, usually partly bent from vertical to subhorizontal plane and pubescent. Tibiae not sexually dimorphic, usually with a marginal row and one submarginal row of tubercles on posterior face.

DISTRIBUTION.— Nayarit and Veracruz to Bolivia and Brazil; about 30 species have been named; 24 species occur in Mexico and Central America.

BIOLOGY.— These monogamous ambrosia beetles occur in small recently cut or broken branches. The adult tunnel consists of a short radial entrance tunnel and a transverse brood gallery that follows a growth ring of the branch, at times forming a complete circle. Few young are produced in the parental tunnels. One species (*cecropii*) appears to have a mutualistic symbiotic or obligatory domicile parasitic relationship with a *Corthylus* species.

NOTES.— Although the species assigned to this genus form a compact group, almost all characters of *Tricolus* intergrade with those of *Amphicranus* to such a degree that its validity is doubtful.

### Key to the Species of *Tricolus*

1. Lower (third) spine on elytral declivity with its apex simple, either rounded or pointed ..... 2

— Spine 3 on elytral declivity with a definite, small, pointed, subapical tubercle on its dorsomedian margin at or near apex ..... 18

2(1). Spines on elytral declivity almost absent, poorly developed, represented by feeble swellings or a broad fold; finely elevated line on declivital suture continued on costal margin (see also *cecropii*) ..... 3

— Declivital spines 1 and 2 clearly developed, pointed, 3 much larger (except in *cecropii*), variously shaped; finely elevated line on declivital suture continued on costal margin than curved dorsad at or near base of spine 3 ..... 5

3(2). Impressed area on elytral declivity subcircular in outline, spine 1 at base of declivity small, sharply pointed; frons coarsely aciculate except for small, central, weakly raised granulate area; Guatemala to Costa Rica; *Ficus*; 1.8 mm ..... 1. ***simplicis*** **Wood**

— Impressed area on elytral declivity conspicuously longer than wide, spine 1 represented by a small rounded granule or almost absent ..... 4

4(3). Smaller; body 3.1 times as long as wide; frons convex, granulate area weakly raised, lateral areas not impressed; median face of lateral convexities vertical from base to its posterior apex; Costa Rica; *Siparuna*; 1.8 mm ..... 2. ***inornatus*** **Wood**

— Larger; body 2.8 times as long as wide; granular area on frons rather strongly elevated, lateral areas on lower half of frons impressed; mandibles enlarged; slope on median face of lateral convexities on declivity more gradual on basal half; Costa Rica; 2.6 mm ..... 3. ***inaffectus*** **Wood**

5(2). Elytral declivity below spine 3 narrowly flattened, its width not exceeding width of impressed declivital area anterior to spine 3, subapical margin usually less strongly elevated, never reflexed upwards (explanate) so as to form an angle out of line with declivital slope of sutural area; granulate area on frons as long as wide or absent ..... 6

— Elytral declivity broadly flattened below spine 3, at least 1.3 times as wide as impressed area above spine 3, if doubtful then granulate area on frons considerably wider than long; apical margin of declivity near suture often feebly explanate ..... 14

6(5). Anterior margin of pronotum strongly produced, acutely angulate medially, armed by very coarse, sharp serrations; spine 3 absent or long and slender ..... 7

— Anterior margin of pronotum rather narrowly to moderately rounded in front, serrations usually rather low, often indefinite; spine 3 stouter ..... 8

7(6). Body rather stout, dark brown; declivital spine 2 not larger than 1, 3 represented by a simple fold, not projecting; granular area on frons large, wider than long, subreniform; Costa Rica; *Cecropia* petioles; 2.2–2.5 mm ..... 4. ***cecropii*** **Wood**

— Body very slender, partly yellowish brown; declivital spine 2 cylindrical, much larger than 1, 3 at least twice as long as wide, larger than 2; Costa Rica to Panama; 2.1–2.5 mm ..... 5. ***ardis*** **Wood**

8(6). Apex of declivital spine 3 not projecting, merely abrupt posterior termination of lateral convexities ..... 9

— Spine 3 a definitely projecting process ..... 10

9(8). Smaller; declivital spines 1 and 2 represented by small, rounded calluses; anterior margin of pronotum armed by nine coarse serrations; pronotum and elytra black; Costa Rica; 2.3 mm ..... 6. **parsus Wood**

— Larger; declivital spines 1 and 2 each longer than their basal width; anterior margin of pronotum obscurely serrate; pronotum reddish brown, elytra black; Costa Rica; 2.7–3.1 mm ..... 7. ***rufithorax*** **Wood**

10(8). Declivital spine 3 very close to posterior margin, separated by a distance less than half thickness of spine; color light brown; Costa Rica to Panama; 2.3–2.8 mm ..... 8. ***badius*** **Wood**

— Declivital spine 3 remote from posterior margin, separated by more than thickness of spine; color dark brown to black ..... 11

11(10). Declivital spine 3 stout, wider than long, somewhat laterally compressed, its apex at lower apical angle ..... 12

— Declivital spine 3 elongate, cylindrical, blunt, about twice as long as its basal width ..... 13

12(11). Larger; black; stouter, body 2.6 times as long as wide; granulate area on frons indistinctly elevated; ?Veracruz, Guatemala to Costa Rica; 2.7–3.0 mm ..... 9. ***nodifer*** **Blandford**

— Smaller; rather dark brown; more slender, 2.8 times as long as wide; granulate area on frons distinctly elevated; Costa Rica; 1.7–1.8 mm ..... 10. ***partilis*** **Wood**

13(11). Punctures in excavated area of elytral declivity small, simple; frons devoid of aciculate lines and elevations, granulate area conspicuously developed; Costa Rica; 2.1 mm ..... 11. ***fenoris*** **Wood**

— Punctures on declivity with (at least) their anterior margins finely granulate; frons aciculate, granulate area absent; Puebla; 2.4 mm ..... 12. ***frontalis*** **Wood**

14(5). Raised granulate area on frons subcircular, about equal in length and width; spine 3 stout, its basal diameter from lateral aspect four or more times that of spine 2; Panama; 2.1 mm ..... 13. ***capitalis*** **Wood**

— Raised granulate area on frons conspicuously wider than long ..... 15

15(14). Subapical posterior margin of declivity uniformly rather weakly elevated and arcuate from suture to near lateral base of spine 3; color reddish brown; Costa Rica; 2.3–2.6 mm ..... 14. ***saundersi*** **Wood**

— Subapical posterior margin of declivity abruptly, angulately produced near suture, forming a conspicuous sutural notch; color partly or entirely very dark brown to black ..... 16

16(15). Spine 3 closer to raised angle on subapical margin than to spine 2; granulate area on frons at least three times as wide as long, strongly constricted toward median line, its dorsal margin forming a broadly V-shaped angle; Costa Rica; 2.9–3.3 mm ..... 15. ***naevus*** **Wood**

— Spine 3 spaced by about equal distances from ventrolateral angle on subapical margin and from spine 2; granulate area on frons not more than twice as wide as long, not conspicuously constricted toward median line ..... 17

17(16). Larger; spine 2 usually slightly closer to 3 than to 1; young adults with basal third of elytra reddish brown, black elsewhere; sides on anterior third of pronotum indistinctly constricted, more broadly rounded in front; Puebla to Costa Rica; 2.6–2.9 mm ..... 16. ***ovicollis*** **Blandford**

— Smaller; spine 2 spaced by about equal distances from spines 1 and 3; elytra of uniform color; sides on anterior third of pronotum distinctly constricted, narrowly rounded in front; Costa Rica to Panama and Venezuela; 1.9–2.3 mm ..... 17. ***scitulus*** **Wood**

18(1). Subapical posterior margin of declivity rather weakly elevated, sutural emargination shallow, broad, much wider than deep; spine 3 projecting, more nearly cylindrical, except *pernanulus*; smaller than 3.1 mm ..... 19

— Subapical posterior margin of declivity more strongly elevated, sutural emargination very narrow, deeper than wide; spine 3 laterally compressed; larger than 3.2 mm except *plaumanni* ..... 22

19(18). Spine 3 stout, projecting a distance about half as great as longitudinal axis of its basal width; longitudinal axis of spine 3 diagonal, strongly converging posteriorly; female frons strongly impressed at sides of granulate area (often bifoveate) ..... 20

— Spine 3 subcylindrical, about one and one-half to two times as long as wide; female frons not bifoveate; larger species ..... 21

20(19). Male granular area on frons smaller, as wide as long, its dorsal margin arcuate; female frons on lateral thirds (lateral to granular area) narrowly impressed on crescent-shaped area, impression occupying less than half of area from raised granular area to margin of eye, concavities not extending above upper level of eye; Nayarit to Guatemala; 1.5–2.1 mm ..... 18. ***difodinus*** **Bright**

— Male granular area wider than long, its dorsal margin straight to feebly recurved; female frons has median third with contour equal to a regularly convex frons, lateral thirds strongly concave to above upper level of eyes; Costa Rica to Brazil; 2.0–2.4 mm ..... 19. ***senex*** **Schedl**

21(19). Frons with definite, raised, granulate area; anterior margin of pronotum rather narrowly rounded, coarsely serrate; Costa Rica to Panama; 2.7–3.1 mm ..... 20. ***peltatus*** **Wood**

— Frons aciculate, granulate area obsolete; anterior margin of pronotum more broadly rounded, serrations almost obsolete; Puebla; 2.2–2.5 mm ..... 21. ***aciculatus*** **Wood**

22(18). Smaller; body slender, 3.5 times as long as wide; frons aciculate; granulate area absent; base of pronotal disc without transverse lines or asperities; Costa Rica and Panama to Brazil; 1.9–2.0 mm ..... 22. ***plaumanni*** **Schedl**

— Larger; body stouter, less than 2.8 times as long as wide; frons with definite granulate area; base of pronotal disc with impressed, transverse lines ..... 23

23(22). Declivital spine 2 spaced by about equal distances from spines 1 and 3; bicolored; Costa Rica; 3.1–3.4 mm ..... 23. ***bicolor*** **Wood**

— Declivital spine 2 arising very close to spine 1, remote from spine 3; color black; Puebla; 3.6–3.9 mm ..... 24. ***amplus*** **Wood**

### 1. *Tricolus simplicis* Wood

*Tricolus simplicis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):57 (Holotype, female; Palín, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— In this species the frons is rather coarsely aciculate except for a small, median, raised, central granular area, and declivital spines 2 and 3 are essentially absent.

FEMALE.— Length 1.8 mm, 2.8 times as long as wide; color light brown.

Frons convex, shining, coarsely, convergently aciculate except on small, median, subcircular, raised granular area at center; vestiture inconspicuous. Antennal club broadly obovate; sutures 1 and 2 distinctly procurved, obtusely subangulate, finely septate except at middle, without long setae on posterior face.

Pronotum 1.3 times as long as wide; sides straight and subparallel on basal half, narrowly rounded in front; summit indefinite, anterior to middle; anterior slope finely, closely asperate; anterior margin a rather strongly, acutely elevated continuous costa; posterior area reticulate, punctures obscure, very shallow, moderately close. Glabrous.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; disc smooth, shining, punctures small, shallow, some obsolete, evidently at least slightly confused. Declivity occupying posterior third, excavated as in other members of this genus; face smooth,

shining, indistinct punctures small, confused; lateral margins rather strongly, continuously elevated on heart-shaped pattern from suture to moderately near posterior margin, gradually increasing in height posteriorly, ending precipitously on lower, median angle; spine 1 on interstriae 1 at base very small, pointed, 2 feebly indicated, 3 rounded, not projecting. Glabrous.

DISTRIBUTION.— Guatemala to Costa Rica.

GUATEMALA: Palín, Esquintla, 19-V-64, 300 m, No. 685, *Ficus*, S. L. Wood. COSTA RICA: Volcán, Puntarenas, 11-XII-63, 1000 m, No. 304, tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from twigs 1 cm in diameter.

NOTES.— The above treatment was based on the holotype and on one other specimen.

### 2. *Tricolus inornatus* Wood
Fig. 213

*Tricolus inornatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):57 (Holotype, female; 15 km SE Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *simplicis* Wood by the much more

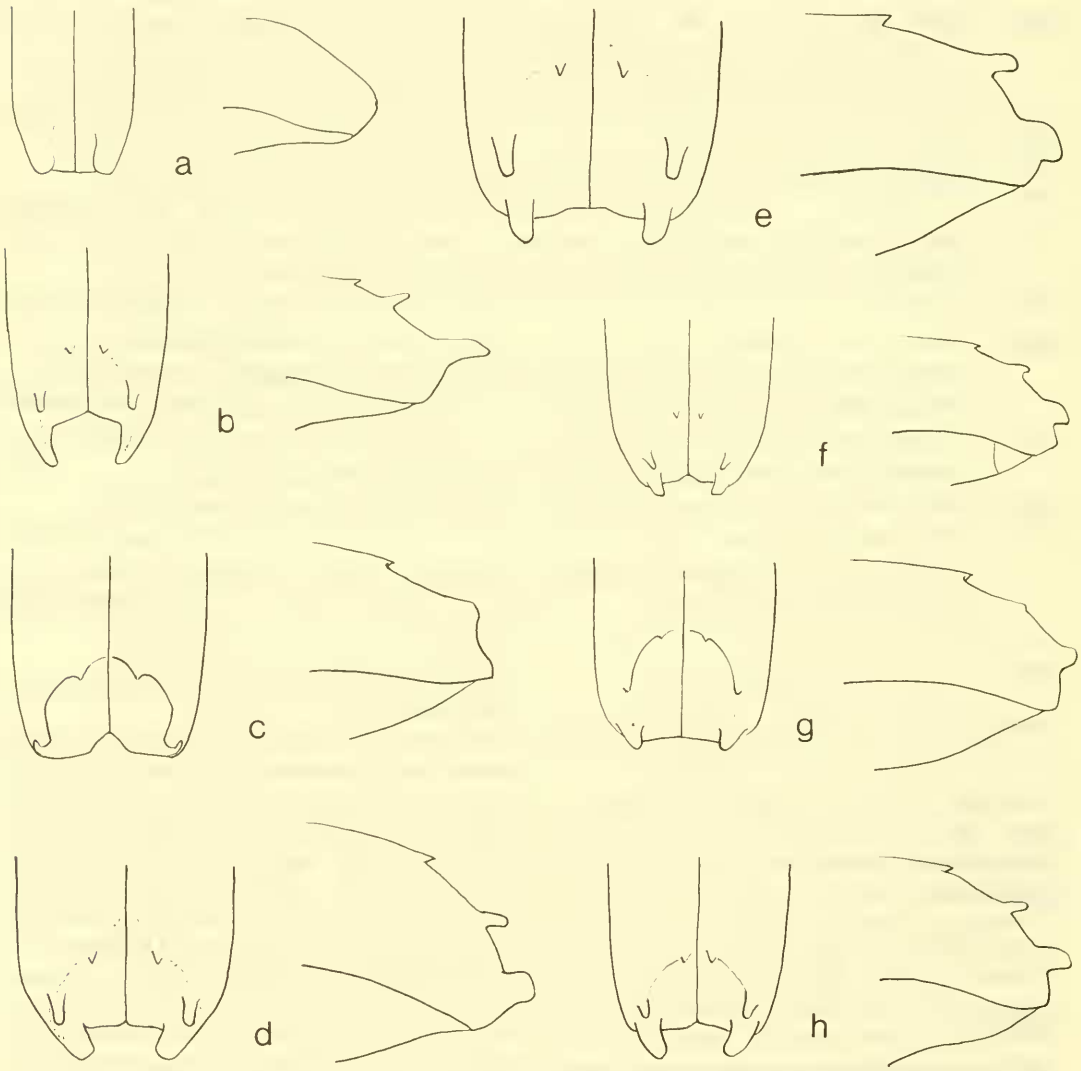



Fig. 213. *Tricolus* spp., dorsal and lateral aspects of declivity: a, *inornatus*; b, *ardis*; c, *parsus*; d, *badius*; e, *nodifer*; f, *partilis*; g, *capitalis*; h, *saundersi*.

slender body, by the narrower declivital excavation, and by the absence of declivital spine 1.

FEMALE.— Length 1.8 mm, 3.2 times as long as wide; color very dark brown.

Frons evidently as in *simplicis*, upper half concealed. Antennal club subcircular, sutures almost straight; posterior face with two or three long hairs.

Pronotum 1.4 times as long as wide; essentially as in *simplicis* except punctures on posterior area deeper, distinct, a slight irregularity at base anterior to scutellum. Glabrous.

Elytra 2.0 times as long as wide; disc as in *simplicis*. Declivity similar to *simplicis* except excavated area much narrower, spine 1 represented only by a small callus, 2 represented by a distinct callus, 3 more broadly rounded, not projecting. Glabrous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 15 km SE Cartago, Cartago, 24-IX-63, 2800 m, No. 248, *Siparuna nicaraguaensis*, S. L. Wood.

BIOLOGY.— One specimen was taken from a small, broken branch.

NOTES.— The above treatment was based on the holotype.

### 3. *Tricolus inaffectus* Wood

*Tricolus inaffectus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):57 (Holotype, female; Volcán Poás, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *inornatus* Wood by the larger, stouter body, by the impressed lower, lateral areas of the frons, by the pronotum, and by the slightly wider elytral declivity.

FEMALE.— Length 2.6 mm, 2.9 times as long as wide; color black except elytral disc and antennae yellowish brown.

Frons as in *simplicis* Wood except granular area more strongly elevated; lateral area impressed just above epistoma; mandibles apparently elongate. Antennal club broadly oval, sutures straight; posterior face ornamented by more than 20 long hairs.

Pronotum 1.2 times as long as wide; outline about as in *simplicis* except sides on slightly more than anterior half distinctly constricted, anterior costa more nearly serrate; posterior areas reticulate, punctures moderately fine, rather deep. Glabrous.

Elytra 1.8 times as long as wide, 1.6 times as long as pronotum; as in *inornatus* Wood except excavated declivital area distinctly wider, calluses indicating positions of spines 1 and 2 less conspicuous. Glabrous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Poás, Heredia, 19-XI-63, 2600 m, host not recorded, S. L. Wood.

NOTES.— The above treatment was based on the holotype.

### 4. *Tricolus cecropii* Wood

*Tricolus cecropii* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):58 (Holotype, female; Turrialba, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the moderately stout body, by the poorly developed declivital spines, by the strongly produced, acute, strongly serrate anterior margin of the pronotum, by the large, subreniform granular area on the frons, and by the habits.

FEMALE.— Length 2.2–2.5 mm, 2.6 times as long as wide; color dark brown.

Frons somewhat flattened on median three-fourths from epistoma to upper level of eyes, most of flattened area occupied by a raised, granular area of subreniform shape. Antennal club obscurely subtriangular, sutures weakly procurved; very few long setae on posterior face.

Pronotum 1.3 times as long as wide; widest near base, sides weakly converging on basal two-thirds; anterior margin very strongly, subacutely produced and coarsely, closely serrate, 14–16 serrations; summit indefinite, near middle; anterior slope armed by rather large, low asperities; posterior area reticulate, punctures sparse, fine, shallow. Glabrous.

Elytra 1.5 times as long as wide, 1.2 times as long as pronotum; disc smooth, punctures small, shallow, confused. Declivity moderately steep, excavation narrower and not as deep as in other species; spines 1 and 2 present as small, pointed tubercles, 1 slightly larger, 3 represented by a low, poorly developed fold; subapical margin subacute, not produced. Subglabrous.

MALE.— Similar to female.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Turrialba, Cartago, 5-VII-63, 700 m, No. 19, *Cecropia peltata* petioles, S. L. Wood.

BIOLOGY.— Specimens were taken from spiral-shaped galleries in the petioles of fallen *Cecropia* leaves. This species was

invariably found in the same tunnels with *Corthylus cecropii* Wood in an apparent domicile parasitic or mutualistic role. Adults of both species were usually present, but occupied different branches of the same gallery system. Few larvae were produced by either species.

NOTES.— The above treatment was based on the type series of 10 specimens.

### 5. *Tricolus ardis* Wood
Fig. 213

*Tricolus ardis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):58 (Holotype, female; Escasú, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the acutely angulate, strongly serrate anterior margin of the pronotum, by the aciculate frons which also has a small elevated granulate area, and by the elytral declivity.

FEMALE.— Length 2.1–2.5 mm, 3.3 times as long as wide; head, prothorax, and elytral declivity dark brown, basal two-thirds of elytra light brown.

Frons convex, convergently aciculate except for a small, transversely oval granular area at center occupying median third. Antennal club broadly obovate, sutures moderately arcuate; posterior face without long hair.

Pronotum 1.5 times as long as wide; sides almost straight and parallel on basal half, arcuately converging to subacute median angle in front; anterior margin coarsely serrate; summit indefinite; anterior slope finely, closely asperate; posterior areas reticulate, punctures fine, shallow, not close, some of those at base connected by transverse lines. Glabrous.

Elytra (including spines) 2.1 times as long as wide; sides straight and parallel to base of declivity, arcuately converging to apex of spine 3, apices of spine 3 separated by a distance equal to width of elytra, posterior emargination broadly, somewhat U-shaped; surface almost smooth, shining, punctures shallow, small, largely confused, their centers apparently reticulate. Declivity moderately steep, excavated in a narrowly heart-shaped area; lateral areas abruptly, rather strongly elevated, spine 1 at base on interstriae 1 rather small, sharply pointed, 2 one-third declivital length from base, twice as long as wide, 3 projecting posteriorly, conspicuously longer than wide (as seen in lateral aspect). Glabrous except for an occasional hairlike seta near declivity.

MALE.— Similar to female except for apical terga of abdomen.

DISTRIBUTION.— Costa Rica and Panama.

COSTA RICA: Escasú, San José, 2-X-63, 1300 m, No. 218, tree seedling, S. L. Wood. PANAMA: Cerro Punta, Chiriquí, 11-1-64, 1800 m, Nos. 380, 401, tree branches, S. L. Wood.

BIOLOGY.— Specimens were taken in stems 2–4 cm in diameter.

NOTES.— The above treatment was based on the type series of 26 specimens.

### 6. *Tricolus parsus* Wood
Fig. 213

*Tricolus parsus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):59 (Holotype, male?; 15 km SE Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *inaffectus* Wood by the more narrowly rounded anterior margin of the pronotum, by the acutely elevated, subapical margin of the declivity, and by the very different declivital spine 3.

MALE(?).— Length 2.3 mm, 2.6 times as long as wide; color almost black.

Frons of type largely concealed, evidently not aciculate, finely granulate, raised granular area as in *ardis* Wood. Antennal club broadly subquadrate, sutures feebly procurved.

Pronotum 1.3 times as long as wide; about as in *ardis* except anterior margin narrowly rounded, not angulate, serrations with their bases contiguous. Glabrous.

Elytra 1.6 times as long as wide, 1.3 times as long as pronotum; sides straight and parallel on basal two-thirds, gradually narrowed, rather broadly rounded behind, with a conspicuous, rather narrow emargination at suture; surface almost smooth, shining, punctures largely confused, small, moderately deep. Declivity much as in *inaffectus* except slightly wider, margins slightly higher, spine more strongly developed but not pointed, spine 3 more distinctly converging mesad, its crest not as high, its apex rounded, distinctly, weakly projecting; subapical margin acutely elevated, projecting moderately to produce sides of median emargination. Glabrous except for an occasional hairlike seta on sides.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 15 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 196, woody vine (liana), S. L. Wood.

BIOLOGY.— One specimen was taken from a vine 5 mm in diameter.

NOTES.— The above treatment was based on the holotype.

### 7. *Tricolus rufithorax* Wood

*Tricolus rufithorax* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):59 (Holotype, female; Finca Gromaco on Río Coto Brus, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *parsus* Wood by the larger size, by the well-developed declivital spines, by the subserrate anterior margin of the pronotum, and by other characters.

FEMALE.— Length 2.7 mm (male 3.1 mm), 2.4 times as long as wide; color reddish brown except elytra black.

Frons convex, reticulate-granulate above, somewhat punctate laterally; subcircular raised, granular area occupying slightly more than median third to upper level of eyes; glabrous except on epistoma. Antennal club moderately large, almost subtriangular, sutures weakly procurved; posterior face bearing two long hairs.

Pronotum 1.2 times as long as wide; outline as in *parsus* except anterior margin less narrowly rounded, its elevated costa weakly serrate; posterior areas strongly reticulate, very low, strongly transverse, asperities continuing from summit to base. Glabrous.

Elytra 1.4 times as long as wide, 1.2 times as long as pronotum; outline about as in *parsus* except sutural emargination smaller and spine 3 projecting very slightly; disc smooth, shining, punctures fine, confused. Declivity with contours much as in *parsus* except spine 1 conical, slightly larger, 2 cylindrical, projecting slightly more than its basal width, 3 low, costate, ending abruptly, not projecting, directed toward sutural apex but ending remote from it, subapical margin acutely elevated but less strongly than in *parsus*. Glabrous except for a few setae on sides.

MALE.— Similar to female except without long hair on posterior face of antennal club; declivital spine 2 of allotype abnormal, apparently chewed off on both sides.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 65, woody vine, S. L. Wood.

BIOLOGY.— Two specimens were taken from one tunnel in a woody vine less than 1 cm in diameter.

NOTES.— The above treatment was based on the holotype and allotype.

### 8. *Tricolus badius* Wood

Fig. 213

*Tricolus badius* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):60 (Holotype, female; Pandora, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nodifer* Blandford by the smaller size, by the reddish brown color, and by the more widely spaced third spines which are very close to the subapical margin.

FEMALE.— Length 2.3–2.8 mm, 2.6 times as long as wide; color reddish brown.

Frons as in *rufithorax* Wood except raised granular area occupying one-fourth space between eyes. Antennal club subcircular, sutures rather weakly procurved; posterior face with up to a dozen long, hairlike setae.

Pronotum 1.2 times as long as wide; as in *rufithorax*.

Elytra 1.5 times as long as wide; outline as in *rufithorax* except spine 3 projecting more strongly; disc smooth, shining, with very fine, irregular lines, punctures fine, shallow, confused. Declivity as in *rufithorax* except spine 2 more slender, twice as long as wide; 3 close to costal margin, separated by about half its basal width, subapical margin reaching its posterior margin; spine 3 projecting, subtriangular, almost as high as its basal width; subapical margin acutely, not strongly elevated. Subglabrous.

MALE.— Similar to female except antennal club with fewer long setae.

DISTRIBUTION.— Costa Rica and Panama.

COSTA RICA: Pandora, Limón, 13-VIII-63, 50 m, No. 150, tree branch, S. L. Wood; Peralta, Cartago, 10-III-64, 500 m, No. 462, woody vine, S. L. Wood. PANAMA: Cerro Punta near Volcán Chiriquí, 11-I-64, 1800 m, No. 376, tree branch, S. L. Wood; Ft. Clayton, Canal Zone, 22-XII-63, No. 332, tree limb, No. 329, *Serjania*, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 1–4 cm in diameter.

NOTES.— The above treatment was based on the type series of 33 specimens.

### 9. *Tricolus nodifer* Blandford
Figs. 213, 215

*Tricolus nodifer* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):287 (Holotype, sex?; Mirandilla, Esquintla, Guatemala; British Mus. Nat. Hist.)

*Tricolus triarmatus* Schedl, 1939, Mitt. Münchner Ent. Ges. 29:578 (Holotype, sex?; Colonia, presumably in Mexico; Schedl Coll.); Wood, 1966, Great Basin Nat. 26:30. *Synonymy*

DIAGNOSIS.— This species is distinguished from *badius* Wood by the larger size, by the black color, and by declivital characters.

FEMALE.— Length 2.7–3.0 mm, 2.5 times as long as wide; color almost black.

Frons essentially as in *badius*; antennal club subtriangular, sutures moderately procurved, posterior face with several long, hairlike setae.

Pronotum 1.2 times as long as wide; as in *badius* except one median serration on anterior margin usually more strongly developed; anterior half of discal area largely devoid of transverse crenulations.

Elytra 1.5 times as long as wide, 1.2 times as long as pronotum; about as in *badius* except lower area more broadly flattened, submarginal costa passing laterad of spine 3, spine 3 not as close to costal margin and stouter, length usually conspicuously shorter than basal width.

MALE.— Similar to female except long hair on posterior face of antennal club reduced or absent.

DISTRIBUTION.— Guatemala to Costa Rica, possibly Veracruz.

MEXICO: "Colonia," type locality of *triarmatus* may have been in Veracruz. GUATEMALA: Mirandilla, Esquintla, G. C. Champion. COSTA RICA: Turrialba, Cartago, 5-VII-63, 700 m, No. 19, *Cecropia* petiole; Finca Gromaco, Puntarenas, 14-VII-63, 500 m, No. 59, tree branch, S. L. Wood; Volcán, Puntarenas, 11-XII-63, 1000 m, No. 304, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 2–5 cm in diameter.

NOTES.— The above treatment was based on 11 specimens, 2 of which were compared directly to the holotypes of *nodifer* and *triarmatus* by me. The origin of the type of *triarmatus* is uncertain; localities designated "Colonia" occur throughout Latin America.

### 10. *Tricolus partilis* Wood
Fig. 213

*Tricolus partilis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):60 (Holotype, male; Volcán, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *nodifer* Blandford by the smaller size, by the brown color, by the more slender body form, by the more slender spine 3 on the elytral declivity, and by other characters.

FEMALE.— Length 1.7–1.8 mm, 2.8 times as long as wide; color brown.

Frons as in *nodifer* except granular area distinctly elevated; antennal club subcircular.

Pronotum 1.3 times as long as wide; as in *nodifer* except transverse crenulations in discal area reduced to a few transverse lines.

Elytra 1.7 times as long as wide, 1.3 times as long as pronotum; essentially as in *nodifer* except spines 1, 2, and 3 more slender, 3 distinctly longer; lower declivity less broadly flattened; subapical margin more strongly elevated.

MALE.— Similar to female except with fewer long setae on posterior face of antennal club.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 59, tree branch, S. L. Wood; Volcán, Puntarenas, 11-XII-63, 1000 m, No. 304, tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from branches about 4 cm in diameter.

NOTES.— The above treatment was based on the type series of four specimens.

### 11. *Tricolus fenoris* Wood

*Tricolus fenoris* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):60 (Holotype, male?; 15 km SE Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *partilis* Wood by the larger size, by the more slender body form, and by the longer, more slender declivital spines.

MALE.— Length 2.1 mm, 3.0 times as long as wide; color very dark brown.

Frons, antenna, and pronotum as in *partilis*; pronotum 1.3 times as long as wide.

Elytra 1.7 times as long as wide, 1.3 times as long as pronotum; as in *partilis* except spine 2 three times as long as its basal width, spine 3 about one and one-half times as long as its basal width; subapical margin more strongly produced.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 15 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 196, woody vine, S. L. Wood.

BIOLOGY.— One specimen was just entering a stem 5 mm in diameter.

NOTES.— The above treatment was based on the holotype.

### 12. *Tricolus frontalis* Wood

*Tricolus frontalis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):61 (Holotype, female; 8 km or 5 mi NE Teziutlán, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the aciculate frons with the granular area absent, and by the slender declivital spine 3.

FEMALE.— Length 2.4 mm, 3.1 times as long as wide; color dark brown.

Frons convex, aciculate, granulate area absent.

Pronotum 1.3 times as long as wide; as in *fenoris* Wood except anterior margin more broadly rounded.

Elytra 1.9 times as long as wide, 1.5 times as long as pronotum; about as in *fenoris* except declivital spine 3 longer, almost three times as long as wide; spine 3 similar in shape to 2 but larger, about two and one-half times as long as wide; subapical margin rather poorly elevated.

DISTRIBUTION.— Puebla.

MEXICO: Puebla: 8 km NE Teziutlan, 27-VI-53, 1600, tree branch, S. L. Wood.

NOTES.— The above treatment was based on the holotype.

### 13. *Tricolus capitalis* Wood
Fig. 213

*Tricolus capitalis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):61 (Holotype, female; 13 km SE El Hato del Volcán, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *ruficollis* (Fabricius) by the slightly smaller size, and by the much less strongly elevated subapical margin of the elytral declivity (thereby eliminating the sutural notch).

FEMALE.— Length 2.1 mm, 2.7 times as long as wide; color rather dark reddish brown.

Frons convex, finely rugose-reticulate, granular area distinctly elevated, subcircular, occupying median third to upper level of eyes; glabrous. Antennal club rather broadly obovate, sutures moderately procurved.

Pronotum 1.3 times as long as wide; sides straight and parallel on basal half, rather narrowly rounded in front; anterior margin armed by about eight coarse teeth (bases of some contiguous); summit indefinite, about one-third pronotum length from anterior margin; anterior slope rather coarsely, closely asperate; posterior areas reticulate, punctures fine, those near base with transverse line or minute shining elevation on their margins. Glabrous.

Elytra 1.6 times as long as wide, 1.2 times as long as pronotum; disc smooth, shining, punctures rather fine, shallow, confused. Declivity excavated basically as in other members of genus; spine 3 stout, subtriangular, projecting slightly, as in *ruficollis*, separated from subapical margin by width of spine; lower declivity flattened below spine 3 to lateral margin of spine 3, subapical margin almost straight, rather weakly elevated, without sutural emargination, not at all produced as in *ruficollis*.

DISTRIBUTION.— Panama.

PANAMA: 13 km S El Hato del Volcán, Chiriquí, 7-1-64, 1000 m, No. 371, tree seedling, S. L. Wood.

BIOLOGY.— Specimens were taken from a stem 2 cm in diameter.

NOTES.— The above treatment was based on the type series of two female specimens.

### 14. *Tricolus saundersi* Wood
Fig. 213

*Tricolus saundersi* Wood, 1967, Great Basin Nat. 27:139 (Holotype, male; Dominical, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *capitalis* Wood by the slightly larger size, by the granular area on the frons being much wider than long, and by the more slender, subquadrate declivital spine 3.

FEMALE.— Length 2.3–2.6 mm, 2.8 times as long as wide; color reddish brown.

Frons broadly convex, surface rather finely reticulate and finely punctured, with a large, transversely oval, slightly elevated, coarsely reticulate area occupying central half, its upper limits slightly above upper level of eyes; vestiture limited to epistomal margin. Antennal club broadly obovate, suture 1 weakly, 2 moderately procurved, both sutures partly septate.

Pronotum 1.4 times as long as wide; widest near base, sides almost straight, almost imperceptibly converging anteriorly on basal half, then very narrowly, almost subangulately rounded in front; anterior margin armed by a series of about a dozen teeth, median one larger and projecting more nearly forward; asperities decreasing in height posteriorly, those a short distance behind summit appearing as shining wrinkles; posterior areas reticulate, very finely, sparsely punctured. Glabrous.

Elytra 1.5 times as long as wide, 1.6 times as long as pronotum; sides almost straight and subparallel to base of declivity then arcuately narrowed about a fourth to projecting declivital spine 3, very broadly, shallowly emarginate behind; surface almost smooth, shining, punctures rather fine, not close, strial and interstrial punctures not close, in obscure rows except confused near suture. Declivity abrupt, broadly excavated, lateral and upper margins abruptly elevated; upper margin bearing a small, acute tooth as tall as wide, in line with striae 1, spine 2 on lateral elevation just above middle of declivity, subquadrate, about one and one-half times as long as basal thickness, projecting caudad and slightly dorsad; spines 1 and 2 connected by an acutely margined ridge thicker than high, 3 just above and basally separated from the acutely marked posterior declivital margin, subquadrate, with upper basal margin expanded, twice as thick and almost twice as long as 2, directed primarily caudad but slightly mesad and dorsad; ridge connecting 2 and 3 thicker than above, but with same continuous acute inner margin that ends in 3; excavation broadly, transversely concave, suture slightly elevated, punctures rather fine, shallow, not sharply defined, confused. Glabrous.

MALE.— Similar to female except posterior face of antennal club without long hair.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Beverley, Limón, 26-VIII-63, 7 m, No. 154, woody vine, S. L. Wood; Dominical, Puntarenas, 29-IX-64, 10 m, *Theobroma cacao*, S. L. Wood.

NOTES.— The above treatment was based on the type series of six specimens.

### 15. *Tricolus naevus* Wood

Fig. 214

*Tricolus naevus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):61 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *ovicollis* Blandford by the slightly larger size, by the very broad, subreniform granular area on the frons, by the narrowly flattened area below declivital spine 3, and by the much stouter declivital spine 3.

FEMALE.— Length 2.9–3.3 mm, 2.7 times as long as wide; color almost black.

Frons broadly convex, with lateral areas just above epistoma conspicuously impressed; sculpture of lower area irregular, smooth, and shining laterally, becoming subreticulate above; granular area very broad, occupying median two-thirds of area between eyes, at least three times longer than wide, its lower margin almost straight, strongly emarginate on its upper margin. Antennal club subtriangular but narrower than in *ovicollis*.

Pronotum 1.3 times as long as wide; as in *ovicollis* except anterior margin more narrowly rounded and more coarsely serrate.

Elytra 1.6 times as long as wide, 1.2 times as long as pronotum; as in *ovicollis* except declivital area below spine 3 flattened only to median margin of spine 3; spine 3 stout, subtriangular, its length about equal to its basal width. Subglabrous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 24-X-63, 1300 m, No. 241 in *Phoebe mexicana*, No. 244 in a woody vine, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 2–5 cm in diameter.

NOTES.— The above treatment was based on the type series of five specimens.

### 16. *Tricolus ovicollis* Blandford

Figs. 214–215

*Tricolus ovicollis* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):287 (Holotype, sex?; Cerro Zunil, Quezaltenango, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— Distinguishing characters are treated in the above key and in the diagnosis of *naevus* Wood.

FEMALE.— Length 2.9–3.3 mm, 2.7 times as long as wide; color black except recently emerged specimens with basal half of elytra reddish brown.

Frons as in *naevus* except granular area transversely oval, slightly less than twice as wide as long. Antennal club wider than long; a few long setae on posterior face.

Pronotum 1.2 times as long as wide; sides straight and parallel on basal half, abruptly converging to rather narrowly rounded anterior margin; anterior margin subserrate; summit indefinite, about one-third pronotum length from anterior margin; posterior areas reticulate, punctures minute, some punctures in basal area of disc associated with feeble, transverse crenulations. Glabrous.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; sides straight and parallel on basal half, slightly tapered to level of sutural apex, abruptly, broadly rounded behind, conspicuously emarginate at suture, spine 3 projecting; declivity excavated and armed as in most other *Tricolus* except spine 3 almost twice as long as its basal width, declivital area below spine 3 flattened to lateral margin of spine 3, lateral margin rather strongly elevated, slightly bent dorsad, deeply, rather broadly emarginate at suture. Subglabrous.

MALE.— Similar to female except antennal club subcircular, with fewer long setae on posterior face; granular area on frons sometimes wider but upper margin always straight.

DISTRIBUTION.— Puebla to Costa Rica.

MEXICO: **Puebla**: 9 km NE Teziutlán, 27-VI-53, and 2-VII-67, 1600 m, *Miconia*, S. L. Wood. GUATEMALA: Cerro Zunil, Quezaltenango, G. C. Champion. COSTA RICA: Tapantí, Cartago, 24-X-63, 1300 m, No. 265, *Phoebe mexicana*, 17-IX-63, No. 178, a woody vine, S. L. Wood.

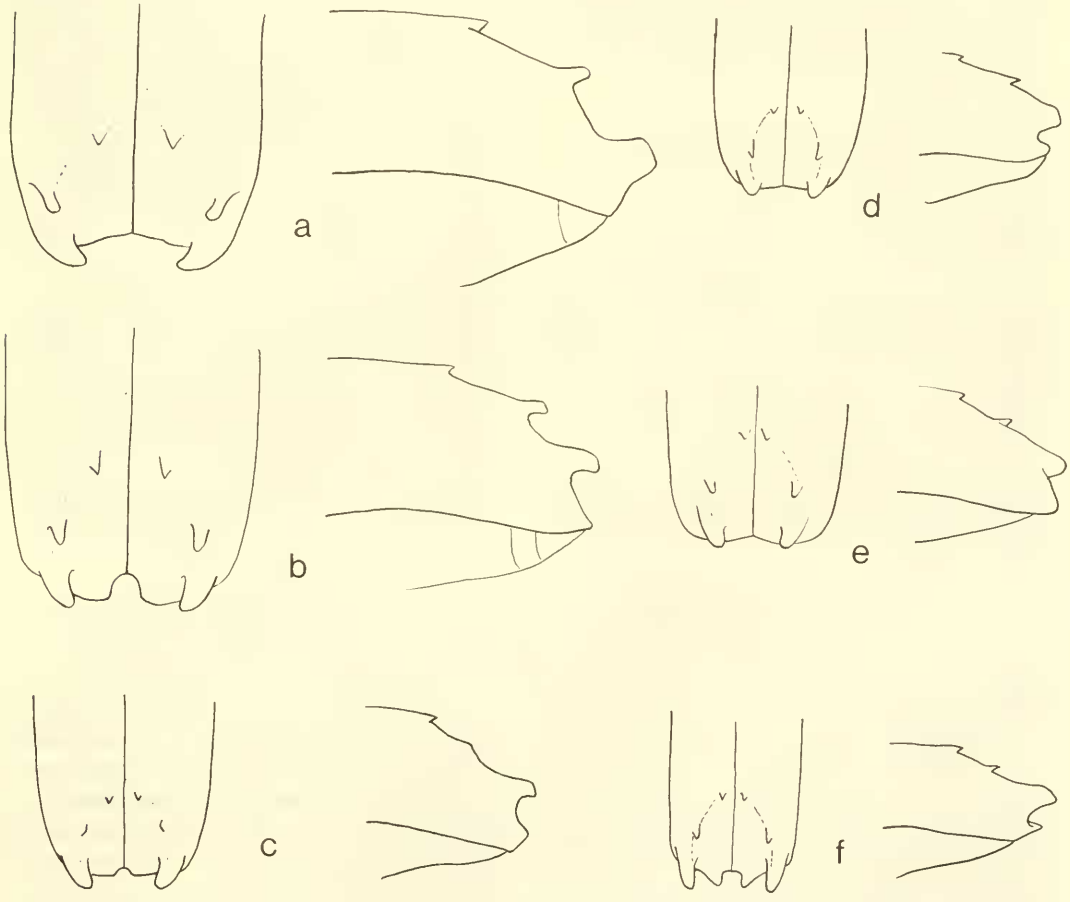



Fig. 214. *Tricolus* spp., dorsal and lateral aspects of declivity: a, *naevus*; b, *ovicollis*; c, *scitulus*; d, *difodinus*; e, *senex*; f, *plaumanni*.

BIOLOGY.— Specimens were taken from cut branches 2–5 cm in diameter.

NOTES.— The above treatment was based on 22 specimens, one of which was compared directly to the holotype.

### 17. *Tricolus scitulus* Wood
Fig. 214

*Tricolus scitulus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):62 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *ovicollis* Blandford by the smaller size, by the uniform brown color, and by the flatter lower declivity below spine 3.

FEMALE.— Length 1.9–2.3 m, 2.6 times as long as wide; color dark brown, young adults uniformly brown.

Frons and pronotum as in *ovicollis* except anterior margin of pronotum more narrowly rounded. Antennal club not quite as broad.

Elytra as in *ovicollis* except area below spine 3 flatter.

MALE.— Similar to female except antennal club slightly smaller, with fewer long setae on posterior face.

DISTRIBUTION.— Costa Rica, Panama, and Venezuela.

COSTA RICA: Tapantí, Cartago, 26-XI-63, 1300 m, No. 265, *Phoebe mexicana*, S. L. Wood; Turrialba, Cartago, 5-VII-63, 700 m, No. 23, *Crotolaria*, S. L. Wood. PANAMA: Cerro Punta near Volcán Chiriquí, 11-I-64, 1800 m, No. 406, tree branch, S. L. Wood. VENEZUELA: La Carbonera, 50 km NW Merida, Merida, 28-IV-70, 2500 m, No. 453, woody vine, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 1–3 cm in diameter.

NOTES.— The above treatment was based on the type series of 13 specimens, and on 9 other specimens.

### 18. *Tricolus difodinus* Bright
Fig. 214

*Tricolus difodinus* Bright, 1972, Canadian Ent. 104:1380 (Holotype, male; 21 km or 13 miles N Ocozocoautla, Chiapas, Mexico; Canadian Nat. Coll., 12650)

DIAGNOSIS.— This species is distinguished from *bicavus* Wood by the smaller average size, by the smaller, narrower excavations in the lateral areas of the female frons, and by the smaller, narrower granular area on the frons of both sexes.

FEMALE.— Length 1.7–2.0 mm, 2.9 times as long as wide; color reddish brown.

Frons basically convex, with granular area in normal position, its lateral margins precipitous, lateral areas abruptly concave on a small oval or reniform area not extending above upper level of eyes, occupying less than half of area from granular area to margin of eye; surface shining, minutely irregular; glabrous except near epistoma. Antennal club moderately large, obscurely subtriangular, sutures obtusely subangular; posterior face with several long hairs on lateral and mesal margins.

Pronotum 1.3 times as long as wide; about as in *ovicollis* Blandford, anterior margin varying from moderately to very narrowly rounded.

Elytra 1.6 times as long as wide, 1.2 times as long as pronotum; elytra and upper declivity as in *ovicollis*. Declivity with spine 2 rather small, pointed; spine 3 low, broad, subrectangular; area below spine 3 not broadly flattened; subapical margin weakly elevated, not projecting, becoming obsolete well below base of spine 3. Subglabrous.

MALE.— Similar to female except frons evenly convex, elevated granular area subquadrate; antennal club subcircular, without long hair on posterior face.

DISTRIBUTION.— Nayarit to Guatemala.

MEXICO: Chiapas: 21 km or 13 miles N Ocozocoautla, 2-VII-69, D. E. Bright; 8 km N Rosamorada, 15-VII-65, 100 m, No. 252, tree branch, S. L. Wood. GUATEMALA: Palín, Esquintla, 19-V-64, 300 m, No. 591, Cola de Pavo branch, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 2–4 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 12 other specimens.

### 19. *Tricolus senex* Schedl
Fig. 214

*Tricolus senex* Schedl, 1939, Mitt. Münchner Ent. Ges. 29:580 (Syntypes; Nova Teutonia, Brazil; Schedl and Plaumann colls.)

DIAGNOSIS.— This species is distinguished from *pernanulus* Schedl by the larger average size, by the much more extensively impressed lateral areas of the female frons, and by the larger, broader granular area on the frons of both sexes.

FEMALE.— Length 1.7–2.2 mm, 2.8 times as long as wide; color reddish brown.

Identical with *pernanulus* and *difodinus* Bright except for frons. Frons with lateral thirds strongly, much more extensively impressed from precipitous mesal margin to inner margin of eye and from epistoma to well above upper level of eyes; upper margin of granular area on median third straight or weakly recurved. Sparse, short vestiture confined to epistomal area. Antennal club subtriangular, about intermediate between narrower *difodinus* and broader *pernanulus*.

MALE.— Similar to female except frons evenly convex, with similar granular area slightly elevated and wider than long; antennal club slightly smaller and more nearly oval, without long hair on posterior face.

DISTRIBUTION.— Costa Rica to Brazil.

COSTA RICA: 15 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 203, *Siporana nicaraguensis*, S. L. Wood; Tapantí, Cartago, 17-VIII-63, 1300 m, No. 102, *Calliandra confusa*, S. L. Wood; Beverley, Limón, 26-VIII-63, 7 m, No. 154, woody vine, S. L. Wood; Pandora, Limón, 23-VIII-63, 50 m, No. 149, tree branch, S. L. Wood; Volcán Puntarenas, 11-XII-63, 1000 m, No. 304, tree branch, S. L. Wood. OTHER COUNTRIES: Brazil.

BIOLOGY.— Specimens were taken from stems 2–4 cm in diameter.

NOTES.— The above treatment was based on the type series of 32 specimens.

The frontal characters used to distinguish *difodinus*, *bicavus*, and *pernanulus* are of a type that varies within series and between series in other genera. Nevertheless, in the limited material at hand they are completely consistent. It is entirely possible that specimens from intermediate areas would intergrade and make it necessary to recognize these forms as geographical races of one another.

### 20. *Tricolus peltatus* Wood

*Tricolus peltatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):62 (Holotype, female; Cerro Punta near Volcán Chiriquí, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the similar but remotely related *nodifer* Blandford by the subapical tubercle on declivital spine 3, by the less strongly elevated subapical margin on the declivity, by the longer declivital spine 3, and by other characters.

FEMALE.— Length 2.7–3.1 mm, 3.0 times as long as wide; color very dark brown.

Frons, pronotum, and elytral disc as in *nodifer*, except granular area on frons slightly larger. Pronotum 1.3 times as long as wide.

Elytral declivity with basic contours as in *nodifer*, except spine 1 slightly larger, spine 2 more slender; spine 3 slightly longer than wide, more erect than in *nodifer*, with a conspicuous tubercle on dorsomedian subapical margin; subapical margin less strongly produced and less strongly elevated than in *nodifer*.

MALE.— Similar to female except posterior face of antennal club without long hair.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Voclán Poás, Heredia, 19-XI-63, 2500 m, No. 260, tree seedling, S. L. Wood. PANAMA: Cerro Punta near Volcán de Chiriquí, Chiriquí, 11-I-64, 1800 m, Nos. 372, 376, and 392 in tree branches, No. 385 in woody vine, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 2–4 cm in diameter.

NOTES.— The above treatment was based on the type series of seven specimens.

### 21. *Tricolus aciculatus* Wood

*Tricolus aciculatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):62 (Holotype, female; 10 km or 6 miles NE Teziutlán, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *peltatus* Wood by the smaller size, by the more slender form, by the absence of a raised granular area on the frons, and by the presence of a very small granule in each puncture in the excavated area of the declivity.

FEMALE.— Length 2.2–2.7 mm, 3.1 times as long as wide; color very dark brown.

Frons convex, rather weakly impressed above epistoma in lateral areas; surface shining, conspicuously aciculate on lateral thirds, obscurely on median third, granular area found in other species entirely absent; median area above epistoma with a broad, low, elevated area somewhat similar to allied species. Antennal club large, broadly, asymmetrically oval; sutures almost straight, obscure, indistinctly septate on central third; a very few long setae on posterior face.

Pronotum 1.3 times as long as wide; pronotum as in *nodifer* Blandford except anterior margin finely subserrate.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; elytra as in *peltatus* except more slender, discal punctures slightly larger, punctures on declivital face each with a fine granule; declivital spines 2 and 3 more slender than in *peltatus*, 3 distinctly longer, bearing a subapical tubercle as in *peltatus*; subapical margin of declivity as in *peltatus* except from dorsal aspect median fifth appearing abruptly, shallowly emarginate. Subglabrous.

MALE.— Similar to female except posterior face of antennal club without long hair.

DISTRIBUTION.— Puebla.

MEXICO: Puebla: 10 km NE Teziutlán, 2-VII-67, 1600 m, No. 137, *Miconia*, S. L. Wood.

BIOLOGY.— Specimens were taken from cut branches less than 4 cm in diameter.

NOTES.— The above treatment was based on the type series of 48 specimens.

## 22. *Tricolus plaumanni* Schedl

Fig. 214

*Tricolus plaumanni* Schedl, 1954, Dusenia 5:40 (Syntypes; Rondon, Parana, Brazil; Schedl and Plaumann colls.)

DIAGNOSIS.— This species is distinguished from *aciculatus* Wood by the much more slender antennal club, by the more distinctly compressed spine 3, by the more strongly produced, much more narrowly emarginate subapical margin of the declivity, and by the lighter color.

FEMALE.— Length 1.9–2.0 mm, 3.4 times as long as wide; color yellowish brown, pronotum and declivity a darker brown.

Frons as in *aciculatus* except more strongly aciculate. Antennal club similar to but much more slender than in *aciculatus*; posterior face without long hair.

Pronotum 1.5 times as long as wide; as in *aciculatus* except anterior margin feebly elevated, obscurely serrate, and discal punctures much less numerous, very shallow.

Elytra 2.0 times as long as wide, 1.4 times as long as pronotum; about as in *aciculatus* except spine 3 compressed, not as high as wide, subapical tubercle less conspicuous; subapical margin rather strongly elevated near suture, from dorsal aspect apices appearing subacute and separated by a narrow sutural emargination.

MALE.— Similar to female.

DISTRIBUTION.— Costa Rica and Panama to Brazil.

COSTA RICA: San Ignacio de Acosta, San José, 5-VII-63, 1500 m, No. 28, tree branch, S. L. Wood. PANAMA: Cerro Punta near Volcán de Chiriquí, 11-I-64, 1800 m, No. 385 in woody vine, No. 392 in tree branch, S. L. Wood. OTHER COUNTRIES: Venezuela, Brazil.

BIOLOGY.— Specimens were taken from stems 2–4 cm in diameter.

NOTES.— Specimens from Panama were compared directly to Schedl's syntype of *plaumanni*. This syntype has declivital spine 3 slightly shorter and directed slightly more caudomesad than in most of the Panama specimens. Variation in my series, however, suggests they are the same species.

## 23. *Tricolus bicolor* Wood

*Tricolus bicolor* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):63 (Holotype, female; Volcán Poas, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the color pattern, by the more dorsal position of the frontal granular area, and by the unique declivity.

FEMALE.— Length 3.1–3.4 mm, 2.7 times as long as wide; color of dorsal surface yellowish brown except pronotal disc from summit to base and elytral declivity black, ventral surface black except legs light brown.

Frons of type series largely concealed, evidently convex above, shallowly impressed on lateral thirds of lower half, median area distinctly elevated above epistoma; granular area more dorsal in position than normal, largely above upper level of eyes, apparently wider than long. Antennal club slightly asymmetrical, sutures weakly procurved.

Pronotum 1.1 times as long as wide; sides feebly arcuate and subparallel on basal half, rather strongly converging anteriorly to rather narrowly rounded, serrate anterior margin; sculpture about as other *Tricolus*.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel to level of sutural apex, truncate behind except for projecting spine 3 and small sutural emargination; disc and upper declivity about as in *nodifer* Blandford except declivital excavation more broadly impressed; spine 3 on extreme posterolateral margin, somewhat laterally compressed, appearing quadrate from lateral aspect, distinctly longer

than wide, with a conspicuous tubercle on dorsomedian apical angle, its mesal surface somewhat concave or grooved toward its apex; subapical margin acutely, weakly elevated, a shallow sutural emargination.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Poás, Heredia, 14-VII-63, 1500 m, No. 44, tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from a small branch.

NOTES.— The above treatment was based on the type series of two specimens.

### 24. *Tricolus amplus* Wood

*Tricolus amplus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):63 (Holotype, female; 10 km or 6 miles NE Teziutlan, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the large size, by the black color, by the displaced declivital spine 2, by the subtriangular granular area on the frons, and by other characters.

FEMALE.— Length 3.6–3.9 mm, 2.5 times as long as wide; color black.

Frons convex above, lateral areas above epistoma moderately impressed, lateral areas below upper level of eyes distinctly aciculate; median granular area largely above eyes, wider than long, subtriangular, its apex directed orad; vestiture of short, sparse hair. Antennal club slightly asymmetrical, obscurely subtriangular; sutures weakly procurved.

Pronotum 1.13 times as long as wide; about as in *bicolor* except basal area of disc more coarsely, more extensively asperate.

Elytra 1.4 times as long as wide, 1.3 times as long as pronotum; outline as in *bicolor* except posterior margin bisinuate; disc subshining, almost smooth, punctures very fine, shallow, confused. Declivity much as in allied species except lateral margin less abruptly, less strongly elevated; spine 1 in usual position at base on interstriae 1; spine 2 larger and stouter than usual and in position of interstriae 2, its base beginning at level of apex of spine 1 (much more anterior in position than all other species); spine 3 strongly, laterally compressed, on lateral margin, quadrate, distinctly wider than long, a conspicuous tubercle on its dorsomesal apical angle; subapical margin acute, distinctly, not strongly produced, extending to base of spine 3. Subglabrous.

MALE.— Similar to female, including long hair on posterior face of antennal club.

DISTRIBUTION.— Puebla.

MEXICO: **Puebla**: 10 km NE Teziutlán, 2-VII-67, 1600 m, No. 140, tree limb, S. L. Wood.

BIOLOGY.— Specimens were taken from a limb 5–15 cm in diameter.

NOTES.— The above treatment was based on the type series of eight specimens.

## GENUS *AMPHICRANUS* Erichson

*Amphicranus* Erichson, 1836, Archiv Naturgesch. 2(1):63 (Type-species: *Amphicranus thoracicus* Erichson, monobasic)

*Piezorhopalus* Guerin-Meneville, 1838, Rev. Zool. 1838:107 (Type-species: *Piezorhopalus nitidulus* Guerin-Meneville = *Amphicranus thoracicus* Erichson, monobasic); Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):290. *Synonymy*

*Steganocranus* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:460 (Type-species: *Steganocranus dohrni* Eichhoff, monobasic); Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):289. *Synonymy*

DIAGNOSIS.— This genus is distinguished from *Tricolus* Blandford by the strongly to profoundly explanate and divaricate elytral apex, by the more variable, usually elaborately sculptured elytral declivity, by the more simple prothoracic precoxal area, and by other characters.

DESCRIPTION.— Length 2.5–8.0 mm, 2.4–4.4 times as long as wide; color light brown to black, or bicolored.

Frons flat to convex, occasionally sexually dimorphic; eye oval, emarginate, antennal socket in emargination; antennal scape elongate, funicle 3-segmented, less commonly 2-segmented, club broadly oval to elongate, sutures 1 and 2 each marked by fine line, occasionally also marked by setae; posterior face of female club often ornamented by long hair. Pronotum elongate, lateral margins usually with a fine raised line (three exceptions); sculpture of posterior areas very conservative, anterior areas sometimes highly modified. Elytral disc with fine punctures confused or in strial rows; posterior area variable, varying from almost truncate to elaborately excavated and ornamented by spines or carinae, posterior margin strongly to profoundly explanate, usually also divaricate at suture. Anterior face of contiguous

procoxal cavities transversely straight, not modified or noticeably pubescent. Protibiae not sexually dimorphic; as in *Tricolus*.

DISTRIBUTION.— Jalisco and Veracruz to Bolivia and Brazil; about 46 species have been named, 29 of them occur in Mexico and Central America.

BIOLOGY.— These monogamous ambrosia beetles occur in branches, limbs, and boles of unthrifty, broken, or recently cut trees. Although most of them undoubtedly establish their own gallery system, apparently some of them appropriate the tunnel of another species of Scolytidae or Platypodidae. The galleries are similar to those of *Tricolus*. Few young are produced in each gallery system. Most species are exceedingly rare and are found as individuals, as isolated mated pairs, or as the brood of one pair. They are largely restricted to the primary tropical forest.

NOTES.— *Tricolus* probably is a well-marked subdivision of this genus. Superficially, *Amphicranus* also appears to intergrade with *Monarthrum*, but characters on the female tibiae readily separate these genera.

Key to the Species of *Amphicranus*

1. Anterior slope of pronotum declivous, asperate, margin rather narrowly rounded to emarginate, armed or not; female ventral area of head and mouthparts normal (subgenus *Amphicranus*) ..... 2

— Anterior area of male pronotum feebly declivous, profoundly extended to form an acute median point; female pronotum devoid of asperities, anterior margin less strongly produced; female ventral area of head surrounding oral cavity excavated to accommodate greatly enlarged maxillae; elytral declivity excavated, strongly explanate and divaricate (subgenus *Steganocranus*) ..... 28

2(1). Posterior margin of elytral declivity moderately explanate, not divaricate; basal fourth of pronotum (on disc) with fine, transverse rugae; declivity commencing on basal half of elytra, its margins armed by not more than two pairs of subspinose processes; anterior margin of pronotum unarmed; color black ..... 3

— Posterior margin of declivity moderately to profoundly explanate and divaricate; basal half of pronotum devoid of rugae; margins of declivity armed by two or more pairs of spines; anterior margin of pronotum armed or not ..... 4

3(2). Smaller; declivity steep, interstriae 1 armed by a small denticle at center of excavated area, posterolateral margin acutely costate from suture to above middle of lateral margin; black, legs yellowish; frons lacking a definite granulate area; Guatemala to Costa Rica; 3.5–4.0 mm ..... 1. ***brevipennis*** **Blandford**

— Larger; declivity gradual, suture 1 unarmed in excavated area, posterolateral margin acutely costate on lower third; black, abdomen reddish brown; lower frons with a narrow, elevated granulate area; Veracruz to Costa Rica; 6.3–7.5 mm ..... 2. ***elegans*** **Eichhoff**

4(2). Lateral margins of pronotum with a fine raised line (except *mirandus*); posterior margin of declivity weakly to strongly explanate and divaricate, sutural notch rather narrowly V-shaped, anterior margin of pronotum variously sculptured ..... 5

— Lateral margins of pronotum rounded, without a fine, raised line (except *propugnatus* and *cordatus*); posterior margin of declivity on median two-thirds not at all produced, posterolateral angles profoundly produced into forcepslike processes; pronotum narrowly rounded in front and coarsely serrate; base of male declivity with three small spines between suture and first major spine (two in *propugnatus* and *cordatus*) ..... 25

5(4). Lateral margin of declivity uniformly costate, without a tubercle or abrupt angle at level of sutural apex; base of declivity with a major spine on interstriae 2 ..... 6

— Lateral margin of declivity with either a denticle or an abrupt angle at level of sutural apex ..... 15

6(5). Declivity with a moderately large, blunt spine on lower half of declivity on interstriae 1 just before sutural apex; posterolateral explanate process about as long as wide ..... 7

— Interstriae 1 near apex of suture unarmed, posterolateral elytral processes each about twice as long as wide ..... 8

7(6). Larger; major spine at base of elytral declivity blunt; lateral margin of declivity more strongly elevated, apex of posterolateral processes more broadly rounded; Nayarit to Guatemala; 3.0 mm ..... 3. ***hybridus*** **Blandford**

— Smaller; major spine at base of declivity sharply pointed; lateral margin of declivity less strongly elevated, apex of posterolateral process more narrowly rounded; Nayarit to Veracruz; 1.8 mm ..... 4. ***stenodermus*** (Schedl)

8(6). Basal margin of declivity armed by one pair of tubercles or spines on interstriae 2 (often appearing as though on 1), males with a second spine on margin near middle of declivity, females with a tubercle at same level but strongly displaced mesad; frons never with a specialized granular area; posterolateral areas of declivity weakly to moderately elevated ..... 9

— Basal margins of elytra armed by two or three pairs of spines, male and female declivities similar; frons usually with a specialized median granular area; posterolateral margins of declivity very strongly extended ..... 13

9(8). Elytral declivity with rather coarse, close, confused punctures, female spine 2 represented by a minute granule closer to lateral margin than to suture at level of middle of declivity; female antennal club 1.5 times as long as wide, widest on basal half, posterior face without a tuft of hair; male unknown; Costa Rica; 2.2 mm ..... 5. ***argutus*** **Wood**

— Declivital area with punctures minute to obsolete, female spine 2 a pointed tubercle; female antennal club widest on apical half, posterior surface ornamented by a tuft of hair ..... 10

10(9). Female declivity with lateral margin on middle third forming a large mammiform elevation; spine 2 at its apex directed caudomesad, basal margin with small granules on interstriae 1 and 2; antennal club widest at suture 2, apical margin rounded; Costa Rica; 4.0 mm ..... 6. ***callosus*** (Schedl)

— Female declivity with spine 2 closer to suture than to lateral margin and not supported on an elevation connected to lateral margin ..... 11

11(10). Smaller; declivity more gradual, male with spine 2 conical, as small as 1, below middle of declivity, female with a rugose area extending from below spine 2 to lateral margin; female antennal club as long as scape, 1.1 times as long as wide, tuft of hair on posterior face much shorter than club; Costa Rica to Panama; 1.5–2.0 mm ..... 7. ***micans*** **Wood**

— Larger; declivity very steep, male with spine 2 large, subconical, projecting, at middle of declivity, female with declivital surface smooth, shining; female antennal club much longer than scape, tuft of hair longer than club ..... 12

12(11). Smaller; lower margin of male epistomal process straight, occupying about half of epistomal width; female epistomal process unarmed; female antennal club slightly longer than wide (1.1 times); female declivity without a marginal granule near spine 2; Costa Rica; 2.8–3.0 mm ..... 8. ***fulgidus*** **Wood**

— Larger; lower margin of male epistomal process straight, occupying more than three-fourths of epistomal width; female epistomal process armed by a small, low, median tubercle; female antennal club much longer than wide (1.4 times), its apical margin arcuate; female declivity with a small tubercle on lateral margin near spine 2; Costa Rica to Panama; 4.1–4.6 mm ..... 9. ***melanura*** **(Blandford)**

13(8). Basal margin of declivity armed by three pairs of spines; posterolateral processes on declivity laterally compressed, appearing subquadrate from lateral aspect, comparatively short; Durango; *Quercus*; 3.5–3.7 mm ..... 10. ***rameus*** **Wood**

— Basal margin of declivity armed by two pairs of spines; posterolateral processes on declivity dorsoventrally compressed, very long; smaller, more slender species ..... 14

14(13). Area between posterolateral elytral processes narrowest at sutural apex, widest two-thirds of its length from sutural apex, inner margin of process armed by a stout denticle at this widest point; anterior margin of male pronotum procurved and serrate; female frons entire; lateral margins of pronotum with a fine raised line; Panama to Venezuela; 2.6–2.8 mm ..... 11. ***terebella*** **Blandford**

— Area between male elytral processes broad at apex of suture, narrowest one-third length of process from suture, mesal margin of process obtusely angulate at this point; female processes much shorter, with a strongly elevated crest on median side of its dorsal surface; anterior margin of male pronotum broadly emarginate, unarmed, feebly procurved in female; female frons with a deep, median cleft or groove on lower third; lateral margin rounded, not marked by a fine, raised line; Costa Rica; males 2.8–3.5 mm, females 2.5–2.8 mm ..... 12. ***mirandus*** **Wood**

15(5). Declivital base armed by only one pair of small denticles, lateral margins at level of sutural apex bluntly angled, not dentate, apical margin rather weakly to strongly explanate, notch U-shaped ..... 16

— Declivital base armed by at least two pairs of denticles, lateral margins at level of sutural apex obtusely angled and armed by a small, acute denticle, apical margin very strongly explanate, notch V-shaped ..... 19

16(15). Larger, more slender; anterior margin of pronotum rather weakly serrate (female only?); color pale or bicolored ..... 17

— Smaller, less slender; anterior margin of pronotum coarsely serrate; color very dark brown ..... 18

17(16). Larger; lateral and ventrolateral processes very strongly elevated; unicolorous; Costa Rica; 7.3 mm ..... 13. ***ursus*** **Schedl**

— Smaller; lateral and ventrolateral processes on declivity rather modestly elevated; anterior half of pronotum and posterior half of elytra black, remaining areas yellowish brown; Costa Rica; 2.5–2.8 mm ..... 14. ***tornatilis*** **Wood**

18(16). Angle on lateral margin of declivity at level of sutural apex less strongly produced, its anterior arm descending posteriorly; Costa Rica; 2.2 mm ..... 15. ***speciosus*** **(Schedl)**

— Angle on lateral margin of declivity at level of sutural apex more strongly produced, its anterior arm horizontal or ascending slightly toward apex of angle; Costa Rica; 2.3–2.5 mm (see also 16b. ***spectus*** **Wood**) ..... 16a. ***spectibilis*** **(Wood)**

19(15). Denticle on lateral margin of declivity at level of sutural apex quadrate, a strong emargination between its apex and posterior continuation of lateral margin; frons with a transversely elongate, raised, granulate area above upper level of eyes; yellowish or reddish brown except elytra and abdomen black; Costa Rica to Panama; 3.5–4.0 mm ..... 17. ***collaris*** **Blandford**

— Denticle on lateral margin of declivity at level of sutural apex pointed, margin not at all emarginate on either side of denticle; granulate area on frons either absent or entirely below upper level of eyes; body entirely unicolorous or else part of pronotum black ..... 20

20(19). Larger; frons with a raised, granulate area on lower half; antennal club larger, almost twice as long as wide, widest on distal half ..... 21

— Smaller; frons without a raised, granulate area; antennal club only slightly longer than wide, widest on basal half ..... 22

21(20). Anterior half of pronotum, posterior half of elytra, head, and abdomen black; posterior half of pronotum, anterior half of elytra, sternal area of thorax, and legs reddish brown; Nicaragua and Costa Rica; 6.3–7.0 mm (see also 19. ***torneutes*** **Blandford**, Guerrero, 5.8 mm) ..... 18. ***belti*** **Blandford**

— Head, prothorax, and posterior third of elytra dark brown; basal two-thirds of elytra, sternal areas of meso- and metathorax, and abdomen yellowish brown; Guatemala; 7.5–8.0 mm ..... 20. ***balteatus*** **Blandford**

22(20). Base of declivity lateral to major spine armed by a row of about five small denticles, lateral margin with spine at level of sutural apex rather large, displaced mesad and pointed mesad; declivital excavation with moderately abundant long hair ..... 23

— Margin of declivity smooth between spines 1 and 2, spine 2 on margin, small; excavated area of declivity glabrous; smaller species ..... 24

23(22). Smaller; basal area of pronotal disc without indications of asperities; elytra less strongly explanate, sutural emargination almost as wide as deep; Nayarit; 2.0 mm ..... 23. ***parilis*** **Wood**

— Larger; basal area of pronotal disc minutely asperate; elytra more strongly explanate, sutural emargination half as wide as deep; Guerrero; 3.7 mm ..... 24. ***filiformis*** **Blandford**

24(22). Lateral declivital process of elytra almost as long as wide, this process almost straight from denticle on its upper margin to its inner apical angle; Costa Rica; 1.8–1.9 mm ..... 21. ***macellus*** **Wood**

— Lateral declivital process of elytra almost twice as long as wide, this process arcuately narrowed from denticle on its upper margin to its inner apical angle; Venezuela and (?) Brazil; 3.4 mm ..... 22. ***tenuis*** **Blandford**

25(4). Major declivital spine laterally compressed, quadrate, less than twice as long as wide; lateral margin of pronotum with fine, raised line; basal margins of declivity with two pairs of minor spines ..... 26

— Major declivital spine subcylindrical, more than three times as long as wide; lateral margins of pronotum rounded; declivity with only one major spine above ventrolateral process, basal margin with three pairs of minor spines ..... 27

26(25). Margin of declivity smooth between first major spine and ventrolateral process, spine 1 cylindrical, blunt, ventrolateral process much shorter, stouter; granular area on frons occupying median third, heart-shaped; Oaxaca; 2.8 mm . ..... 25. ***cordatus*** **(Bright)**

— Margin of declivity with a spine between first major spine and ventrolateral process, spine 1 quadrate, flattened, ventrolateral process rather slender; granular area on frons occupying median three-fourths; Guatemala; 3.8 mm ..... ..... 26. ***propugnatus*** **Blandford**

27(25). Smaller; pronotal disc with punctures almost to entirely obsolete; elytra subshining; Costa Rica; 2.0–2.4 mm ..... 27. ***spinescens*** **Wood**

— Larger; pronotal disc with small, shallow, moderately abundant punctures; elytra brightly shining; Costa Rica; 2.7–3.0 mm ..... 28. ***spinosus*** **Wood**

28(1). Posterolateral process of male elytral declivity narrower, its upper margin horizontal, almost reaching declivital face at its middle then ascending rather abruptly to major spine on lateral margin; posterolateral elytral process in male with a moderately large, conical spine at level of apex of suture equidistant between mesal and lateral margins; female frons smooth and shining above level of eyes, a definite, sharply elevated, longitudinal oval granulate area extending from epistoma almost to upper level of eyes, this area about twice as long as wide; Panama; male 3.0–3.3 mm, female 2.7 mm ..... ..... 29. ***mucronatus*** **Wood**

— Posterolateral process of male elytral declivity broad, ascending very slightly to meet major spine on lateral margin without approaching level of declivital surface; lateral margin of posterolateral elytral process in male with a small spine at level of apex of suture, sometimes displaced mesad but with its base reaching lateral margin; female frons finely rugose-reticulate to well above eyes, lower frons in median area slightly inflated and granulate, but without a definite elevated margin; Guatemala to Costa Rica; male 3.7–4.2 mm, female 2.7–3.2 mm ..... 30. ***fastigiatus*** **Blandford**

### 1. *Amphicranus brevipennis* Blandford

Fig. 215

*Amphicranus brevipennis* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):293 (Holotype, female?; San Isidro, Suchitepéquez, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This is the only known Central American representative of this South American species group. It is distinguished from other Central American species by the strongly explanate but not divaricate subapical margin of the declivity, which continues without interruption to a large, rounded process on the basal third at about interstriae 3, and by the presence of a small tubercle on interstriae 1 near the center of the declivity.

MALE.— Length 3.5–4.0 mm, 2.4 times as long as wide; color black, legs yellowish brown.

Frons irregular, moderately arched transversely, almost straight longitudinally; submarginal epistomal area moderately elevated on median third; surface finely, deeply rugose-reticulate; glabrous except for epistomal brush. Antennal funicle 2-segmented; club large, elongate-oval, 2.0 times as long as wide.

Pronotum 1.1 times as long as wide; sides weakly arcuate and slightly converging anteriorly on basal three-fourths, broadly rounded in front; summit indefinite on anterior third; anterior fourth strongly declivous, rather finely, closely asperate; basal third with low, broad asperities decreasing in size from base; middle third with transverse, shining lines suggesting asperities but not elevated; surface finely rugose-reticulate, lateral areas with fine, obscure punctures. Glabrous.

Elytra 1.1 times as long as wide, 1.1 times as long as pronotum; sides straight, diverging slightly to declivity, broadly rounded behind; declivity commencing at middle; surface of

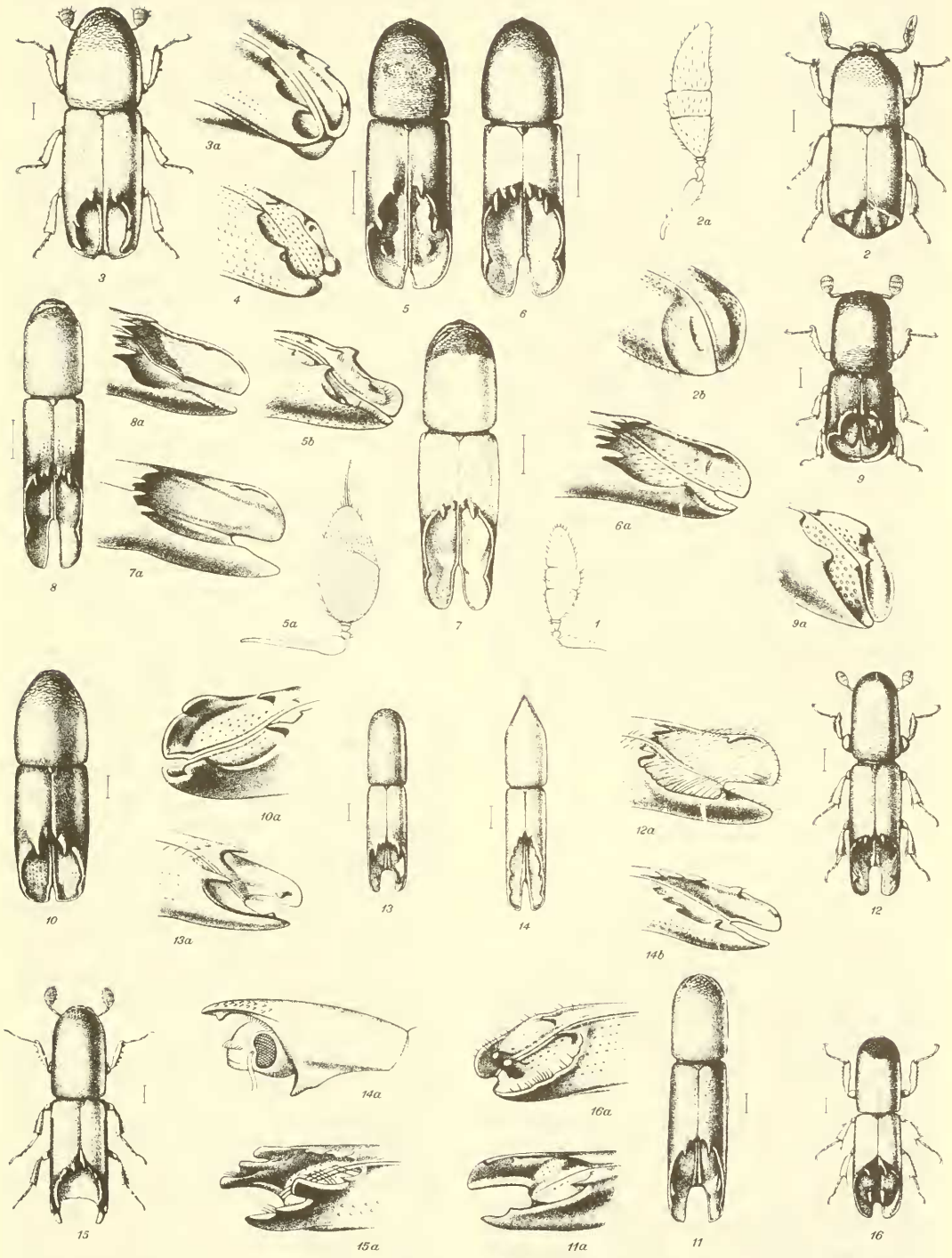



Fig. 215. Corthylini spp.: 1, *Glochinocerus retusipennis*, male, 2, 2a, 2b, same, female; 3, 3a, *Tricolus ovicollis*; 4, *Tricolus nodifer*; 5, 5a, 5b, *Amphicranus elegans*; 6, 6a, *Amphicranus balteatus*; 7, 7a, *Amphicranus belti*; 8, 8a, *Amphicranus torneutes*; 9, 9a, *Amphicranus brevipennis*; 10, 10a, *Amphicranus collaris*; 11, 11a, *Amphicranus tenuis*; 12, 12a, *Amphicranus filiformis*; 13, 13a, *Amphicranus terebella*; 14, 14a, 14b, *Amphicranus fastigatus*; 15, 15a, *Amphicranus propugnatus*; 16, 16a, *Amphicranus hybridus*. (After Blandford 1905:pl. 9.)

disc minutely irregular, punctures fine, shallow, obscure, confused. Declivity with upper margin abrupt from suture to a rounded prominence at interstriae 3 that continues margin and extends well behind declivital base, lateral margin of process continued as an acutely, strongly elevated margin to suture; suture narrowly divaricate; declivital face flattened below, rising to a distinct summit on interstriae 1 just above middle, this summit armed by a small, pointed tubercle; declivital face shining, densely, rather coarsely punctured. Glabrous.

FEMALE.— Similar to male except basal margin less abrupt, more nearly rounded.

DISTRIBUTION.— Guatemala to Costa Rica.

GUATEMALA: San Isidro, Suchitepéquez, G. C. Champion. COSTA RICA: Volcán, Puntarenas, 11-XII-63, 1000 m, No. 304, tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from a broken branch 7 cm in diameter.

NOTES.— The above treatment was based on two males that were compared to the holotype. The basal margin of the declivity of the holotype was less abrupt and more nearly rounded. In an almost identical Venezuelan species this difference is a secondary sexual character. For this reason the holotype and the two Costa Rican males are regarded as different sexes of the same species.

### 2. *Amphicranus elegans* Eichhoff

Fig. 215

*Amphicranus elegans* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:276 (Holotype, sex?; Mexico; presumably lost with Hamburg Mus.)

DIAGNOSIS.— This species is distinguished from the remotely allied *brevipennis* Blandford by the larger size, by the more elongate form with much more gradual declivity, and by the different sculpture of the elytral declivity, pronotum, and frons.

FEMALE.— Length 6.2–7.5 mm, 2.8 times as long as wide; color black except abdomen reddish brown.

Frons broadly convex; surface finely, densely granulate, punctures sparse, fine, obscure; raised median area occupying median one-seventh, 2.5 times as long as wide, extending from epistoma to above upper level of eyes, its surface densely, minutely punctured; raised epistoma transversely straight, epistomal margin extended orad in lateral areas. Antennal funicle 3-segmented, segments 2 and 3 almost fused; club large, 1.8 times as long as wide, slightly asymmetrical, suture 1 moderately, 2 more strongly angulate.

Pronotum 1.2 times as long as wide; sides feebly arcuate on basal half, subparallel, broadly rounded in front; anterior margin armed by one median serration; summit indefinite, on anterior third; anterior slope very steep, coarsely asperate; posterior two-thirds on median third transversely strigose, ridges shining, impressed lines reticulate, lateral areas smooth, shining, finely punctured. Glabrous.

Elytra 1.6 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel to level of sutural apex, broadly rounded behind, narrowly, rather deeply divaricate; declivity commencing one-third elytral length from base, disc smooth, shining, punctures minute, confused. Declivity very gradual, extensively excavated; area of interstriae 1 and 2 moderately impressed from a point one-third elytral length from base to just in front of middle, then more abruptly impressed and margin continuing laterad then curving caudad to a major, rounded marginal process having its apex two-thirds elytral length from base, margin descending abruptly behind process and continuing to sutural apex; declivital face concave, shining, punctures fine, mostly obscure, a distinct callus in lateral areas of lower third. Glabrous, except moderately abundant, fine hair on apical fifth of declivity.

MALE.— Similar to female except basal margin of declivity at interstriae 2 forming a blunt denticle.

DISTRIBUTION.— Veracruz to Costa Rica.

MEXICO: **Veracruz**: Cordoba, Eichhoff (not seen); Toxpam, Sallé. NICARAGUA: Chontales, Belt. COSTA RICA: Finca La Lola, Limón, VIII-64, *Theobroma cacao*, J. L. Saunders.

NOTES.— The above treatment was based on six specimens, some of which evidently were compared by Blandford to the type before it was lost.

### 3. *Amphicranus hybridus* Blandford
Fig. 215

*Amphicranus hybridus* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):298 (Holotype, female; Guatemala, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species and *stenodermus* (Schedl) are the only Central American *Amphicranus* having a large, blunt spine on interstriae 1 on the lower third of the declivity.

FEMALE.— Length 3.0 mm, about 3.9 times as long as wide; color yellowish brown, with pronotum and declivity darker brown.

Frons broadly convex; surface finely, uniformly rugose-reticulate; epistomal margin with a broad, conspicuous brush of hair. Antennal funicle 2-segmented; club narrowly obovate, 1.8 times as long as wide, sutures slightly procurved; posterior face with a conspicuous brush of long hair on lateral side; extending one-third club length beyond apex.

Pronotum 1.8 times as long as wide; sides straight and parallel on basal three-fourths, very broadly rounded in front; anterior margin elevated, not serrate; summit indefinite, on anterior fifth; anterior slope very steep, moderately asperate; posterior areas reticulate, rather finely punctured. Glabrous.

Elytra about 2.2 times as long as wide, 1.3 times as long as pronotum; sides straight and parallel to level of sutural apex, broadly rounded and deeply divaricate behind; declivity occupying slightly more than posterior third; disc smooth, shining, surface punctures fine, largely confused, subsurface striae indicated by definite rows of "punctures." Declivity gradual, concavely excavated; basal margin on interstriae 2 with large, blunt, nonprojecting process extending well behind margin, serrate margin descending posterolaterally to interstriae 5 then continuing as a smooth, moderately high ridge to near sutural apex, rather broadly, deeply emarginate at suture; declivital face smooth, shining, with moderately large, confused punctures; interstriae 1 with a large, blunt spine just before sutural apex, equal in size and shape to spine at basal margin.

DISTRIBUTION.— Nayarit to Guatemala.

MEXICO: Nayarit: Volcán Colima, 2-XII-48, at light. GUATEMALA: Guatemala City; G. C. Champion.

NOTES.— The above treatment was based on the Nayarit specimen that was previously compared to the holotype by me.

### 4. *Amphicranus stenodermus* (Schedl)

*Pterocyclon sternodermus* Schedl, 1963, Ent. Arb. Mus. Frey 14:166 (Holotype, sex?; Cordoba, presumably Veracruz, Mexico; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *hybridus* Blandford, by the much smaller size, by the slightly less strongly elevated declivital margin, with the upper major spine pointed, and by the slightly shorter, more pointed ventrolateral processes of the declivity.

FEMALE.— Length 1.9 mm, about 3.8 times as long as wide; yellowish brown, except anterior fourth of pronotum and elytral declivity rather dark brown.

As in *hybridus* except as noted in the diagnosis.

DISTRIBUTION.— Nayarit and Veracruz.

MEXICO: Nayarit: 6 km W Tepic, 13-VII-65, 1000 m, No. 240, tree limb, S. L. Wood. Veracruz: Cordoba.

BIOLOGY.— One female was taken from a recently cut limb 8 cm in diameter.

NOTES.— The above treatment was based on my female that was compared directly to the holotype. In the original description Schedl refers to a small denticle at interstriae 5 on the declivital margin. This denticle on my specimen, and the irregularities below it, evidently are much reduced. They also are so small on the type that I failed to call attention to them in my notes that describe it.

### 5. *Amphicranus argutus* Wood

*Amphicranus argutus* Wood, 1976, Great Basin Nat. 36:349 (Holotype, female; Finca La Lola, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is remotely allied to *melanura* (Blandford) but is distinguished by the much smaller size and by the very different female frons and elytral declivity as described below.

FEMALE.— Length 2.2 mm, 3.0 times as long as wide; color dark reddish brown.

Frons convex above, a weak transverse impression between upper level of eyes and epistoma; epistoma weakly developed on median fourth; surface reticulate, punctures very small, shallow, not close; vestiture limited to epistomal margin. Antennal club 1.3 times as long as scape, 1.5 times as long as wide; tuft of hair on posterior face absent.

Pronotum 1.5 times as long as wide; sides straight on posterior two-thirds; indefinite summit on anterior fourth; anterior slope arising vertically from anterior margin to transverse costa, then gradually to summit, asperities broad, low, their anterior limit marked by a serrate costa near submarginal costa; posterior areas reticulate, fine, shallow punctures clearly marked. Glabrous.

Elytra 1.6 times as long as wide, 1.1 times as long as pronotum; sides straight and parallel on basal four-fifths, broadly rounded behind, feebly emarginate at suture; surface smooth, brightly shining, punctures very small and in strial rows on posterior third of disc, about twice as large and moderately confused on basal half; disc descending slightly on posterior third before declivital descent. Declivity subvertical, irregularly subconcave; posterolateral margin acutely, moderately elevated from suture to lateral margin slightly below middle of declivity, much more strongly elevated from this point to basal margin at suture; interstriae 1 at basal margin with a minute tubercle, a second tubercle at middle of declivity slightly closer to lateral margin than to suture; surface brightly shining, punctures moderately coarse, rather close, deep; excavated area wider than long. Glabrous.

Protibiae as in *melanura*.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Finca La Lola, Limón, VIII-63, No. 14, *Theobroma cacao*, J. L. Saunders.

NOTES.— The above treatment was based on the holotype.

### 6. *Amphicranus callosus* (Schedl)

*Pterocyclon callosum* Schedl, 1935, Rev. de Ent. 5:351 (Holotype, female; Coronado, presumably San Isidro de Coronado, San José, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from others in the *melanura* group of species by the unique epistoma and by characters of the female antennal club and female declivity as mentioned below.

FEMALE.— Length 4.0 mm, 3.4 times as long as wide; color dark reddish brown.

Frons as in *melanura* (Blandford) except epistoma; epistomal process low, very broad, its lower margin rather strongly impressed almost to margin of eye at level of ocular emargination. Antennal club as in *melanura* except slightly stouter, tuft of hair smaller, much shorter.

Pronotum 1.4 times as long as wide; as in *melanura*.

Elytra 2.04 times as long as wide; sides straight and parallel on basal three-fourths, posterior margin broadly, rather deeply emarginate on median 40 percent; disc shining, strial punctures minute, in rows except confused near base, surface with weakly impressed, irregular lines, reticulate on basal half of interstriae 1. Declivity very strongly sulcate; basal margin abrupt, projecting slightly to striae 3, margin armed by minute granules at interstriae 1 and 2; spine 2 supported on large mammiform elevation occupying middle half of declivity from lateral margin two-thirds distance to suture, spine 2 rather small, its apex directed caudomesad; posterolateral margin subacutely, rather strongly elevated, ending at junction with sutural emargination in a small tubercle; excavated area smooth, shining, punctures minute to obsolete. Glabrous except for a few hairs on lower margin of declivity.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Coronado (presumably San Isidro de Coronado, San José), 1400–1500 m, F. Nevermann.

NOTES.— The above treatment was based on the holotype.

### 7. *Amphicranus micans* Wood

*Amphicranus micans* Wood, 1976, Great Basin Nat. 34:350 (Holotype, female; Río Damitas Dota Mts., San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *argutus* Wood by the smaller size, by the smaller, broader antennal club, by the shorter pronotum, and by the different elytral declivity.

FEMALE.— Length 1.5–2.0 mm, 3.0 times as long as wide; color dark reddish brown, basal two-third of pronotum lighter.

Frons convex, epistomal process occupying median half, low, weakly developed; surface rugose-reticulate, punctures obscure; glabrous except at epistomal margin. Antennal club as long as scape, 1.1 times as long as wide, widest on apical third; tuft of hair on posterior face sparse, short.

Pronotum 1.4 times as long as wide; as in *melanura* (Blandford) except surface strongly reticulate, asperities more numerous, higher.

Elytra 1.8 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal three-fourths, very broadly rounded behind, feebly emarginate at suture; discal surface smooth, shining, except base of interstriae 1 reticulate in some specimens; strial punctures very small, in rows on posterior half, slightly confused on basal half. Declivity rather abrupt, very steep, somewhat biconcave; much as in *argutus* except acute posterolateral margin not as strongly elevated, ending before middle of declivity, tubercle on interstriae 1 slightly larger, closer to suture, tubercle 2 slightly below middle of declivity and much closer to suture (three-fourths of distance from lateral margin to suture), a feeble to moderate elevation (variable) extending from lateral margin to tubercle; punctures almost obsolete, surface smooth, brightly shining except for oval rugose area below tubercle 2 extending from its base to lateral margin. Glabrous except for sparse setae on sides near declivity.

MALE.— Similar to female except declivity rather deeply, broadly concave, lateral margins higher, tubercles distinctly larger, tubercle 2 on small submammiform elevation on mesal side of lateral margin, punctures on excavated area larger, deeper, rugose area absent.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Guapiles, Limón, 22-VIII-66, 100 m, Nos. 101, 109, 123, leguminous trees; Peralta, Cartago, 10-III-64, 500 m, No. 465, tree limb; Puerto Viejo, Heredia, 12-III-64, 70 m, No. 475, log; Río Damitas, Dota Mts., San José, 22-VIII-63, 250 m, No. 124, stump. PANAMA: Ft. Clayton, Canal Zone, 22-XII-63, 30 m, No. 327, leguminous tree; Limón Bay, Canal Zone, 30-XII-63, 3 m, No. 352, log. All taken by me.

BIOLOGY.— Specimens were taken from material 10–20 cm in diameter.

NOTES.— The above treatment was based on the type series of 35 specimens.

### 8. *Amphicranus fulgidus* Wood

*Amphicranus fulgidus* Wood, 1976, Great Basin Nat. 36:350 (Holotype, female; Finca Los Diamantes, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *melanura* (Blandford) by the smaller size and by characters on the frons and elytral declivity.

FEMALE.— Length 2.8–3.0 mm, 2.7 times as long as wide; color dark brown, basal two-thirds of pronotum and elytra usually lighter.

Frons as in *melanura* except without any indication of a feeble carina or epistomal tubercle, but with a distinct, transverse impression above epistomal process and epistomal process broader. Antennal club 1.5 times as long as scape, 1.1 times as long as wide, apical margin straight; cirrus longer than club.

Pronotum 1.5 times as long as wide; as in *melanura*.

Elytra 1.5 times as long as wide, 1.15 times as long as pronotum; outline and disc as in *melanura* except posterior margin more broadly, more feebly emarginate. Declivity as in *melanura* except steeper, less strongly impressed, without a tubercle on lateral margin near middle of declivity.

MALE.— Similar to female except antennal club oval, 1.3 times as long as wide, and declivity as in male *melanura*.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Finca Los Diamantes (near Dominical, Pentarenas) 7-II-63, *Theobroma cacao*, J. L. Saunders.

NOTES.— The above treatment was based on the type series of 21 specimens.

### 9. *Amphicranus melanura* (Blandford)

*Pterocyclon melanura* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):272 (Holotype, male; Volcán de Chiriquí, Chiriquí, Panama; British Mus. Nat. Hist.)

*Pterocyclon opacifrons* Schedl, 1935, Rev. de Ent. 5:350 (Holotype, female; Coronado, presumably San Isidro de Coronado, San José, Costa Rica; Schedl Coll.); Wood, 1966, Great Basin Nat. 26:26. *Synonymy*

DIAGNOSIS.— This species is distinguished from *fulgidus* Wood by the larger size and by the characters of the head and declivity as indicated below.

FEMALE.— Length 4.1–4.6 mm, 2.9 times as long as wide; color dark brown, basal two-thirds of elytra lighter.

Frons convex, a feeble median (subcarinate) elevation slightly below upper level of eyes; outline of epistomal process obtusely angulate, its apex subtuberculate; surface strongly reticulate; setae confined to epistomal margin. Antennal club 1.5 times as long as scape, 1.4 times as long as wide, apical margin strongly arcuate; cirrus longer than club.

Pronotum 1.4 times as long as wide; sides almost straight and parallel on basal two-thirds, rather broadly rounded in front; indefinite summit about one-fourth pronotum length from anterior margin; asperities very low, broad; posterior areas minutely reticulate, punctures minute, sparse. Glabrous.

Elytra 1.7 times as long as wide, 1.2 times as long as pronotum; sides almost straight and parallel to sutural apex, broadly rounded except rather shallowly, obtusely emarginate on median fourth; disc smooth, brightly shining; punctures very minute, almost obsolete, confused. Declivity very steep; posterolateral margin acutely margined, moderately elevated from sutural apex to level of middle of declivity, then moderately elevated and broadly rounded to striae 1; spine 1 at base, apparently on interstriae 2, small, conical; spine 2 similar, slightly below middle, slightly closer to suture than to lateral margin; area between spines 1 and 2 rather strongly concave, impressed area continued between lower spines and more broadly, less strongly concave; spine 2 on a low, submammiform elevation connecting to lateral margin; lateral margin with a small granule at middle of declivity. Glabrous except for a few setae on sides near declivity.

MALE.— Similar to female except epistomal process higher, its margin almost straight, without a tubercle; frons not at all subcarinate; antennal club smaller, 1.6 times as long as wide; declivity broadly concave on heart-shaped outline, lateral margin subacute to base, much higher, spine 1 much larger, acute, spine 2 on margin, larger than 1, subcylindrical, blunt.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Coronado (presumably San Isidro de Coronado, San José), 1400–1500 m, F. Nevermann; Tapantí, Cartago, 24-X-63, 1300 m, No. 265, *Phoebe mexicana*, No. 263, log, S. L. Wood. PANAMA: Volcán de Chiriquí, Chiriquí, G. C. Champion.

BIOLOGY.— Specimens were taken from material 10–20 cm in diameter.

NOTES.— The above treatment was based on my three specimens that were compared directly to the holotypes of *melanura* and *opacifrons*.

### 10. *Amphicranus rameus* Wood

Fig. 217

*Amphicranus rameus* Wood, 1967, Great Basin Nat. 27:55 (Holotype, female; 5 km or 3 miles W El Salto, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This unique species is distinguished by the shape of the granular area on the frons, by declivital sculpture, and by other characters.

FEMALE.— Length 3.5–3.7 mm, 3.7 times as long as wide; color of pronotum in front of summit, elytral declivity and abdomen almost black, remainder of pronotum reddish brown, remainder of elytra yellowish brown.

Frons convex, its surface reticulate and rather coarsely, indistinctly punctured, median third with a low, sharply raised, flat, coarsely reticulate area resembling outline of a cup (more nearly heart-shaped in paratypes); vestiture inconspicuous. Antennal funicle two-segmented; club with two nonseptate, weakly arcuate sutures.

Pronotum 1.5 times as long as wide; sides straight and parallel on basal three-fifths, rather narrowly rounded in front; anterior margin projecting downward very slightly at center, armed by about 10 low teeth, median pair more prominently extended; summit three-fifths of pronotum length from base, indefinite, rather strongly declivous and coarsely asperate in front of summit, posterior area finely reticulate with small, shallow, rather sparse punctures; glabrous.

Elytra 2.2 times as long as wide; sides straight and parallel to a point even with sutural apex, posterolateral angles convergently projecting behind beyond broadly emarginate elytral apex; disc irregularly smooth, shining, subsurface punctures suggested but not attaining surface. Declivity abrupt, moderately steep, broadly excavated; margin subacutely elevated from interstriae 1 about two-thirds of distance from top of declivity, elevation not as high as wide, then continued on lower third to projecting subquadrate, converging, lateral processes, these processes about one and one-half times as long as their width in lateral profile; lateral margin armed by small, equal, pointed spines on interstriae 1 and 3 at base of declivity, and at interstriae 4 by a slender blunt tooth about twice as long as upper ones; lateral processes without special armature; median two-thirds of posterior

margin emarginate, emargination about half as deep as wide. Vestiture fine, scanty, confined to declivity.

MALE.— Similar to female except raised frontal callus absent; a smaller tuft of hair present on antennal club.

DISTRIBUTION.— Durango.

MEXICO: **Durango**: 5 km or 3 miles W El Salto, 7-VI-65, 2500 m, No. 41, *Quercus*, S. L. Wood.

BIOLOGY.— Specimens were taken from a dying oak branch about 6 cm in diameter. The branch grew 8 m above the ground in a very large living tree.

NOTES.— The above treatment was based on the type series of four specimens.

### 11. *Amphicranus terebella* Blandford

Fig. 215

*Amphicranus terebella* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):296 (Holotype, male?; Volcán de Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *hybridus* Blandford by the serrate anterior margin of the pronotum and by the very different elytral declivity.

MALE.— Length 2.6–2.8 mm, 4.5 times as long as wide; color light brown, anterior slope of pronotum and elytral declivity slightly darker.

Frons and pronotum as in *hybridus* except pronotum 2.0 times as long as wide, its anterior margin armed by 12 serrations.

Elytra 2.7 times as long as wide, 1.4 times as long as pronotum; outline and disc as in *hybridus* except posterior emargination wider, deeper, and strial punctures in rows, interstriae impunctate. Declivity basically as in *hybridus* except base with a small, pointed tubercle on interstriae 1, major spine longer, more slender, projecting from its base, about 2.5 times as long as its basal width, lateral margins more strongly elevated, more strongly explanate behind; declivity occupying slightly more than posterior third of elytral length, declivity from base to apex of suture equal in length to lateral processes from end of suture to their apices; apical emargination narrowly U-shaped, three-fifths as wide as long; lateral process with an acute denticle on inner margin one-third of process length from its apex; declivital face shining, subreticulate, punctures not clearly indicated.

DISTRIBUTION.— Panama and Venezuela.

PANAMA: Volcán de Chiriquí, G. C. Champion. VENEZUELA: Rancho Grande in Pittier Nat. Pk., Aragua, 9-IV-70, 1100 m, No. 431 in *Nectandra*, No. 432 in Guttiferae near *Vismia*, S. L. Wood.

BIOLOGY.— Venezuelan specimens were taken from dying branches 2–6 cm in diameter.

NOTES.— The above treatment was based on the holotype and on three identical male specimens from Venezuela.

### 12. *Amphicranus mirandus* Wood

*Amphicranus mirandus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):63 (Holotype, female; Rincón de Osa, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *hybridus* Blandford by the pronounced sexual dimorphism, by the cleft female epistoma, by the more slender antennal club, by the absence of an elevated line on the lateral margins of the pronotum, and by the very different declivity.

FEMALE.— Length 2.5–2.8 mm (males 2.8–3.5 mm), 3.3 (male 3.9) times as long as wide; color yellowish brown except anterior third of pronotum and elytral declivity darker brown.

Frons convex above, weakly, transversely impressed just below upper level of eyes, epistomal area protuberant and sharply cleft on median line from epistomal margin to transverse impression; surface subrugose-reticulate, a few fine punctures obscurely indicated; glabrous except along epistomal margin and on sides of head near eyes. Antennal funicle 2-segmented; club 1.6 times as long as wide, oval, sutures weakly procurved, posterior face with some long hair.

Pronotum 1.4 times as long as wide; widest at base, sides straight but distinctly converging on basal three-fourths, very broadly rounded in front; anterior margin unarmed; summit on anterior fifth; anterior slope very steep, asperities rather sparse; posterior areas finely reticulate, punctures minute, obscure. Glabrous.

Elytra 1.9 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal three-fourths, a broad, rather deeply U-shaped emargination behind between lateral processes; declivity confined to posterior two-fifths; disc as in *hybridus*.

Declivity basically as in *hybridus*; interstriae 1 at base with a minute tubercle, 2 with a slender spine about three times as long as its basal width; lateral margin following same course as in *hybridus* but only weakly elevated and not serrate; lateral processes about as long as their basal widths, separated by slightly greater distance than depth of emargination between them; mesal margin of terminal processes bearing a strongly elevated, laterally compressed, longitudinal process, its upper margin horizontal, its posterior margin subvertical. Disc glabrous, rather sparse, fine hair on declivity.

MALE.— Similar to female except frons broadly convex, epistomal area normal; anterior margin of pronotum vertical, appearing shallowly, broadly emarginate from dorsal aspect; declivital spines and lateral processes distinctly longer; lateral declivital processes with margins directed mesad (not dorsad) thereby forming a pronounced constriction in area of emargination just anterior to its middle; face of declivity glabrous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 85, tree limb, S. L. Wood.

BIOLOGY.— Specimens were taken from a broken limb 5–15 cm in diameter.

NOTES.— The above treatment was based on the type series of 32 specimens.

### 13. *Amphicranus ursus* Schedl

*Amphicranus ursus* Schedl, 1934, Ent. Blätt. 30:37 (Holotype, female?; San José, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *speciosus* Schedl and *scitulus* Wood by the much larger size, by the absence of a raised, granular area on the frons, and by the very different declivity described below.

FEMALE(?).— Length 7.3 mm, 3.7 times as long as wide; color uniformly dark brown.

Frons broadly convex, with an abruptly impressed, rather deep, narrow cleft extending entire width immediately above epistoma; surface dull, minutely reticulate, fine, rather sparse punctures indicated; glabrous. Antennal club 1.7 times as long as wide.

Pronotum 1.4 times as long as wide; as in female *scitulus* except anterior margin more broadly rounded, asperities near summit lower, more nearly scalelike, and posterior areas more strongly reticulate, with punctures much finer. Glabrous.

Elytra 2.2 times as long as wide, 1.2 times as long as pronotum; outline about as in *scitulus* except very strongly explanate, U-shaped sutural notch twice as deep as wide; striae not impressed, punctures minute, shallow, obscure, in rows; interstriae shining, almost smooth, more than six times as wide as striae, an occasional puncture present. Declivity abrupt, very steep, very strongly excavated; surface of excavated area smooth, shining, punctures minute, obscure, confused; basal margin armed on interstriae 3 by a pair of small, pointed tubercles at apex of a base forming a 90 degree angle, mesal margins of base converging anteriorly toward suture at 70 degree angle, lateral margins extending to major spine; major spine somewhat subquadrate, from lateral aspect its base wider than its height; notch between major spine and ventrolateral process deep, its outline obtusely rounded; each ventrolateral process broad, slightly wider than sutural notch, its apex rather broadly rounded; distance from apex of minor spine to apex of major spine equal to distance from sutural apex to apex of ventrolateral process. Glabrous except for sparse, fine, short hair on margins of declivity.

DISTRIBUTION.— Costa Rica.

COSTA RICA: San José, VI-24, 1000–1500 m, F. Nevermann.

NOTES.— The above treatment was based on the holotype.

### 14. *Amphicranus tornatilis* Wood

*Amphicranus tornatilis* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):64 (Holotype, female; 6 km S San Vito, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *spectabilis* (Wood) by the larger size, by the color, by the coarsely serrate, more narrowly rounded anterior margin of the pronotum, and by the more gradual, more strongly explanate elytral declivity.

FEMALE.— Length 2.5–2.8 mm, 3.5 times as long as wide; color yellowish brown with head, anterior half of pronotum, and posterior half of elytra black.

Frons as in *spectabilis*.

Pronotum 1.6 times as long as wide; as in *spectabilis* except anterior margin more narrowly rounded and armed by nine coarse serrations, median one prominent, and posterior areas less strongly reticulate, more shining.

Elytra 1.9 times as long as wide, 1.3 times as long as pronotum; as in *spectabilis* except disc very smooth, brightly shining, declivity not as steep, posterior margin more strongly explanate, and upper slope of lower major prominence on margin of declivity horizontal (as in *speciosus* Schedl), not ascending. Glabrous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 6 km S San Vito, Puntarenas, 19-21-III-67, tree, D. D. Sliwa.

NOTES.— The above treatment was based on the type series of eight specimens.

### 15. *Amphicranus speciosus* (Schedl)

*Tricolus speciosus* Schedl, 1934, Ent. Blätt. 30:38 (Holotype, sex?; Hamburgfarm on Río Reventazón, Limón, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *spectabilis* (Wood) by the more poorly developed second process on the lateral margin of the declivity, and, perhaps, by other characters.

ADULT.— Length 2.2 mm, 3.1 times as long as wide; as in *spectabilis* except as noted in above diagnosis. Granular area on frons more definite, about twice as extensive. Declivital process 2 descending on its apical half of the anterior slope.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Hamburgfarm on Río Reventazón, Limón, Costa Rica, 2-VI-29, at light, F. Nevermann; Guápiles, Limón, 22-VII-66, 100 m, tree, S. L. Wood.

NOTES.— The above treatment was based on a brief comparison of the holotype of *speciosus* and the allotype of *spectabilis*. The two forms are very similar. Because the series of six specimens of *spectabilis* is entirely consistent in declivital structure, *speciosus* is either an aberrant specimen or a distinct species. The two type localities are within a few kilometers of one another in Limón Province, Costa Rica.

### 16a. *Amphicranus spectabilis* (Wood)

*Tricolus spectabilis* Wood, 1967, Great Basin Nat. 27:140 (Holotype, female; Finca La Lola, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *speciosus* (Schedl) by the more strongly projecting declivital spine 2 that is horizontal or ascending on apical half of its dorsal margin and by the larger, more clearly defined granular area on the frons.

FEMALE.— Length 2.3-2.5 mm, 3.0 times as long as wide; color very dark brown.

Frons not visible, head withdrawn into prothorax in all specimens except allotype, evidently as in male, described below.

Pronotum 1.3 times as long as wide; sides subparallel but feebly arcuate on basal half then convergently arcuate to narrowly rounded, subserrate, anterior margin; asperities decreasing in size posteriorly, ending at or before summit; posterior area subreticulate, finely, deeply, rather sparsely punctured; glabrous.

Elytra 1.7 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel to level of middle of declivity, then very broadly rounded behind, with a rather broad, deep, sutural emargination; strial punctures fine, shallow, in rather indefinite rows; interstriae smooth, with a few irregularly placed punctures identical to those of striae. Declivity beginning two-thirds elytral length from base, broadly, deeply excavated, with upper and lateral margins acutely, rather strongly elevated except rounded on interstriae 1; upper margin armed on interstriae 2 by a small, pointed tooth; a second prominence on lateral margin just below middle, its basal margins in lateral profile forming a 90 degree angle (somewhat blunt); acute margin continuing to apex; profile as in *speciosus* except second prominence higher; excavated area broadly concave, shining, sutural interstriae finely, not strongly elevated, smooth, remaining area finely, rather closely punctured. Glabrous.

MALE.— Similar to female except serrations on anterior margin of pronotum much more prominent. Frons rather strongly, broadly convex; surface reticulate and rather coarsely, deeply punctured except on a small, more coarsely reticulate, impunctate area below upper level of eyes equal in diameter to one-fifth width of frons; vestiture limited to epistomal area.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Finca La Lola, Limón, 22-VI-63, No. 53, *Theobroma cacao*, J. L. Saunders.

NOTES.— The above treatment was based on the type series of six specimens.

### 16b. *Amphicranus spectus* Wood

*Amphicranus spectus* Wood, 1980, Great Basin Nat. 40:358 (Holotype, male; Pichucalco, Chiapas, Mexico; Wood Collection)

DIAGNOSIS.— This species is distinguished from *spectabilis* Wood by the larger size, by the more elongate antennal club, with more strongly arcuate sutures, by the more shallowly impressed elytral punctures, and by the more strongly, more acutely elevated lateral margin of the elytral declivity from base to apex.

MALE.— Length 2.9 mm, 3.2 times as long as wide; color reddish brown (fully mature?).

Frons about as in *spectabilis* except surface more finely punctured, raised median granular area slightly larger (occupying almost median third), much more sharply defined. Antennal club more slender, 1.5 times as long as wide, sutures more strongly arcuate than in *spectabilis*.

Pronotum 1.6 times as long as wide; about as in *spectabilis* except punctures on posterior areas slightly smaller.

Elytra 1.8 times as long as wide, 1.13 times as long as pronotum; similar to *spectabilis* except punctures on disc very shallow, obscurely impressed, declivity more deeply excavated, lateral margin more acutely, more strongly elevated, more strongly explanate below, basal area of spine 1 protruding slightly.

DISTRIBUTION.— Chiapas.

MEXICO: Chiapas: Pichucalco, 26-III-80, *Theobroma cacao*.

NOTES.— The above treatment was based on the holotype.

### 17. *Amphicranus collaris* Blandford

Fig. 215

*Amphicranus collaris* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):294 (Holotype, female?; Volcán Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished by the coloration, by the quadrate declivital spine 3, with a distinct notch between it and subapical posterior margin of the declivity, and by other characters.

FEMALE.— Length 3.5–4.0 mm, 2.8 times as long as wide; color yellowish brown, with elytra and abdomen black.

Frons convex, lateral areas transversely impressed immediately above epistomal margin; surface rugose-reticulate, punctures obscure; raised granular area entirely above eyes, more than 3.0 times as wide as long; vestiture sparse, inconspicuous except for narrow epistomal brush. Antennal funicle 3-segmented; club somewhat obovate, 1.3 times as long as wide, sutures weakly procurved.

Pronotum 1.25 times as long as wide; sides feebly arcuate, subparallel on more than basal half, narrowly rounded in front; anterior margin acutely elevated, shallowly serrate; summit one-third pronotum length from anterior margin, indefinite; asperities on anterior slope coarse, low; posterior areas finely reticulate, punctures very minute. Glabrous.

Elytra 1.6 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel to level of apex of suture, broadly rounded behind and narrowly, deeply emarginate at suture; declivity occupying slightly less than posterior half; disc smooth, shining, punctures minute, confused. Declivity moderately steep, broadly, concavely excavated; basal margin armed at position of interstriae 1 by a small, pointed tubercle, spine 2 rather large, somewhat blunt, about one and one-half times as long as basal width, in position of interstriae 2; lateral margin below spine 2 rounded, not strongly elevated; spine 3 commencing below middle, quadrate, slightly longer than basal width, a conspicuous notch between spine 3 and posterolateral margin; rather strongly explanate behind; sutural emargination about one and one-half times as deep as wide. Subglabrous.

MALE.— Similar to female.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Tapantí, Cartago, 17-IX-63, 1300 m, No. 178 in a woody vine, No. 265 in *Phoebe mexicana*, S. L. Wood. PANAMA: Volcán Chiriquí, Chiriquí, G. C. Champion.

BIOLOGY.— Specimens were taken in stems 5–8 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 14 other specimens.

### 18. *Amphicranus belti* Blandford
Fig. 215

*Amphicranus belti* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):292 (Holotype, sex?; Chontales, Nicaragua; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished by the distinctive coloration, by two pairs of denticles arming the basal margin of the elytral declivity, by the very strongly explanate posterior margin of the declivity, and by other characters.

MALE.— Length 6.5–7.0 mm, 3.6 times as long as wide; color bright reddish brown except anterior third of pronotum, posterior half of elytral disc, and all of declivity, head, and most of abdomen black.

Frons convex (an irregular serpentous callus on my specimen evidently an aberation); surface finely rugose-reticulate; oval area on median half from epistoma to upper level of eyes granular. Antennal funicle 3-segmented; club somewhat obovate, 1.6 times as long as wide, sutures narrowly, rather strongly procurved.

Pronotum 1.4 times as long as wide; sides almost straight and parallel on basal two-thirds, rather broadly rounded in front; anterior margin irregularly costate; summit indefinite, anterior eighth abruptly declivous, asperities not clearly defined; surface finely reticulate, punctures very minute. Glabrous.

Elytra 2.2 times as long as wide, 1.6 times as long as pronotum; declivity commencing slightly anterior to middle; disc smooth, surface punctures almost obsolete. Declivity abrupt at base, then gradual, broadly, extensively excavated; basal margin with a stout, moderately large, pointed denticle at position of interstriae 1, interstriae 2 with a small irregularity suggesting a minute denticle, interstriae 3 with a denticle similar to but slightly larger than that on 1, posterolateral margin acutely, strongly elevated to apex, a small, blunt denticle on its median margin at level of sutural apex; subapical margin profoundly explanate, deeply, rather narrowly emarginate at suture, emargination more than three times as deep as wide; face of declivity almost smooth, shining. Subglabrous except explanate portion with moderately abundant, fine, rather short hair.

DISTRIBUTION.— Nicaragua to Costa Rica.

NICARAGUA: Chontales, Belt. COSTA RICA: 6 km S San Vito, Puntarenas, 14-III-67.

NOTES.— The above treatment was based on my San Vito specimen. The holotype was also examined, but the two specimens were not compared directly.

### 19. *Amphicranus torneutes* Blandford
Fig. 215

*Amphicranus torneutes* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):292 (Holotype, sex?; Chilpancingo, Guerrero, Mexico; British Mus. Nat. Hist.)

HOLOTYPE.— Sex? Length 5.8 mm, 3.86 times as long as wide; color medium brown, with basal half of elytral disc lighter brown.

DISTRIBUTION.— Guerrero.

MEXICO: Guerrero: Chilpancingo, June, 4000 ft., H. H. Smith.

NOTES.— The holotype is identical to *belti* Blandford except that it is slightly smaller, more slender, and the coloration is slightly different. In a genus where these features are so unreliable and where so few specimens of these exceedingly rare species are available for study, reliable taxonomic judgements cannot be made. Although *torneutes* is listed here as a species, it probably does not warrant a rank higher than subspecies.

### 20. *Amphicranus balteatus* Blandford
Fig. 215

*Amphicranus balteatus* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):291 (Holotype, sex?; Cerro Zunil, Quezaltenango, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *belti* Blandford by the larger size, by the color pattern, by the less precipitous, more nearly rounded anterior declivous area of the pronotum, and by details of the declivital structure.

FEMALE.— Length 7.5–8.0 mm, 3.5 times as long as wide; color yellowish brown, head, pronotum, and elytral declivity dark brown to black.

Frons largely concealed in specimens at hand, evidently as in *belti.*

Pronotum 1.3 times as long as wide; anterior fifth less abruptly declivous, asperities more numerous and more clearly defined, anterior margin more irregular.

Elytra 2.0 times as long as wide; essentially as in *belti* except denticles on interstriae 1 and 2 at base of declivity subequal in size and shape, denticle on interstriae 3 conspicuously

larger, posterior margin less profoundly explanate, sutural emargination about twice as deep as wide.

MALE.— Similar to female.

DISTRIBUTION.— Guatemala.

GUATEMALA: Cerro Zunil, G. C. Champion; Volcán Pacaya, Esquintla, 1-VI-64, 1300 m, No. 688, Caldo de Frijol, S. L. Wood.

BIOLOGY.— One pair of specimens was taken from a *Platypus* tunnel 8 cm deep in a recently cut tree 30 cm in diameter. Presumably these specimens had evicted the *Platypus*, but they had not altered the tunnel prior to their capture.

NOTES.— The above treatment was based on the pair from Volcan Pacaya, which had been compared directly to the holotype.

### 21. *Amphicranus macellus* Wood

*Amphicranus macellus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):64 (Holotype, female; Rincón de Osa, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *balteatus* Blandford by the much smaller size, by the color, by the absence of a granular area on the frons, by details of the declivital sculpture, and by other characters.

MALE.— Length 1.8–1.9 mm, 4.0 times as long as wide; color yellowish brown.

Frons uniformly convex; surface evidently minutely rugose-reticulate. Antennal funicle 3-segmented; club 1.3 times as long as wide, broadly oval, sutures rather weakly procurved.

Pronotum 1.8 times as long as wide; sides straight and almost parallel on basal three-fourths, rather narrowly rounded in front; anterior margin acutely elevated, subserrate except median serration slightly larger and basally separate from marginal costa; indistinct summit on anterior fourth; anterior slope steep, convex, most conspicuous asperities arranged in a subtransverse row; surface subreticulate, punctures small, very shallow. Glabrous.

Elytra 2.4 times as long as wide, 1.4 times as long as pronotum; outline as in *balteatus* except apical emargination wider, U-shaped; disc smooth, strial punctures fine, shallow, in rows. Declivity broadly, deeply excavated much as in *balteatus* except steeper and somewhat less strongly explanate; basal margin with spines on interstriae 1 and 2 minute, spine on 3 moderately large, pointed, lateral margin acutely, strongly elevated to small denticle on mesal side at level of sutural apex, margin obliquely descending from denticle to apex of lateral process on a straight line; sutural emargination narrowly U-shaped, 1.5 times as deep as wide; declivital face reticulate, shining, punctures very obscurely indicated. Glabrous.

FEMALE.— Similar to male except declivity less strongly explanate, its lateral margins less strongly elevated; sutural emargination as long as wide.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 85, tree limb, S. L. Wood.

BIOLOGY.— Specimens were taken from a recently broken limb 10 cm in diameter.

NOTES.— The above treatment was based on the type series of four specimens.

### 22. *Amphicranus tenuis* Blandford

Fig. 215

*Amphicranus tenuis* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):295 (Holotype, female; "Mexican" tobacco refuse; British Mus. Nat. Hist.)

This species was named from one specimen intercepted at Paris from tobacco crates that supposedly came from Mexico. As with several other species named by Blandford from this same source, all indications are that they came from Brazil, not Mexico. In addition to the type, I have seen one specimen from Campimento Río Grande near El Palmar, Bolivar, Venezuela.

### 23. *Amphicranus parilis* Wood

*Amphicranus parilis* Wood, 1975, Great Basin Nat. 35:31 (Holotype, male; 6 km or 4 miles W Tepic, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *filiformis* Blandford by the much smaller size, by the absence of minute crenulations on the base of the pronotal disc, and by differences on the elytral declivity indicated below.

MALE.— Length 2.0 mm, 4.0 times as long as wide; color pale yellowish brown, elytral declivity brown.

Frons and pronotum as in *filiformis* except as noted in above diagnosis. Elytra as in *filiformis* except less strongly explanate, sutural

emargination only slightly deeper than wide (twice as deep as wide in *filiformis*), declivital spine 2 smaller, less strongly pointed.

DISTRIBUTION.— Nayarit.

MEXICO: Nayarit: 6 km W Tepic, 13-VII-65, 1000 m, No. 240, tree branch, S. L. Wood.

NOTES.— The above treatment was based on the holotype.

### 24. *Amphicranus filiformis* Blandford
Fig. 215

*Amphicranus filiformis* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):295 (Holotype, sex?; Omilteme, Guerrero, Mexico; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *belti* Blandford by the smaller size, by the absence of a granular area on the frons, and by the details of the declivital sculpture described below.

HOLOTYPE.— Sex? Length 3.7 mm, 4.2 times as long as wide; color pale brown, elytral declivity very dark brown.

Frons convex; surface uniformly rugose-reticulate, punctures obscure; apparently glabrous. Pronotum about as in *macellus* Wood except asperities on anterior slope slightly larger, disc more nearly shining, basal third of disc with several minute crenulations. Elytra as in *hybridus* Blandford except more strongly explanate, lower tubercle on suture entirely absent, posterolateral margin more strongly elevated, angulate, and armed by a rather coarse spine at level of sutural apex, this spine displaced mesad from margin and directed mesad, its base extending from margin almost one-fourth distance to apex of suture; face of declivity moderately pubescent, setae short on basal half, very long on lower half.

DISTRIBUTION.— Guerrero.

MEXICO: Chiapas: 21 km N Ocozocoautla, 2-VII-69. Guerrero: Omilteme, VIII, 8000 ft, H. H. Smith.

NOTES.— The above treatment was based on the holotype and on one other specimen.

### 25. *Amphicranus cordatus* (Bright)

*Tricolus cordatus* Bright, 1972, Canadian Ent. 104:1380 (Holotype, male; 184 km S Oaxaca on Highway 131, Oaxaca, Mexico; Canadian Nat. Coll., 12651).

DIAGNOSIS.— This species is distinguished from *Tricolus* by the quadrate precoxal piece on the prothorax, and by the two pairs of minor spines on interstriae 1 and 3 on the basal margin of the declivity. It is distantly allied to *propugnatus* Blandford, from which it is distinguished by characters included in the above key.

MALE.— Length 2.8 mm, 3.0 times as long as wide; color yellowish brown, with anterior two-fifths of pronotum and elytral declivity very dark brown.

Frons convex, weakly, transversely impressed above epistoma; lateral areas shining, moderately punctured, subaciculate below upper level of eyes; median area with a broadly heart-shaped granulate area on median third, its upper third extending above upper level of eyes; vestiture sparse except on epistomal margin. Antennal club broadly ovate, almost subcircular, sutures indicated on middle third.

Pronotum 1.4 times as long as wide; about as in *propugnatus* except asperities on anterior slope distinctly smaller.

Elytra 2.0 times as long as wide, 1.5 times as long as pronotum; essentially as in *propugnatus* except major spine 1 cylindrical, about twice as long as minor spines, its apex bluntly rounded; lateral margin smooth from spine 1 to ventrolateral process; ventrolateral process quadrate, slightly compressed laterally, only slightly longer than basal width.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: 184 km S Oaxaca on Highway 131, 12-V-71, 2000 m, D. E. Bright.

NOTES.— The above treatment was based on the holotype.

### 26. *Amphicranus propugnatus* Blandford
Fig. 215

*Amphicranus propugnatus* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):297 (Holotype, female?; Cerro Zunil, Quezaltenango, Guatemala; British Mus. Nat. Hist.)

*Amphicranus armatus* Schedl, 1934, Ent. Blätt. 30:37 (Holotype, female?; Turrialba, Costa Rica; Schedl Coll.). *Probably synonymy*

DIAGNOSIS.— This species is distinguished from *spinosus* Wood by the frons, by the arrangement of the declivital spines, and by the fine, raised line on the lateral margins of the pronotum.

FEMALE.— Length 3.5 mm, 4.1 times as long as wide; color dark brown, elytral disc lighter.

Frons strongly, broadly convex except moderately, transversely impressed above epistoma; granular area covering almost entire convex portion on slightly more than median three-fourths.

Pronotum as in *spinosus* except asperities on anterior slope slightly smaller; lateral margins marked by a fine, raised line.

Elytra basically as in *spinosus* except for declivital spines; basal margin of declivity armed by small, pointed spines on interstriae 1 and 3, first major spine large, quadrate, laterally compressed, a smaller, compressed, subtriangular spine at base of ventrolateral process, ventrolateral processes subcylindrical, slightly shorter than in *spinosus*.

DISTRIBUTION.— Guatemala.

GUATEMALA: Cerro Zunil, Quezaltenango, G. C. Champion. COSTA RICA: Turrialba, XI-28, Schild.

NOTES.— The above treatment was based on the holotype of *propugnatus*. The holotype of *armatus* Schedl fits this species completely except that it is 4.5 mm in length. Both types were examined, but were not compared to one another nor to other specimens of the same species.

### 27. *Amphicranus spinescens* Wood

*Amphicranus spinescens* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):65 (Holotype, female; Rincón de Osa, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the absence of a fine, raised line on the lateral margins of the pronotum, by the very coarse, slender serrations on the anterior margin of the pronotum, and by the different armature on the elytral declivity.

FEMALE.— Length 2.0–2.4 mm, 4.4 times as long as wide; color yellowish brown, anterior half of pronotum and posterior third of elytra a darker brown.

Frons transversely concave, lower third weakly, transversely impressed, surface rugose-reticulate except subgranular on oval area on median half at upper level of eyes; vestiture confined to epistomal margin. Antennal funicle 3-segmented; club oval, 1.4 times as long as wide.

Pronotum 1.8 times as long as wide; sides straight and parallel on basal two-thirds, narrowly, strongly produced in front; anterior margin armed by 10–12 very coarse, basally separate serrations, median ones slender; summit on anterior third; anterior slope moderately steep, convex, anterior asperities coarse, smaller toward summit; posterior areas finely reticulate, punctures minute, almost obsolete. Glabrous.

Elytra 2.4 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel to declivity, broadly emarginate behind, posterolateral angles produced into long forcepslike processes; disc smooth, subshining, strial punctures almost obsolete. Declivity steep, excavated; basal margin subacutely elevated, armed by three small, pointed denticles, one each at interstriae 1, 2, and 3; lateral margin subacutely elevated, bearing just below middle of declivity a very large, cylindrical, blunt spine 3.5 times as long as its basal width, directed caudad; below this spine lateral margin continues to apex of ventrolateral process; ventrolateral process subcylindrical, curving slightly mesad, its length, measured from apex of suture, equal to more than half width of elytra; posterior emargination very broad, deeply, broadly U-shaped, very slightly deeper than wide.

MALE.— Similar to female except declivital spines slightly longer.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 85, tree limb, S. L. Wood.

BIOLOGY.— Specimens were taken from the same limb that contained *marcellus* Wood.

NOTES.— The above treatment was based on the type series of 20 specimens.

### 28. *Amphicranus spinosus* Wood

*Amphicranus spinosus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):65 (Holotype, female; Rincón de Osa, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *spinescens* Wood by the larger size, by the finely punctured pronotal disc, and by the more brightly shining elytra.

FEMALE.— Length 2.7–3.0 mm, 4.0 times as long as wide; color brown.

As in *spinescens* except posterior areas of pronotal disc reticulate, with moderately abundant, fine, distinctly impressed punctures in both discal and lateral areas, and elytra much more brightly shining.

MALE.— Similar to female except declivital spine slightly longer.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 85, tree limb, S. L. Wood.

BIOLOGY.— Specimens were taken from the same limb that contained *spinescens*.

NOTES.— The above treatment was based on the type series of four specimens.

### 29. *Amphicranus mucronatus* Wood

*Amphicranus mucronatus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):66 (Holotype, female; Volcán de Chiriquí at Cerro Punta, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *fastigiatus* Blandford by the smaller size, by the very different female frons, and by the narrower posterolateral elytral process of the male on which the spine at the level of the sutural apex is positioned equidistant from the lateral and mesal margins (not on the lateral margin as in *fastigiatus*).

FEMALE.— Length 2.7 mm, 4.0 times as long as wide; color light brown, pronotum and elytral declivity darker.

Frons convex, reticulate below upper level of eyes, shining above, punctures fine, moderately abundant, obscure on reticulate area; median fourth from epistoma to more than half distance to upper level of eyes with a sharply elevated, low, oval, granulate area; vestiture inconspicuous. Antennal club transversely oval, slightly wider than long.

Pronotum 1.7 times as long as wide; as in *fastigiatus* except submarginal grooves and callus on anterior slope much more poorly developed.

Elytra as in *fastigiatus* except discal punctures slightly smaller.

MALE.— Length 3.0–3.3 mm; similar to male *fastigiatus* except antennal club slightly more broadly oval; anterior margin of pronotum more strongly, narrowly acuminate, process on its ventral surface almost obsolete; elytral declivity slightly less strongly explanate, lateral margins much less strongly elevated, denticles on basal margin much smaller, denticle at level of sutural apex in center of floor of lateral process (not on inner surface of lateral margin as in *fastigiatus*).

DISTRIBUTION.— Panama.

PANAMA: Cerro Punta near Volcán Chiriquí, Chiriquí, 11-I-64, 1800 m, No. 376, tree branch, S. L. Wood.

NOTES.— The above treatment was based on the type series of three specimens.

### 30. *Amphicranus fastigiatus* Blandford

Fig. 215

*Amphicranus fastigiatus* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):296 (Holotype, male; Cerro Zunil, Quezaltenango, Guatemala)

DIAGNOSIS.— The female of this species is distinguished from the female of *dorni* (Eichhoff) by the slightly different frons, by the subcircular antennal club, by the more obtuse anterior margin of the pronotum, and by the very different elytral declivity, and in the male by the bifid tubercle on the ventral side of the pronotal mucro and by details in sculpture of the elytral declivity.

FEMALE.— Length 2.7–3.2 mm, 4.0 times as long as wide; color dark brown, elytral disc, legs, and antennae yellowish brown.

Frons convex, slightly protuberant in median area on lower half; a small, median, epistomal tubercle; entire surface rugose-reticulate from epistoma to well above upper level of eyes. Antennal club broadly oval, slightly longer than wide.

Pronotum 1.8 times as long as wide; widest at base, sides almost sraight and converging slightly on more than basal half, moderately constricted, then narrowly, obtusely rounded; summit indefinite, on anterior fourth; anterior margin costate, unarmed, a broad submarginal groove just above margin, above this an obtuse costa, and above this a second broad groove, all following contour similar to anterior margin; surface reticulate, punctures very fine, deep. Glabrous.

Elytra 2.3 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on more than basal two-thirds, slightly narrowed to level of sutural apex, then rather abruptly rounded, strongly, rather broadly emarginate behind; disc smooth, shining, punctures rather small, distinct, close, confused (obscure striae discernible in some posterior areas). Declivity occupying posterior third of elytra, extensively, subconcavely impressed; lateral margins moderately, obtusely elevated, a small, pointed denticle at position of interstriae 3, a strongly elevated, narrow costa extending caudomesad from lateral margin to position

of interstriae 3 then continued caudad and ending abruptly just before level of sutural apex; subacute lateral margin continued from interstriae 4 to apex of explanate lateral process; apex emarginate on median fifth of elytral width, emargination as deep as wide; excavated area reticulate, punctures obscure. Sparse, fine hair in excavated area of declivity.

MALE.— Length 3.7–4.2 mm; as in female except lower frons not inflated or tuberculate, median third granular to upper level of eyes; anterior third of pronotum converging to an acute median mucronate point, feebly declivous, ventral surface of mucro bearing a strongly developed bifid tubercle; elytral declivity much more strongly excavated and explanate, basal margin armed by small tubercles on interstriae 1 and 2, a larger spine on 3, lateral margins strongly, acutely elevated to apex, a small tubercle on median surface of lateral margin at level of sutural apex (*dorni* with an additional tubercle at dorsocaudal angle of lateral process).

DISTRIBUTION.— Guatemala to Costa Rica.

GUATEMALA: Cerro Zunil, Quezaltenango, G. C. Champion. COSTA RICA: 15 km SE Cartago, Cartago, 29-VII-63, 1800 m, No. 17, in *Conostegia oerstediana*, No. 90 in fallen tree, S. L. Wood; San José, 7-11-33, *Parkinsonia aculeata*, C. H. Ballon.

BIOLOGY.— Specimens were taken from boles 10 cm and 30 cm in diameter. This species is polygynous; the gallery system is as in *Monarthrum*.

NOTES.— The above treatment was based on seven specimens, one of which was compared to the holotype.

The genus *Steganocranus* was named to include *dorni* and subsequently described species in this species group. Except for the strongly mucronate anterior margin of the male pronotum and modified female maxillae, these species are not particularly distinctive. In my opinion, this group is not sufficiently different to warrant generic rank. Other species groups are just as distinctive, but have been retained within *Amphicranus*.

## GENUS *MONARTHRUM* KIRSCH

*Monarthrum* Kirsch, 1866, Berliner Ent. Zeitschr. 10:213 (Type-species: *Monarthrum chapuisi* Kirsch, monobasic)

*Corthylomimus* Ferrari, 1867, Die Forst- und Baunzuchtschädlichen Borkenkäfer, p. 48 (Type-species: *Bostrichus fasciatus* Say, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:118); Eichhoff, 1869, Berliner Ent. Zeitschr. 11:300. *Synonymy*

*Cosmocorynus* Ferrari, 1867, Die Forst- und Baumzuctschälichen Borkenkäfer, p. 62 (Type-species: *Cosmocorynus cristatus* Ferrari, monobasic); LeConte, 1876, Proc. Amer. Philos. Soc. 15:348. *Synonymy*

*Pterocyclon* Eichhoff, 1869, Berliner Ent. Zetischr. 12:276 (Type-species: *Pterocyclon laterale* Eichhoff, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:128); Eichhoff, 1869, Berliner Ent. Zeitschr. 12:299. *Synonymy*

*Anchonocerus* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége 2(8):431 (Type-species: *Anchonocerus rufipes* Eichhoff, monobasic); Wood, 1977, Great Basin Nat. 37:512. *Synonymy*

*Phthorius* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége 2(8):433 (Type-species: *Phthorius ingens* Eichhoff, monobasic); Eggers, 1935, Rev. de Ent. 5:329. *Synonymy*

*Trypocranus* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége 2(8):435 (Type-species: *Trypocranus cincinnatus* Eichhoff, monobasic) (Type lost, suspected synonymy cannot be proved.)

DIAGNOSIS.— This large, diverse, difficult genus is distinguished from other members of the tribe by the 2-segmented funicle, by the presence of a fine, raised line on the lateral margin of the pronotum, (usually) by the horizontal precoxal piece of the prosternum that is usually subacutely pointed and directed between the anterior coxae, and by the dimorphic protibiae that are subinflated and armed on the posterior face by numerous small, confused tubercles.

DESCRIPTION.— Length 1.4–4.8 mm, 2.4–3.4 times as long as wide; color yellowish brown to very dark brown, many species bicolored.

Frons convex and variously, conservatively sculptured in males, females usually similar to male, some concave or elaborately impressed, glabrous to elaborately ornamented by hair. Eye oval, deeply emarginate, usually finely faceted. Antennal scape slender to triangular, finely pubescent in female of some species; funicle 2-segmented; club slender to broadly oval, strongly triangular in females of a few species, sutures almost always present, straight to moderately procurved, posterior face usually ornamented by long hair in female. Pronotum longer than wide, summit at or in front of middle; anterior slope asperate, anterior margin serrate in

male, margin usually unarmed in female; posterior areas very finely sculptured. Scutellum rather large, flat. Elytra very finely sculptured, punctures confused in most species; declivity very gradual to subvertical, convex to elaborately excavated, unarmed to armed by conspicuous spines; sutural apex entire to conspicuously emarginate. Vestiture usually absent except on declivity.

Anterior coxae contiguous, tibiae dimorphic, posterior face subinflated in female and armed by numerous confused tubercles. Prothoracic precoxal piece horizontal, its posterior margin subacute and directed between coxae.

DISTRIBUTION.— United States to Argentina; approximately 100 species are known; 58 occur in North and Central America.

BIOLOGY.— These ambrosia beetles usually attack cut or dying logs and limbs larger than 30 cm in diameter; however, a few tropical forms breed in branches and woody vines as small as 3 cm in diameter. Most species are polygynous, but apparently some of the smaller species may be monogamous. The male initiates the attack on a new host and forms the radial entrance tunnel and nuptial chamber in the xylem tissues. The females, up to seven in some species, cut individual egg galleries that radiate from the nuptial chamber on a transverse plane, often following growth rings. The eggs are deposited in niches in rows on the upper and lower surfaces of the egg tunnel. Each larva enlarges its own niche, presumably feeding on a mixture of host tissues and ambrosial fungi. Young adults emerge through the parental entrance hole.

NOTES.— This genus requires considerably more study. Most species are known from very scanty material and almost nothing has been recorded of their basic habits.

Key to the Species of *Monarthrum*

1. Male elytral declivity moderately to strongly, broadly excavated, lateral margins subacutely to profoundly elevated on more than lower half, upper margin armed by two or three pairs of teeth (usually on interstriae 1, 2, and 3); in *Quercus* ..... 2

— Male elytral declivity basically sulcate, lateral margins rounded, never with more than one tooth on basal margin, most or all of other denticles often mesad of lateral margin; in various hosts including *Quercus* ..... 15

2(1). Larger species; male declivity more gradual, deeply excavated; elytra not emarginate at suture (except in *validum*, *praeruptum*, and *gnarum*); female frons commonly ornamented by long hair or vertex often impressed ..... 3

— Smaller species; male declivity steeper, broadly, less strongly excavated; elytra suturally emarginate in both sexes; female frons and vertex convex, not ornamented by long hair ..... 11

3(2). Elytral apex entire at suture in both sexes (except male *quercus*); base of male declivity armed by two pairs of denticles (three pairs in some *huachucae*); female vertex either convex or shallowly impressed; female declivity with a row of two to four small tubercles on upper half of interstriae 2; female antennal club broadly oval ..... 4

— Elytral apex suturally emarginate in both sexes; base of male declivity armed by three pairs of denticles; female vertex conspicuously excavated, excavation longer than wide; female declivity armed on upper half by about eight small, confused tubercles; female antennal club subtriangular ..... 9

4(3). Posterolateral margin of male declivity strongly, uniformly elevated from elytral apex about two-thirds distance to declivital base; female vertex not impressed ..... 5

— Posterolateral margin of male elytral declivity strongly elevated, but interrupted by a laterally compressed subquadrate process; female vertex shallowly impressed (except *quercus*) ..... 7

5(4). Male spine 1 on interstriae 2 at base of declivity blunt, almost absent, lateral margins similar to *scutellare* but subspinose angle near middle of declivity; type with conspicuous, blunt, conical denticle at middle of excavated area about in line with discal interstriae 3, this denticle entirely absent on left side (abnormality?); Hidalgo; 4.3 mm ..... 1. ***dentatum*** **(Eggers)**

— Male spine 1 at base of declivity present, subspinose angle on lateral margin well above middle of declivity, floor of excavated area entirely unarmed ..... 6

6(5). Male epistomal process unarmed; female frons with median area on lower half distinctly elevated and punctured as on upper areas, small lateral areas immediately above epistoma ornamented by a few long hairs; British Columbia to Baja California; *Quercus*; 3.0–3.5 mm ..... 2. ***scutellare*** **(LeConte)**

— Male epistomal process armed by a small, median tubercle; female frons weakly impressed below upper level of eyes, almost flat, surface of impressed area much more finely, densely punctured and ornamented by a brush of hair, pubescent area attaining upper level of eyes; Arizona; *Quercus*; 3.0–3.5 mm ..... 3. ***huachucae*** **Wood**

7(4). Male declivity profoundly explanate, narrowly, deeply divaricate; female vertex convex, frons glabrous ..... 8a

— Male declivity moderately explanate, feebly if at all emarginate at suture; female vertex shallowly impressed, impression as wide or wider than long; female frons variously pubescent (except glabrous in *querneus*) ..... 8b

8a(7). Larger; male pronotum with nonasperate area on anterior slope of pronotum small, less than 0.2 times as wide as pronotum; basal margin of declivity transversely almost straight, abrupt, lower margin of major spine gradually descending to profoundly elevated ventrolateral margin; Durango; *Quercus*; male 4.4–4.6 mm, female 3.4–3.8 mm ..... 4. ***quercus*** **(Wood)**

— Smaller; male pronotum with a large, subcircular reticulate area on anterior slope 0.4 times as wide as pronotum; basal margin of declivity arcuate, less abrupt, major spine quadrate, a deep notch between its summit and less strongly elevated ventrolateral margin; El Salvador; *Quercus*; male 3.5 mm ..... 5. ***quercivorum*** **Schedl**

8b(7). Compressed, quadrate processes on lateral margins of male elytral declivity almost parallel, their upper angles less acute and weakly dentate on mesal side; female frons glabrous (except for small epistomal brush); Michoacán and Hidalgo to Honduras; *Quercus*; 2.8–3.4 mm ..... 6. ***querneum*** **Wood**

— Compressed, quadrate processes on lateral margins of elytral declivity conspicuously converging dorsally, their dorsomedian angles conspicuously dentate; female frons conspicuously pubescent from epistoma almost to vertex, most setae on median half; Chihuahua and Hidalgo to Panama; *Quercus*; 3.7–4.3 mm ..... 7. ***quercicolens*** **Wood**

9(3). Quadrate lateral process on male declivity divided to form a blunt, subcylindrical spine between this process and ventrolateral explanate process; female frons more coarsely punctured, excavation on vertex larger, commencinng very slightly above upper level of eyes; Veracruz to Panama; *Quercus*; 4.3–4.8 mm ..... 8. ***validum*** **(Ferrari)**

— Large laterally compressed quadrate process on lateral margin of male declivity not subdivided; female frons much more finely punctured, excavation on vertex commencing well above eyes ..... 10

10(9). Male elytral declivity less strongly excavated, entire excavated area reticulate, lateral margins less stomgly elevated, less strongly explanate below, denticles on basal margin reduced in size; Guatemala; 4.1 mm ..... 9. ***praeruptum*** **(Blandford)**

— Male declivity more strongly excavated, most of surface in excavated area smooth, shining, lateral margins more strongly elevated, more strongly explanate below, denticles on basal margin larger; Hidalgo to Chiapas; *Quercus*; 4.2–4.7 mm ..... 10. ***gnarum*** **(Schedl)**

11(2). Declivital face glabrous in both sexes (a few minute setae in *tomicoides*); basal margin of male declivity armed by two pairs of pointed teeth, a third pair slightly above middle on lateral margin, floor of excavated area unarmed; female declivity shallowly, broadly excavated, with two pairs of small tubercles on basal margin, a third tubercle at middle of declivity near lateral margin ..... 12

— Declivital face with some conspicuous pubescence in both sexes; basal margin of male declivity armed by two pairs of denticles on interstriae 1 and 3, those on 3 much larger, each half of excavated area with a small tubercle near its center; female declivity feebly sulcate, almost flat, interstriae 3 armed by two conspicuous tubercles on upper half of face ..... 13

12(11). Body larger, stouter; male declivity with spine at base of interstriae 3 very large, slightly longer than lower spine, lower spine narrowly quadrate, blunt; color black; Guatemala; 3.2–3.3 mm ..... 11. ***tomicoides*** **(Blandford)**

— Smaller, more slender species; denticles at base of male declivity small, of equal size, lower spine cylindrical, pointed; color light brown to bicolored; Costa Rica to Panama; 2.6–2.8 mm ..... 12. ***bispinum*** **(Blandford)**

13(11). Male declivital excavation poorly developed, its margins obtuse, middle half with crescent-shaped elevation on interstriae 3, its upper end armed by a blunt tubercle; Guatemala; 2.7 mm ..... 13. ***terminatum*** **(Blandford)**

— Male declivity more deeply excavated, with margins acute, tubercle on interstriae 3 near middle of declivity not accompanied by an elongate elevation ... 14

14(13). Lateral margin of male declivity subacutely elevated, rising gradually from floor of excavated area to crest of lateral margin; spine 1 on basal margin of male declivity rather slender, sharply pointed, spine 2 rather slender, slightly smaller; Puebla to Hidalgo; *Quercus*; 2.0–2.4 mm ..... 14. ***cordicticum*** **Wood**

— Lateral margin of male declivity on more than lower three-fourths abruptly elevated, elevation as high or higher than its thickness; spine 1 on basal margin of male declivity smaller, 2 larger and stouter; Guatemala to Panama; *Quercus*; 2.2–2.4 mm ..... 15. ***cordatum*** **(Blandford)**

15(1). Male declivity moderately to rather strongly excavated, lateral margins armed on crest of summit by two or three pairs of denticles ..... 16

— Male declivity shallowly excavated to almost flat, two pairs of denticles usually arm declivity, lower pair of denticles (or both pairs) displaced mesad from lateral margin ..... 33

16(15). Larger, stouter species uniformly dark brown in color; frons in both sexes broadly, evenly convex, glabrous; declivity broad, moderately excavated; 2.3–4.0 mm ..... 17

— Smaller, slender species, often bicolored or pale; female frons frequently with various grooves, elevations, or setal ornamentation; 1.4–3.4 mm ..... 22

17(16). Male declivity with a continuous crest extending from summit of denticle 2 (lower one) to elytral apex; female frons with a distinct, uniformly elevated median carina from epistoma to above upper level of eyes, frontal punctures much coarser near epistoma than above eyes (these characters discernible in male but less clearly defined); Costa Rica; *Clusia*, *Quercus*, *Podocarpus*; 3.5–4.0 mm ..... 16. **nevermanni (Schedl)**

— Lower denticle on male declivity isolate, not associated with lateral crest; female frons without a carina, punctures more uniform in size ..... 18

18(17). Male declivity commencing at or slightly anterior to middle of elytra, denticle 1 closer to apex than to base of declivity; female declivity normal; female frons feebly impressed immediately above epistoma, median epistomal process not evident, lower two-thirds of area below upper level of eyes rugose-reticulate, area above eyes almost smooth between punctures; Costa Rica and Trinidad; *Spondias*; 2.3–2.5 mm ..... 17. ***robustum*** **(Schedl)**

— Male declivity commencing well behind middle of elytra; female frons variously sculptured ..... 19

19(18). Male declivity with a distinct, blunt tubercle near apex of interstriae 2; frons in both sexes with a moderate, transverse impression just above epistomal margin, a weak, short, median carina often present immediately above impression; declivital punctures usually obscure; female frons obscurely reticulate in central area above transverse groove, almost rugose-reticulate in groove; Puebla and Veracruz to Oaxaca; *Alnus*; 2.3–3.0 mm ..... 18. ***hoegei*** **(Blandford)**

— Male declivity devoid of tubercle near apex of interstriae 2; frons feebly or not at all impressed above epistoma; declivital punctures usually distinctly impressed ..... 20

20(19). Smaller; female frons rugose-reticulate from epistoma to upper level of eyes, reticulate above, male frons more coarsely punctured, rugose area slightly smaller, very obscurely reticulate above eyes; Puebla to Guatemala; *Quercus*; 2.3–2.6 mm ..... 19. ***luctuosum*** **(Blandford)**

— Larger; frontal sculpture different ..... 21

21(20). Epistomal process not evident; frons rugose-reticulate on most of area below upper level of eyes, mostly shining in large central area above, punctures larger, numerous impressed points present; Puebla to Guatemala; *Alnus*; 2.9–3.2 mm ..... 20. ***umbrinum*** **(Blandford)**

— Epistomal process weakly elevated on about median sixth and apparently overlapping epistoma; frons rather strongly reticulate at epistoma, more weakly impressed toward vertex, punctures much finer, impressed points not evident; Costa Rica to Panama; *Croton*, *Ochroma*, *Conostegia*; 3.0–4.0 mm ..... 21. ***consimile*** **(Blandford)**

22(16). Lateral margin of pronotum rounded, with no indication of a raised line; very small species ..... 23

— Lateral margin of pronotum clearly marked by a fine, raised line; larger species ..... 26

23(22). Declivity obliquely truncate in both sexes, margins rather abruptly angulate in male, apex narrowly, shallowly emarginate; lateral margin of male declivity armed on interstriae 3 by a small denticle and by a moderately large spine on margin slightly above middle of declivity; female declivity with two tubercles on basal half of interstriae 3; body bicolored ..... 24

— Declivity rather broadly sulcate, lateral margins armed by two pairs of denticles of equal size, apex rather broadly, deeply emarginate; body unicolorous, very slender ..... 25

24(23). Male declivity steep, its basal margin obtusely angled, not precipitous or projecting, unarmed from suture to spine 1, declivital face sparsely punctured, punctures on striae 1 widely spaced; female frons with median third conspicuously elevated, margins of elevation usually ornamented by long hair; female antennal club 1.4 times as long as wide, strongly tapered on distal half to subacute apex; Guatemala to Brazil; 1.4–1.8 mm ..... 22. ***egenum*** **(Blandford)**

— Male declivity more gradual, its basal margin precipitous or projecting slightly, armed by 1–3 small denticles between suture and spine 1, face of declivity closely punctured, punctures on striae 1 very close; female frons without median elevation or vestiture, a conspicuous impression on dorsomedian margin of eye; female antennal club 1.0 times as long as wide, its apex very broadly rounded; Costa Rica to Colombia and Venezuela; 1.8–2.2 mm ..... 23. ***dimidiatum*** **(Ferrari)**

25(23). Larger; punctures on frons, pronotum, and elytra slightly more distinct; frons and elytra less strongly reticulate; Costa Rica to Panama; 1.6–1.9 mm ..... 24. ***proprium*** **Wood**

— Smaller; punctures on frons, pronotum, and elytra smaller, usually obscure; frons and pronotum more strongly reticulate; Nayarit and Veracruz to Colombia and Venezuela; 1.4–1.6 mm ..... 25. ***pennatum*** **(Schedl)**

26(22). Female frons evenly convex, punctured, almost glabrous; declivity very steep, occupying 20–25 percent of elytral length ..... 27

— Female frons variously impressed or elevated and ornamented by hair; declivity gradual, occupying more than 25 percent of elytral length; tropical distributions ..... 28

27(26). Elytral disc obscurely reticulate, punctures obsolete; declivital margins more strongly, more acutely elevated, lower dentical closer to lateral margin than to suture; "Mexico"; 1.7 mm ..... 26. ***flohri*** **(Schedl)**

— Elytral disc strongly reticulate, strial punctures in rows, rather obscurely impressed; lateral margin less strongly elevated on lower half of declivity, lower denticle closer to suture than to lateral margin; California and Arizona to W Texas and Baja California; 1.8–2.2 mm ..... 27. ***dentigerum*** **(LeConte)**

28(26). Female frons longitudinally divided into equal thirds by two shallow, parallel grooves from epistoma to upper level of eyes, each groove bearing a row of closely set, stout, short bristles, median third brightly shining, impunctate, remaining areas largely reticulate and with a few punctures or impressed points; male declivity steeper, broader; Costa Rica and Venezuela; 1.8–2.0 mm ..... 28. ***bifoveatum*** **Wood**

— Female frons more extensively, more conspicuously impressed, vestiture longer, more widely distributed; larger species ..... 29

29(28). Elytral disc normal, without a conspicuous impression or tubercles ..... 30

— Elytral disc with a conspicuous impression commencing on basal fourth and extending toward declivity on interstriae 1 and 2, each of these interstriae armed by a row of tubercles ..... 32

30(29). Female epistoma armed by a large, median, blunt horn, frons impressed on lower half, a conspicuous longitudinal, lateral impression above each eye, median area on vertex not pubescent; female antennal club elongate, almost twice as long as wide; male declivity broader, spine 1 at base much larger, closer to suture; Guatemala to Costa Rica, Venezuela; 3.0–3.4 mm ..... 29. ***lobatum*** **(Ferrari)**

— Female frons very strongly, transversely impressed just below upper level of eyes, vertex with a conspicuous tuft of long hair, other tufts of shorter hair on margins between level of antennal insertion and inner margin of eye; male declivity much narrower, spine 1 smaller than 2 ..... 31

31(30). Larger; area on female vertex giving rise to tuft of hair not impressed; female epistomal area not armed by a pair of lateral tubercles; Michoacán and Puebla to Venezuela; *Quercus, Alnus*, etc.; 2.6–3.1 mm ..... 30. ***laterale*** **(Eichhoff)**

— Smaller; median area on female vertex (area giving rise to tuft of hair) distinctly impressed; female epistomal area bearing a pair of tubercles near bases of mandibles; Veracruz to Brazil; *Spondias, Ficus*, etc.; 2.0–2.4 mm ..... 31. ***fimbriaticorne*** **(Blandford)**

32(29). Discal sulcus conspicuous only on basal half of elytral disc, obsolete before declivity; female frons impunctate and glabrous on large triangular area, this area half as wide as frons at a point just above epistoma; Panama; 3.8–4.0 mm ..... 32. ***sulcatum*** **(Blandford)**

— Discal sulcus continuous from basal fourth of disc to declivity; impunctate, glabrous area on female frons elongate, less than one-fourth as wide as frons at its widest point; Veracruz to Panama; 2.5 mm ..... 33. ***ferrarii*** **(Blandford)**

33(15). Ventrolateral margin of male declivity acutely margined from apex to or toward level of lower declivital spine (arc encompassing less than one-third of a complete circle, if sutural emargination ignored); sutural emargination usually acute, rather deep to obsolete ..... 34

— Ventrolateral margin of male declivity acutely margined at least from level of upper spine to apex (arc more than two-thirds of a complete circle if sutural emargination ignored); sutural emargination broadly obtuse ..... 55

34(33). Apex of declivital spine 2 closer to spine 1 than to declivital apex; distance between second declivital spines greater than between first spines (except in species from USA); lower margin of declivity transversely, more narrowly rounded ..... 35

— Apex of declivital spine 2 closer to elytral apex than to spine 1; distance between second declivital spines less than between first spines; lower margin of declivity transversely more broadly rounded ..... 44

35(34). Declivity in both sexes weakly if at all impressed, spine 2 reduced, obsolete or not clearly identifiable; sutural apex entire to narrowly, rather shallowly emarginate ..... 36

— Declivity more broadly, rather deeply excavated, spine 2 as large or larger than spine 1; emargination at sutural apex larger, deeper (except absent in *desum*) ..... 38

36(35). Larger; elytral apex at suture entire; declivital face weakly convex, armed by about four pairs of tubercles below spine 1, their arrangement evidently indefinite; female frons shallowly concave from epistoma to vertex, median line distinctly, subacutely elevated, entire surface densely covered by fine, short hair; Nayarit; *Quercus*; 2.9–3.3 mm ..... 34. ***bicavum*** **Wood**

— Smaller; elytral apex at least weakly emarginate at suture; declivital face without supplemental tubercles; female frons convex, subglabrous ..... 37

37(36). Declivital spine 2 of reduced size; second declivital spines more closely spaced than first; declivital interstriae 1 unarmed by granules; frons reticulate; color light brown; Minnesota and Maine to E Texas and Florida, California; 1.8–2.4 mm ..... 35. ***mali*** **(Fitch)**

— Declivital spine 2 obsolete; declivital interstriae 1 with a row of granules near middle (very fine in female); frons rugose-reticulate; color light brown except anterior half of pronotum and elytral declivity dark brown; Wisconsin and Massachusetts to Texas and Florida; 2.3–2.8 mm ..... 36. ***fasciatum*** **(Say)**

38(35). Male declivital spine 2 much closer to suture than to lateral margin, much larger than 1, blunt; male declivity weakly impressed, distance between second declivital spines equal to that between first spines; Jalisco; 2.4 mm ..... 37. ***tetradontium*** **Wood**

— Male elytral declivity more deeply sulcate, second spines much more widely spaced than first ..... 39

39(38). Elytral surface shining, irregular impressed lines rather numerous, punctures distinctly impressed; male declivital spine 2 rather large, blunt; Jalisco to Nayarit; 3.1–3.6 mm ..... 38. ***conversum*** **Wood**

— Elytral disc reticulate (at least on basal half), punctures on reticulate area small, obscure ..... 40

40(39). Male elytral declivity occupying 40 percent of elytral length, gradual anterior to spine 1 and occupying as much longitudinal space as area below spine 1; posterior half of elytra brightly shining; Costa Rica; 1.4 mm ..... 39. ***morsum*** **Wood**

— Male declivity steeper, occupying less than 30 percent of elytral length; elytral disc and declivity reticulate; larger species ..... 41

41(40). Male declivity more conspicuously extended beyond sutural apex, spine 1 remote from lateral margin, about one-third length of declivity from basal margin, small spine 2 at level of base of sutural emargination, spine 2 about equal distance between suture and lateral margin; Veracruz to Colombia and Venezuela; 1.8–2.1 mm ..... 40. ***exornatum*** **(Schedl)**

— Male declivital spine 1 on lateral margin, spine 2 well above level of base of sutural emargination ..... 42

42(41). Male declivity more narrowly, more deeply impressed, lateral margins more gradually rounded, interstriae 1 at base of declivity unarmed, spine 2 wider than high and pointed; frons with a fine, acutely elevated carina from epistoma to upper level of eyes; Costa Rica; 2.5–2.8 mm ..... 41. ***carinatum*** **Wood**

— Male declivity with small tubercle at base on interstriae 1 (except in *desum*), spine 2 larger; male declivity more broadly, more shallowly excavated, its margins more abruptly rounded; body often somewhat bicolored; frons devoid of a carina ..... 43

43(42). Elytral apex not emarginate, declivity much steeper; minute tubercle absent on interstriae 1 at base of declivity; female declivity more strongly impressed, with second pair of spines more widely spaced than first pair; frons with a median tubercle near upper level of eyes; Chihuahua to Michoacán; *Quercus*; 1.8–2.1 mm ..... 42. ***desum*** **(Wood)**

— Elytral apex conspicuously emarginate, declivity not as steep, female with spacing of spines 1 and 2 about equal; frons without a median tubercle ..... 44

44(43). Margins of male declivity abruptly rounded, spine 2 longer than its basal diameter; posterolateral margin of declivity acutely elevated from apex to level of spine 2; Costa Rica to Panama; 2.2–2.5 mm ..... 43. ***punctifrons*** **(Blandford)**

— Margins of male declivity more gradually rounded, spine 2 shorter than its basal diameter; posterolateral margin of declivity acutely elevated only half of distance from its apex to level of spine 2; Costa Rica; *Quercus*; 2.8–3.4 mm ..... 44. ***pseudoscutellare*** **(Schedl)**

45(34). Male declivity with a small, blunt tubercle at apex of interstriae 2, sutural emargination very shallow, broad, angle formed on declivital face between suture and subapical margin very slightly greater than 90 degrees, posterior margin lateral to suture extending only slightly beyond level of sutural apex; female frons with a strong transverse impression immediately above epistoma and with a conspicuous median tubercle immediately above impression (male of *difficile* unknown, female frontal characters not strongly developed) ..... 46

— Male without a tubercle or callus at apex of declivital interstriae 2 (except present in *insignatum*), sutural emargination conspicuous, subapical margin conspicuously exceeding sutural apex in lateral area, angle formed on declivital face between suture and subapical margin much greater than 90 degrees; female frons sometimes with transverse groove or carina but never with both ..... 48

46(45). Larger; transverse impression and median tubercle on female frons moderately to poorly developed, dorsolateral areas of frons smooth, shining, very coarsely punctured; (male unknown); Costa Rica to Panama; 2.8–3.1 mm ..... 45. ***difficile*** **(Blandford)**

— Smaller; transverse impression on female frons abrupt, moderately deep, median tubercle rather well developed ..... 46

47(45). Summit of lateral margin of male declivity at line extending between lateral margins of spines 1 and 2; female frons entirely devoid of median carina above median tubercle; Costa Rica; 2.4–2.6 mm ..... 46. ***insignatum*** **Wood**

— At least one-third of impressed area on male declivity lateral to line extending between spines 1 and 2; female frons protruding slightly toward median line, a distinct median carina extending from tubercle to upper level of eyes; Costa Rica; 2.0–2.3 mm ..... 47. ***fastigiorum*** **Wood**

48(45). Male declivital spine 2 laterally compressed, its apex bituberculate or emarginate, female frons very strongly, transversely impressed, impression occupying more than half of area between epistoma and upper level of eyes ..... 49

— Male declivital spine 2 conical, pointed; female frons convex or if strongly, transversely impressed, impressed area confined to much less than one-fourth of area between epistoma and upper level of eyes, (except larger in female *notatum*) ..... 50

49(47). Male elytral declivity slightly steeper, less broadly impressed; surface of male elytral disc reticulate from base to declivity; frons more finely punctured in both sexes; female frontal impression deepest on median third; Puebla; *Alnus*; 2.3–2.5 mm ..... 48. ***bidentatum*** **Wood**

— Male elytral declivity not as steep, more broadly impressed; male elytral disc reticulate on basal half, shining on posterior half; frons very coarsely punctured in both sexes; female frontal impression deepest on lateral thirds; Costa Rica to Panama; *Conostegia*; 2.7–2.8 mm ..... 49. ***bidens*** **(Blandford)**

50(48). Punctures on male declivital striae 1 distinctly impressed; frons with a distinctly, abruptly impressed transverse groove immediately above epistoma, rather weak in male, strongly developed in female; body usually bicolored ..... 51

— Punctures on male declivital striae 1 obsolete or completely confused with other punctures; frons convex or very feebly impressed above epistoma in both sexes ..... 52

51(50). Transverse frontal groove very deep in female, shallow but distinct in male, occupying lower half of area below upper level of eyes; male declivity more deeply impressed, with punctures on striae 1 very fine; Costa Rica to Panama; 2.2–2.5 mm ..... 50. ***notatum*** **Wood**

— Transverse frontal groove similar in both sexes, of uniform width, its width about equal to twice diameter of a facet of eye; male declivity less deeply impressed, with punctures on striae 1 coarse; Costa Rica to Panama; 2.6–3.0 mm ..... 51. ***vittatum*** **(Blandford)**

52(50). Male declivity armed by two pairs of denticles, without a supplemental row of granules ..... 53

— Male declivity on its upper half with a longitudinal row of granules just mesad of spines 1 and 2; female frons without a carina ..... 54

53(52). Male declivity commencing at middle of elytra; frons devoid of a median carina, rather coarsely punctured in female; Costa Rica; 2.2–2.6 mm; (see also 53. ***glabrifrons*** **Blandford**) ..... 52. ***limulum*** **Wood**

— Male declivity normal, restricted to posterior fourth of elytral length; frons with a low median carina in both sexes; Costa Rica; 2.3–2.6 mm ..... 54. ***carinulum*** **Wood**

54(52). Longitudinal row of granules on male declivity rather poorly developed, granules rather small, declivital sulcus between suture and granules less strongly impressed, surface rising gradually to granules; Honduras; 2.4–2.8 mm ..... 55. ***subgranulatum*** **Wood**

— Longitudinal row of granules on male declivity conspicuous, granules coarse, declivital sulcus between granules and suture more strongly impressed, surface rising precipitously to granules; Puebla to Oaxaca; 2.6–2.8 mm ..... 56. ***granulatum*** **Bright**

55(33). Declivital spine 2 entirely absent in both sexes, margin of sutural emargination strongly elevated perpendicular to declivital face, this elevation in male as high as its longest basal width; Costa Rica; 1.4 mm ..... 57. ***infradentatum*** **Wood**

— Declivital spine 2 present in both sexes, margin of sutural emargination weakly if at all elevated ..... 56

56(55). Declivital face finely punctured, subapical margin evenly curved from suture to lateral margin, area between spines more strongly impressed, including area anterior to spine 1; Costa Rica; 1.7–1.9 mm ..... 58. ***corculum*** **Wood**

— Declivital face more coarsely, shallowly punctured, elevated margin moderately to strongly angulate in posterolateral area, area between spines weakly impressed, and more strongly convex near suture anterior to spine 1 (these characters less evident in female) ..... 57

57(56). Male declivity with posterolateral angles (formed by raised margin) rounded; Costa Rica; 1.7–2.1 mm ..... 59. ***posticum*** **Wood**

— Male declivity with posterolateral angles abrupt; Costa Rica to Venezuela; 1.9–2.3 mm ..... 60. ***proximum*** **Wood**

### 1. *Monarthrum dentatum* (Eggers)

*Amphicranus dentatus* Eggers, 1931, Ent. Blätt. 27:19 (Holotype, male, Mineral del Chico, Hidalgo, Mexico; Berlin Mus.)

DIAGNOSIS.— The true affinities of this species must remain in doubt until normal specimens are available; it should probably be placed somewhere between *scutellare* (LeConte) and *quercicolens* Wood.

MALE.— Length 4.3 mm, 3.3 times as long as wide; color reddish brown, basal two-thirds of elytra yellowish brown.

Frons essentially as in *scutellare*. Pronotum 1.3 times as long as wide; posterior areas reticulate, punctures fine, sparse. Elytra 1.9 times as long as wide, 1.4 times as long as pronotum; discal surface with areas of obscure reticulation, smoother and with impressed points between areas of reticulation, with weak, irregular impressed lines, punctures almost obsolete, confused, small. Declivity intermediate between *scutellare* and *quercicolens*, spine 1 blunt, almost obsolete, 2 small, pointed; subspinose angle at upper limit of strongly elevated lateral margin at level of middle of declivity, lateral margin continued from this angle to sutural apex; floor of excavated area with a conspicuous, blunt denticle as high as wide at level of middle of declivity in line with discal interstriae 3 on right elytron only (abnormality?).

DISTRIBUTION.— Hidalgo.

MEXICO: **Hidalgo**: Mineral del Chico, 23, Flohr.

NOTES.— The above treatment was based on the holotype.

### 2. *Monarthrum scutellare* (LeConte)

*Corthylus scutellaris* LeConte, 1860, Pacific R.R. Expl. Surv. 9(1):59 (Holotype, female; San Jose, California; Mus. Comp. Zool., 2021)

*Cryphalus cavus* LeConte, 1868, Trans. Amer. Ent. Soc. 2:153 (Holotype, male; coast region south of San Francisco, California; Mus. Comp. Zool.); LeConte, 1876, Proc. Amer. Philos. Soc. 15:348. *Synonymy*

*Pterocyclon obliquecaudatum* Schedl, 1935, Rev. de Ent. 5:351 (Syntypes, female; California; Schedl Coll.); Wood, 1966, Great Basin Nat. 26:26. *Synonymy*

DIAGNOSIS.— In this species the declivital suture is not emarginate, and the female declivity is broadly convex; in the male it is rather deeply excavated and armed on the basal margin by two pairs of denticles, and the frons is convex in both sexes, with inconspicuous vestiture.

MALE.— Length 3.0–3.5 mm, 2.8 times as long as wide; color dark brown.

Frons very broadly convex, epistomal process low, its margin abrupt, procurved, occupying median two-thirds; surface rugose-reticulate to upper level of eyes, smoother above, punctures moderately coarse, rather shallow; vestiture inconspicuous except for brush of hair arising from lower margin of epistomal process. Eye rather small, oval, almost one-third divided by emargination; finely faceted; emargination almost entirely filled by antennal socket. Antennal scape elongate; funicle 2-segmented; club 1.17 times as long as scape, 1.3 times as long as wide; suture 1 and 2 weakly procurved.

Pronotum 1.2 times as long as wide; sides almost straight and parallel on basal half, weakly, arcuately converging, then very broadly rounded in front; anterior submargin armed by about 16 low serrations; indefinite summit one-third pronotum length from anterior margin; anterior slope steep, rather finely, closely asperate; posterior areas reticulate, finely, rather sparsely punctured. Glabrous except at margins.

Elytra 1.6 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal six-sevenths, rather abruptly rounded, feebly, broadly subemarginate behind; surface obscurely subreticulate, with minute lines and points usually present, punctures mostly connfused, fine, shallow. Declivity broadly, concavely excavated, rather steep; basal margin abruptly rounded, interstriae 1 usually armed by one or more small, pointed granules, 2 and 3 each armed by a small, pointed spine, lateral margins narrowly, strongly elevated to suture, an abrupt, subspinose angle on margin in line with

interstriae 4, rather strongly explanate below, most specimens entire at suture, a few narrowly cleft; floor of excavated area broad, mostly reticulate, punctures fine, rather close, confused, suture feebly elevated, unarmed. Vestiture largely confined to declivity, of abundant, long hair.

FEMALE.— Similar to male except antennal club bearing a tuft of long hair on posterior face; serrations on anterior submargin of pronotum obsolete; elytral disc strongly reticulate; declivity flattened below, broadly convex above, margins rounded, not at all elevated, spines at base represented by small tubercles, interstriae 2 with a small blunt tubercle on 2 just above middle of declivity, posterior margin subacutely, weakly elevated.

DISTRIBUTION.— British Columbia to Baja California.

CANADA: **British Columbia**: Duncan, Genoa Bay. USA: **California**: Alameda, Alum Rock St. Pk. in Santa Clara Co., Anaheim, Anderson Valley, Ben Lomond in Santa Cruz Co., Berkeley, Big Sur, Big Trees Grove in Mariposa Co., Brookwood in Santa Cruz Co., Callistoga, Camp Greeley in Fresno Co., Carmel, Fieldbrook, Lagunitas, Los Gatos, Marin Co., Menlo Park, Miami R.S., Mill Valley, Mt. Tamalpais, Muir Woods, Napa Co., Nojo River in Mendocino Co., Oakland, Palo Alto, Placerville, Pomona, Port Reyes, Santa Barbara, Santa Cruz Mts., San Mateo, Sequoia N.P., Shasta Co., Yorkville, Yosemite. **Oregon**: Ashland, Corvallis, Hood River. **Washington**: Seattle. MEXICO: **Baja California**: 6.5 km Arroyo Santo Tomás.

HOSTS.— *Chrysolepsis* sp., *Lithocarpus densiflorus*, *Quercus agrifolia*, *Q. kelloggii*.

BIOLOGY.— Usually in logs larger than 15 cm in diameter.

NOTES.— The above treatment was based on 261 specimens, including the type series of *scutellare*, *cavus*, and *obliquecaudatum*. The series from Baja California is smaller and exhibits minor differences in the antenna, female frons, and male elytra. Future collecting might make possible the recognition of subspecies based on these variations.

### 3. *Monarthrum huachucae* Wood

*Monarthrum huachucae* Wood, 1959, Great Basin Nat. 19:61 (Holotype, male; Miller Canyon, Huachuca Mts., Arizona; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from *scutellare* (LeConte) by the more dorsal position of the angulate, subspinose upper limits of the lateral margins of the elytral declivity, by the more slender body form, and by the abundant, long hair on the female frons.

MALE.— Length 3.0–3.5 mm, 3.1 times as long as wide; color very dark brown.

Frons as in *scutellare* except epistomal process bearing a short, median, tuberculate carina. Pronotum 1.25 times as long as wide; as in *scutellare*.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; essentially as in *scutellare* except discal punctures smaller, lateral margins of declivity higher and extending higher on declivity, distance between spines 1 and 2 almost equal to distance between 2 and subspinose upper angle of lateral margins; punctures on declivital face smaller; vestiture much less abundant, mostly shorter.

FEMALE.— As in female *scutellare* except frons below upper level of eyes dull, very finely, densely punctured, and ornamented by abundant, long hair.

DISTRIBUTION.— S Arizona.

USA: **Arizona**: Miller Canyon, Huachuca Mts., 29-VI-07, H. A. Kaeber, 22-VIII-58 and 8-VIII-62, *Quercus hypoleucoides*, S. L. Wood; 4 miles or 6 km SW Forestdale, Navajo Co., 23-VIII-52, H. B. Leech. Oak Creek Canyon, V-78, M. W. Sanderson.

BIOLOGY.— Apparently as in *scutellare*.

NOTES.— The above treatment was based on the type series of 4 specimens and on 26 other specimens.

### 4. *Monarthrum quercus* (Wood)

Fig. 217

*Amphicranus quercus* Wood, 1967, Great Basin Nat. 27:53 (Holotype, male; 3 miles or 5 km W El Salto, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *scutellare* (LeConte) by the more slender form, by the profoundly explanate male declivity, by characters on the frons, and by other characters.

MALE.— Length 4.4–4.6 mm (female 2.4–3.8 mm), 3.4 times as long as wide; color dark brown.

Frons broadly, evenly convex, surface rugose-reticulate, rather coarsely punctured; epistomal process almost parallel to epistomal margin; vestiture largely limited to epistomal brush.

Pronotum 1.8 times as long as wide; sides straight and parallel on basal two-thirds,

broadly rounded to obtusely subangulate in front; anterior margin largely unarmed; much as in *scutellare* except for a subcircular area one-fifth as wide as pronotum and just anterior to summit impressed, devoid of asperities; its surface reticulate. Glabrous.

Elytra 2.1 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal nine-tenths, broadly rounded behind, deeply, narrowly emarginate at suture; disc much as in *scutellare* except not at all reticulate, shining. Declivity much as in *scutellare* except spine 1 at base blunt, displaced toward suture, lateral margins profoundly elevated and extended caudad, upper angle of margin forming a subquadrate tooth, very strongly explanate at narrowly, deeply emarginate suture; inner surface of excavated area subrugose-reticulate except shining and clearly punctured on lower half near suture. Vestiture confined to declivity, rather short except long on crest of elevated lateral margins.

FEMALE.— Frons about as in male, otherwise about as in female *scutellare* except declivity broadly, shallowly concave, lateral margins on lower half slightly higher, and obtuse denticle on face of declivity larger.

DISTRIBUTION.— Durango.

MEXICO: **Durango**: 5 km W El Salto, 7-VI-65, 2500 m, No. 32, *Quercus*, S. L. Wood.

BIOLOGY.— Specimens were taken from logs and boles 50–100 cm in diameter.

NOTES.— The above treatment was based on the type series of 46 specimens.

### 5. *Monarthrum quercivorum* Schedl

*Monarthrum quercivorus* Schedl, 1977, Zeitschr. Arb. Österr. Ent. 29:46 (Holotype, male; Metapán, El Salvador; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from the very closely allied *querneum* Wood by characters presented in the above key.

MALE.— Length 3.0–3.7 mm, 3.2 times as long as wide.

Very similar to *querneus* except as indicated in the above key. The female was not examined.

DISTRIBUTION.— El Salvador.

EL SALVADOR: Metapán, 20-XII-74, 1600–2200 m, *Quercus*, H. Schmutzenhofer.

NOTES.— The above treatment was based on a male, presumably the holotype, prior to its description.

### 6. *Monarthrum querneum* Wood

Fig. 216

*Monarthrum querneus* Wood, 1967, Great Basin Nat. 27:50 (Holotype, male; 33 miles or 53 km E Morelia, Michoacán, Mexico; Wood Coll.)

*Monarthrum bifidus* Bright, 1972, Canadian Ent. 104:1381 (Holotype, male; 13 km or 8 miles E San Cristóbal de las Casas, Chiapas, Mexico; Canadian Nat. Coll.); Wood, 1973, Great Basin Nat. 33:179. *Synonymy*

DIAGNOSIS.— This species is distinguished from *quercicolens* Wood by the smaller size, by the procurved margin of the male epistomal process, by the more restricted vestiture on the female frons, by the broader, deeper impression on the female vertex, and by differences on the elytral declivity.

MALE.— Length 2.8–3.4 mm, 3.3 times as long as wide; color dark brown except basal half of pronotum and basal two-thirds of elytra, legs, and antennae yellowish brown.

Frons about as in *scutellare* except epistomal process less strongly elevated, less strongly procurved.

Pronotum 1.3 times as long as wide; about as in *scutellare*.

Elytra 1.8 times as long as wide, 1.4 times as long as pronotum; outline and disc about as in *scutellare* except surface smoother, lines and impressed points almost obsolete. Upper half of declivity very similar to *scutellare* except spines 1 and 2 slightly larger; strongly elevated lateral margins present on slightly less than middle third of declivity, ending abruptly, lateral margin continued to sutural apex at less than half height of middle third; floor of excavated area smooth, with rather coarse, close, deep punctures. Vestiture largely confined to declivity; long on lateral margins, shorter and less abundant in excavated area.

FEMALE.— Frons similar to male except median third of epistomal brush of hair much more abundant and slightly more extensive; vertex concavely impressed on median area, impression twice as wide as long, its length equal to distance slightly less than width of antennal club; pronotum and elytra about as in female *scutellare* except declivity slightly more convex, with median sulcus on upper half slightly deeper.

DISTRIBUTION.— Michoacán and Hidalgo to Honduras.

MEXICO: **Chiapas**: 13 km E and 6 km E San Cristóbal de las Casas, 6-VI-69, *Quercus*, D. E. Bright. **Hidalgo**: 30 km E Tulancingo, 12-VI-67, 2300 m, No. 15, *Quercus*, S. L. Wood. **Michoacán**: 53 km E Morelia, 14-VI-65, 3000 m, No. 51, *Quercus*, S. L. Wood. HONDURAS: Zamorano, Morazán, 18-IV-64, 700 m, No. 516, *Q. hondurensis*, S. L. Wood.

HOSTS.— *Quercus hondurensis*, *Q.* spp.

BIOLOGY.— Specimens were taken from logs 20–60 cm in diameter.

NOTES.— The above treatment was based on the type series of 44 specimens of *querneum*, on the holotype and 2 paratypes of *bifidus*, and on 39 other specimens.

### 7. *Monarthrum quercicolens* Wood
Fig. 216

*Monarthrum quercicolens* Wood, 1967, Great Basin Nat. 27:49 (Holotype, male; 33 miles or 53 km E Morelia, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *querneum* Wood by the larger size, by the straight margin of the male epistomal process, by the more abundant, more extensive female frontal vestiture, by the shallower, narrower impression on the female vertex, and by the declivity.

MALE.— Length 3.7–4.3 mm, 3.1 times as long as wide; color dark brown, basal half of pronotum and basal half of elytra usually lighter.

Frons with margin of epistomal process straight, more abruptly elevated; other aspects as in *querneum*.

Pronotum and elytra as in *querneum* except strongly elevated portion of lateral margin slightly longer, its crest from dorsocaudal aspect longitudinally arcuate (almost straight in *querneum*); punctures on floor of excavated area more numerous; vestiture more abundant, longer.

FEMALE.— Frons much as in female *querneum* except abundant vestiture continued on median fourth from epistoma to well above eyes, above eyes more broadly distributed over more than median half; impression on vertex rather shallow, heart-shaped, as wide as long, its width about two-thirds as great as width of antennal club; pronotum and elytra about as in female *querneum*.

DISTRIBUTION.— Chihuahua and Hidalgo to Panama.

MEXICO: **Chihuahua**: San Juanito, 4-V-77, *Quercus*, M. M. Furniss. **Durango**: 16 km W El Salto, VII-64, J. B. Thomas. **Hidalgo**: 30 km E Tulancingo, 12-VI-67, 2300 m, No. 15, *Quercus*, S. L. Wood. **Michoacán**: 9 km S Carapan, 18-VI-65, 2300 m, No. 78, *Quercus*, S. L. Wood; 53 km E Morelia, 14-VI-65, 3000 m, No. 51, *Quercus*, S. L. Wood. GUATEMALA: Panyachel, 20-VIII-65, P. J. Spangler, Tecpan, 8-VIII-67, O. S. Flint. PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, No. 373, *Quercus*, S. L. Wood.

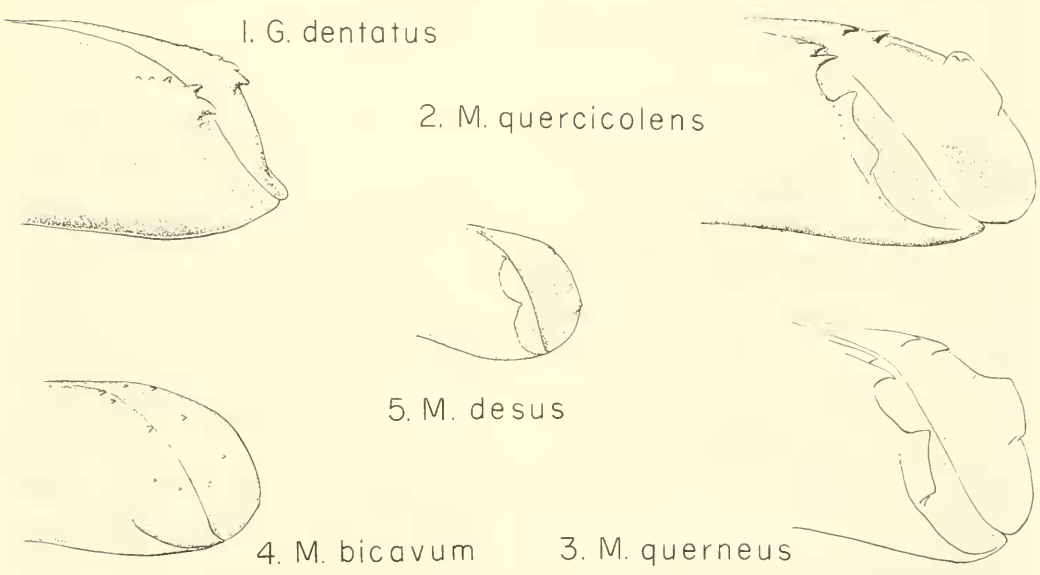



Fig. 216. Corthylini spp., declivities: 1, *Gnathotrichus dentatus*; 2, *Monarthrum quercicolens*; 3, *Monarthrum querneum*; 4, *Monarthrum bicavum*; 5, *Monarthrum desum*. (After Wood 1967:46.)

BIOLOGY.— Specimens were taken from the same logs as *queneum*.

NOTES.— The above treatment was based on the type series of 17 specimens and on 21 other specimens.

The Panama series has the frontal hair in the female more widely dispersed on the lower half. Although this could have subspecific significance, the recognition of subspecies is not warranted by the material at hand.

### 8. *Monarthrum validum* (Ferrari)

*Corthylus validus* Ferrari, 1867, Die Forst- und Baumzuchtschädlichen Borkenkäfer, p. 55 (Lectotype, male; Mexico; Vienna Mus., designated by Wood, 1974, Great Basin Nat. 34:285)

*Amphicranus mexicanus* Eggers, 1931, Ent. Blätt. 27:18 (Holotype, male; Mexico; Berlin Mus.); Wood, 1974, Great Basin Nat. 34:285. *Synonymy*

*Pterocyclon jalapae* Schedl, 1939, Mitt. Münchn. Ent. Ges. 29:584 (Holotype, male; Jalapa, Veracruz, Mexico; Schedl Coll.); Wood, 1974, Great Basin Nat. 34:285. *Synonymy*

DIAGNOSIS.— This species is distinguished from *gnarum* (Schedl) by the different male declivital armature, with almost obsolete declivital punctures, and by the deeper female excavation on the vertex, without a median carina on its floor.

MALE.— Length 4.3–4.8 mm, 3.1 times as long as wide; color dark brown.

Frons as in *gnarum* except median tubercle slightly closer to epistoma, granules smaller. Pronotum and elytral disc as in *gnarum* except punctures on both evidently from fine (as in *gnarum*) to very minute. Declivity as in *gnarum* except quadrate lateral elevation with lower third divided by a cleft from its upper two-thirds, thus forming an upper quadrate, and a lower, slightly longer, cylindrical, blunt spine; floor of excavation rugulose laterally, punctures much finer, almost obsolete, a few of them replaced by minute granules.

FEMALE.— Similar to female of *gnarum* except excavated area on vertex at least twice as deep, its floor not at all divided by a median carinate partition.

DISTRIBUTION.— "Mexico" and Costa Rica to Panama.

MEXICO: "Mexico, Flohr." COSTA RICA: Tapantí, Cartago, 2-VII-63, 1300 m, No. 6, *Quercus*, S. L. Wood. PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, No. 373, *Quercus*, S. L. Wood.

BIOLOGY.— Specimens were taken from logs 30–100 cm in diameter.

NOTES.— The above treatment was based on 26 specimens to which the types of *validus*, *mexicanus*, and *jalapae* had been directly compared. The male lectotype of *validus* has the punctures of the elytra very slightly larger than my series from Costa Rica and Panama; however, this character is rather variable within these series and probably does not have taxonomic significance.

### 9. *Monarthrum praeruptum* (Blandford)

*Pterocyclon praeruptum* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):273 (Holotype, male; Totonicipan, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *gnarum* (Schedl) by the less strongly excavated male elytral declivity, with the lateral margins less strongly elevated, with the ventrolateral margin less strongly explanate, and with the surface of the excavated area entirely reticulate.

MALE.— Length 4.1 mm; as in *gnarum* except as noted in diagnosis; in addition, minor spines at base of declivity smaller, lower angle of major spine more strongly acuminate.

DISTRIBUTION.— Guatemala.

GUATEMALA: Totonicapan, 85–10,500 ft, G. C. Champion.

NOTES.— The above treatment was based on the holotype.

### 10. *Monarthrum gnarum* (Schedl)

*Pterocyclon gnarum* Schedl, 1950, Dusenia 1:169 (Holotype, female; Mexico; Schedl Coll.)

*Amphicranus spinatus* Bright, 1972, Canadian Ent. 104:1383 (Holotype, male; 51 km or 32 miles S Valle Nacional, Oaxaca, Mexico; Canadian Nat. Coll., 12655); Wood, 1974, Great Basin Nat. 34:285. *Synonymy*

DIAGNOSIS.— This species is distinguished from *quercicolens* Wood by the brown color, by the frons in both sexes, by the less abundant elytral vestiture, and by the rather deep cleft between the quadrate process on the lateral margin and the ventrolateral margin of the declivity.

MALE.— Length 4.2–4.7 mm, 3.1 times as long as wide; color brown.

Frons broadly convex, a distinct transverse impression between epistomal process and

median tubercle at upper level of eyes; epistomal process ascending slightly, distinctly procurved; surface rugose-reticulate below, smooth and shining above upper level of eyes; area below upper level of eyes with moderately coarse, rounded, isolated granules, rather coarsely punctured above. Antennal club obovate, 1.7 times as long as wide.

Pronotum 1.2 times as long as wide; about as in *scutellare* except anterior margin more narrowly rounded, armed by about 10 coarser serrations; posterior areas obscurely reticulate (probably variable), punctures fine, distinct, moderately close.

Elytra about as in *quercicolens* except surface smoother, shining, base of declivity with fine, pointed teeth on interstriae 1, 2, and 3, quadrate process higher than in *quercicolens*, separated from more strongly elevated ventrolateral process by an acutely angulate (about 30 degrees) cleft; floor of excavated area smooth, shining, punctures very small, shallow. Vestiture very sparse, confined to sides and margins of declivity.

FEMALE.— Frons elongate, weakly convex, smooth, closely, deeply, rather finely punctured, glabrous; vertex with a heart-shaped, rather deep excavation, about 1.7 times as long as wide, dorsal half of its floor marked by median carina; anterior margin of pronotum unarmed, posterior areas strongly reticulate; elytral disc strongly reticulate; declivity about as in female *quercicolens* except sutural and subapical impressions stronger, lateral areas armed by three to six scattered tubercles.

DISTRIBUTION.— Hidalgo to Chiapas.

MEXICO: **Chiapas**: San Cristóbal de las Casas, 26-V-69, at light, D. E. Bright. **Hidalgo**: 30 km E Tulancingo, 12-VI-67, 2300 m, No. 15, *Quercus*, S. L. Wood. **Oaxaca**: 41 km S Juchatengo, 11, 27–30-V-71, at light, D. E. Bright, 59 km S Valle Nacional, 24-V-71, 2700 m, at light, D. E. Bright.

BIOLOGY.— One female was taken from a log 30 cm in diameter.

NOTES.— The above treatment was based on the holotypes of *gnarum* and *spinatus*, on several paratypes of *spinatus*, and on one other female.

### 11. *Monarthrum tomicoides* (Blandford)

*Pterocyclon tomicoides* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):273 (Lectotype, male; San Geronimo, Verapaz, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *conversum* Wood by the broadly, weakly elevated epistomal process and by the male declivity.

MALE.— Length 3.2–3.3 mm, 2.7 times as long as wide; color black.

Frons, pronotum, and elytral disc as in *conversum* except epistomal process weakly, broadly elevated. Elytral declivity essentially as in *conversum* except slightly more broadly impressed, sutural emargination twice as wide; basal margin with a minute tubercle on interstriae 1, a small pointed tooth on 2, interstriae 3 armed by a large, conical, sharply pointed spine (equivalent of spine 1 in *conversum*), lower, lateral spine (equivalent to spine 2 in *conversum*) narrowly quadrate as in *conversum* but slightly longer and slightly shorter than spine at base on interstriae 3.

DISTRIBUTION.— Guatemala.

GUATEMALA: San Geronimo, Verapaz, G. C. Champion.

NOTES.— The above treatment was based on the three male syntypes in the original series. The first of these was labeled as the type, but it has never been so designated. I here designate that specimen as the lectotype of *tomicoides* (Blandford).

### 12. *Monarthrum bispinum* (Blandford)

*Pterocyclon bispinum* Blandford, 1904, Biol. Centr. Amer. Coleopt. 4(6):281 (Holotype, male; Bugaba, Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This species apparently is allied to *cordicticum* Wood, from which it is distinguished by the presence of three pairs of spines on the basal half of the male declivity, by the absence of spines on the face of the male declivity, and by the shining, much more strongly impressed female declivity.

MALE.— Length 2.6–2.8 mm, 2.8 times as long as wide; color yellowish brown to brown, anterior third of pronotum and elytral sides and declivity usually darker.

Frons broadly convex, a distinct, transverse impression immediately above slightly elevated epistomal margin; surface rugose-

reticulate, punctures rather abundant, moderately close, not sharply impressed; vestiture inconspicuous. Antennal club 1.7 times as long as wide, oval except narrowly rounded at both ends.

Pronotum 1.2 times as long as wide; sides almost straight and parallel on basal half, an indistinct, feeble constriction anteriorly, rather narrowly rounded in front; anterior margin armed by about 10–12 broad, low serrations; indefinite summit one-third length from anterior margin; anterior slope rather coarsely asperate; posterior areas finely reticulate, minute, sparse, almost obsolete. Glabrous.

Elytra 1.5 times as long as wide, 1.2 times as long as pronotum; sides subparallel, feebly arcuate to apex, obtusely, rather deeply emarginate on more than median half behind; disc smooth, shining, strial punctures very minute, in rows. Declivity broadly, concavely excavated, outline an inverted heart shape; basal margin abruptly precipitous to suture, spines 1 and 2 conical, pointed, rather coarse, spine 3 in line with interstriae 4, twice as long and twice as thick as 1 or 2, cylindrical, pointed; posterolateral margin acutely, continuously elevated on an irregular arc from base of spine 3 to suture; broadly, rather deeply emarginate at suture; concavity rather deep, deepest near feebly elevated suture, rising gradually to lateral margins; surface of concavity mostly smooth, shining, punctures moderately close and clearly impressed on median half only. Glabrous.

FEMALE.— Similar to male except posterior face on antennal club not as slender, ornamented by long hair; anterior margin of pronotum very feebly serrate; margins of declivity not acutely elevated except on lower third, spines represented by pointed granules, 3 slightly displaced mesad; declivity, particularly upper half, rather strongly, concavely impressed, surface reticulate.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 61, log, S. L. Wood. PANAMA: Bugaba, Chiriquí, 800–1500 ft, G. C. Champion.

BIOLOGY.— Specimens were cut from a yellowish log 30 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 20 other specimens.

### 13. *Monarthrum terminatum* (Blandford)

*Pterocyclon terminatum* Blandford, 1904; Biol. Centr. Amer., Coleopt. 4(6):280 (Holotype, male; Capetillo, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *cordatum* (Blandford) and *cordicticum* Wood by the larger size and by the very different male declivity.

MALE.— Length 2.7 mm, 3.0 times as long as wide; as in *cordicticum* except declivity. Declivity steep, moderately excavated on basal half, basically almost flat below; basal margin armed as in *cordicticum* except spines slightly larger and stouter, lateral margins abruptly rounded, not strongly elevated except moderately elevated on lower half; a large, blunt, crescent-shaped elevation extending from middle of declivity on interstriae 3 to lower fourth of declivity near suture, its upper limits armed by a rather small, blunt tubercle; most surfaces smooth, shining. Vestiture confined to declivity, of moderately abundant, rather long hair.

DISTRIBUTION.— Guatemala.

GUATEMALA: Capetillo, G. C. Champion.

NOTES.— The above treatment was based on the holotype.

### 14. *Monarthrum cordicticum* Wood

*Monarthrum cordicticum* Wood, 1974, Great Basin Nat. 34:135 (Holotype, male; 30 km or 19 miles E Tulancingo, Hidalgo, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *cordatum* (Blandford) in the male by the more gradual elytral declivity, by the less strongly, less abruptly elevated lateral margin of the declivity, by the larger, acutely pointed declivital spine 1 and smaller spine 2. The female is indistinguishable from the female of *cordatum*.

MALE.— Length 2.0–2.4 mm, 3.1 times as long as wide; color yellowish brown except anterior half of pronotum and elytral declivity dark brown.

Frons and pronotum as in *bispinum* (Blandford).

Elytra 1.8 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel almost to apex then broadly rounded, rather deeply, subacutely emarginate on median third behind; surface subreticulate except almost smooth near declivity, punctures

obscure. Declivity steep; concavely truncate; margin abrupt; spine 1 almost at suture, rather small, sharply pointed, 2 in line with striae 3, twice as long as 1, pointed, curved very slightly mesad, lateral margin from spine 2 to suture subacute, rather strongly elevated, descending gradually on its inner margin; rather deeply, subacutely emarginate at suture; excavated area rugose-reticulate, rather numerous, confused punctures on median third, a conical spine just below middle in line with discal interstriae 3, this denticle about as large as spine 1. Subglabrous.

FEMALE.— Similar to male except posterior face of antennal club without long hair; anterior margin of pronotum feebly serrate; declivity flat on lower half, more nearly convex and shallowly sulcate from suture to interstriae 2 above, small, pointed denticles on interstriae 3 at base and also slightly above middle.

DISTRIBUTION.— Puebla to Hidalgo.

MEXICO: **Hidalgo and Puebla**: 30 km E Tulancingo, on state line, 13-VII-67, 2300 m, No. 15, *Quercus*, S. L. Wood.

BIOLOGY.— Specimens were cut from a log 20 cm in diameter.

NOTES.— The above treatment was based on the type series of 22 specimens. The female could not be distinguished from *cordatum*.

### 15. *Monarthrum cordatum* (Blandford)

*Pterocyclon cordatum* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):279 (Holotype, female; Quiché Mts., Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— The male is distinguished from *cordicticum* Wood by the steeper declivity, by the reduced spine 1 and larger spine 2 on the declivity, and by the more abruptly, more strongly elevated lateral margin of the declivity.

MALE.— Length 2.2–2.4 mm; as in *cordicticum* except for elytral declivity. Declivity very steep; as in *cordicticum* except spine 1 blunt, almost obsolete, spine 2 longer and stouter, lateral margin abruptly elevated on inner margin, about as high as wide; face of declivity without distinct punctures on median third.

FEMALE.— Indistinguishable from female *cordicticum*.

DISTRIBUTION.— Guatemala to Panama.

GUATEMALA: Quiché Mts., G. C. Champion. PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, No. 373, *Quercus*, S. L. Wood.

HOST.— *Quercus* sp.

BIOLOGY.— Specimens were cut from a log 30 cm in diameter.

NOTES.— The above treatment was based on one male and three females from Panama. The females were compared directly to the female holotype from Guatemala. These females are indistinguishable from the female of *cordicticum*. It was arbitrarily decided, in the absence of males from southern Mexico or Guatemala, that the Panama series was *cordatum*, because of similarity in the kind of habitat and of oak species. These species must be reexamined when more material is available for study.

### 16. *Monarthrum nevermanni* Schedl

*Pterocyclon nevermanni* Schedl, 1935, Rev. de Ent. 5:348 (Holotype, male; Kraterlagune, Vulkan Poas, Heredia, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from allied forms by the subacutely elevated posterolateral margin of the male declivity, which is continued dorsad and meets spine 2 at its summit, and by the rather coarsely punctured frons, which has a rather definite median carina (poorly developed in the male).

MALE.— Length 3.5–4.0 mm, 3.0 times as long as wide; color brown.

Frons broadly convex, a feeble transverse impression just above epistoma; surface rugose-reticulate, punctures rather coarse, deep, moderately close, a low, broad, median carina from epistomal process to upper level of eyes; vestiture sparse, inconspicuous. Antennal club somewhat obovate, 1.4 times as long as wide.

Pronotum 1.15 times as long as wide; essentially as in *scutellare* (LeConte) except anterior margin more narrowly rounded and armed by about 10 serrations.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, then very slightly narrowed to apex, very broadly rounded and with a moderately deep U-shaped emargination on median third behind; surface reticulate; punctures minute, confused. Declivity rather steep; broadly,

concavely excavated; upper margin rounded, with broadly based, subacutely pointed, low spine 1 in line with striae 3, spine 2 on margin in line with striae 5, forming a subspinose, obtusely pointed angle on lateral margin, subacute lateral margin continuing from its summit to lateral margin of apical emargination; floor of excavated area ascending gradually from position of interstriae 2 to lateral summit, surface reticulate, punctures very fine, confused, rather abundant. Almost glabrous.

FEMALE.— Similar to male except frontal carina more definite; antennal club subtriangular, as wide as long, its posterior face ornamented by long hair; anterior margin of pronotum unarmed; margins of declivity rounded, more nearly sulcate, spine 2 displaced mesad, similar to 1.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Irazu, Cartago, 13-VII-63, 2300 m, No. 42, *Quercus*, S. L. Wood, Volcán Poás, Heredia, 14-VII-63, 2500 m, No. 46, *Podocarpus oleifolius*, 6-IX-63, 1300 m, No. 170, *Clusia*, S. L. Wood.

HOSTS.— *Clusia* sp., *Quercus* spp., *Podocarpus oleifolius*.

BIOLOGY.— Specimens were cut from logs 20–120 cm in diameter.

NOTES.— The above treatment was based on 51 specimens, 2 of which were compared directly to the holotype by me.

### 17. *Monarthrum robustum* (Schedl)

*Pterocyclon robustum* Schedl, 1966, Ent. Arb. Mus. Frey 17:123 (Holotype, female; Las Mercedes, Santa Clara district in Limón, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from others in this species group by the male declivital sulcus, which begins slightly anterior to the middle of the elytra, by other details of the declivity, and by the complete absence of a median frontal elevation in either sex.

MALE.— Length 2.3–2.5 mm, 2.5 times as long as wide; color dark brown.

Frons broadly convex, a weak transverse impression just above slightly elevated epistomal margin; surface rugose-reticulate from epistomal impression almost to upper level of eyes, at sides, and on vertex, central area almost smooth, punctures rather coarse, moderately close except sparse in central area; vestiture inconspicuous.

Pronotum 1.1 times as long as wide; outline as in *nevermanni*; indefinite summit at middle; anterior slope coarsely asperate, anterior margin armed by about eight serrations; posterior areas reticulate, punctures sparse, fine, some near base extended by short, transverse lines. Glabrous.

Elytra 1.3 times as long as wide, 1.2 times as long as pronotum; sides straight and parallel on basal half, weakly, arcuately converging, then very broadly rounded behind, rather shallowly emarginate on median one-fifth; disc occupying basal half of elytral length; surface reticulate at base, shining near declivity, a few weak, irregular lines present, punctures very fine, confused toward base, mostly in rows toward declivity. Declivity commencing at or slightly anterior to middle, sulcate between interstriae 3 to level of spine 1 then more steeply, more broadly impressed; spine 1 on crest, moderately small, pointed, its anterior slope subcarinate; distance from base to spine 1 slightly greater than from spine 1 to apex; spine 3 slightly mesad of margin, distances to spine 1 and to apex about equal, conical, slightly larger than 1; posterolateral margin acutely, weakly elevated on a semicircular arc from sutural apex to a point at level of lower margin of spine 2; surface smooth, shining, punctures small, confused, moderately deep, rather abundant. Subglabrous.

FEMALE.— Similar to male except frons less strongly convex; posterior face of antennal club ornamented by long hair; anterior margin of pronotum unarmed; elytral disc reticulate, declivity normal, sulcus anterior to spine 1 greatly reduced, declivital spines and impression slightly reduced.

DISTRIBUTION.— Costa Rica, Trinidad.

COSTA RICA: Las Mercedes, Santa Clara district in Limón, 13-VI-28, 100 m, F. Nevermann; Santa Ana, San José, 9-X-63, 1300 m, No. 228, *Spondias purpurea*, S. L. Wood. TRINIDAD: Morne Bleu, 8-VIII-69, 900 m, H. A. Howden.

HOST.— *Spondias purpurea*.

BIOLOGY.— Specimens were cut from a recently cut limb 20 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 31 other specimens.

### 18. *Monarthrum hoegei* (Blandford)

*Pterocyclon hoegei* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):274 (Holotype, Jalapa, Veracruz, Mexico; British Mus. Nat. Hist.)

*Monarthrum oaxacaensis* Bright, 1972, Canadian Ent. 104:1382 (Holotype, male; 32 miles or 51 km S Valle Nacional, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from others in this group by the presence of a small, blunt tubercle near the apex of male declivital interstriae 2, by the small size, and by the subcarinate median crest on the female frons.

MALE.— Length 2.3–3.0 mm, 2.7 (female 2.9) times as long as wide; color dark brown.

Frons as in *robustum* (Schedl) except transverse impression slightly stronger, a weak, median, subcarinate elevation indicated from epistoma to upper level of eyes.

Pronotum 1.16 times as long as wide; as in *robustum* except punctures very minute.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; disc occupying basal two-thirds; sides straight and parallel on basal two-thirds, very shallowly, obtusely emarginate on median three-fourths behind; surface reticulate, punctures minute, partly in rows. Declivity very similar to female *robustum* but more deeply impressed (somewhat variable), spines conspicuously larger, surface subreticulate, punctures obsolete, a rather conspicuous, low, subtuberculate swelling near apex of interstriae 2. Subglabrous.

FEMALE.— Similar to male except transverse impression above epistoma much deeper, median elevation above impression usually much higher (variable); posterior face of antennal club ornamented by long hair; anterior margin of pronotum more weakly serrate; declivity more narrowly impressed, spines smaller, tubercle near apex of interstriae 2 entirely absent.

DISTRIBUTION.— Puebla and Veracruz to Oaxaca.

MEXICO: **Oaxaca**: 24 km and 51 km S Valle Nacional, 20–21-V-71, 1300 m, D. E. Bright. **Puebla**: 9 km NE Teziutlan, 27-VI-53, 2-VII-67, 1600 m, No. 135 in *Alnus* No. 137 in *Miconia*, S. L. Wood; Las Vigas, 5-VII-67, No. 160, *Alnus*, S. L. Wood.

HOSTS.— *Alnus* sp., *Miconia* sp.

BIOLOGY.— Specimens were cut from branches 4–6 cm in diameter.

NOTES.— The above treatment was based on the holotype and 2 paratypes of *oaxacaensis*, and on 39 other specimens. The unique holotype of *hoegei* differs slightly from my Puebla series; additional material from Veracruz is needed to determine whether or not they actually are the same species.

### 19. *Monarthrum luctuosum* (Blandford)

*Pterocyclon luctuosum* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):276 (Holotype, male; Cerro Zunil, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *robustum* (Schedl) by the coarser, deeper punctures on pronotum and declivity, by the reticulate surface of the elytra, including the declivity, and by the shorter, normal male declivity.

MALE.— Length 2.3–2.6 mm, 2.7 times as long as wide; color dark brown.

Frons and pronotum as in *robustum* except punctures on pronotal disc larger and deeper. Elytra as in *robustum* except disc occupying basal two-thirds, surface reticulate, punctures larger, deeper, confused; declivity about as in *hoegei* except surface reticulate, punctures on median half impressed, confused, rather abundant, and tubercle near apex of interstriae 2 entirely absent.

FEMALE.— Similar to male except posterior face of antennal club ornamented by long hair; spines on elytral declivity slightly smaller, impression not as deep.

DISTRIBUTION.— Puebla to Guatemala.

MEXICO: **Puebla**: 9 km NE Teziutlan, 2-VII-67, 1600 m, No. 136 in tree bole, No. 152 in *Quercus*, S. L. Wood. GUATEMALA: Cerro Zuni, 4000 ft, G. C. Champion.

HOST.— *Quercus* sp.

BIOLOGY.— Specimens were taken from small recently cut trees 8–15 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 20 other specimens.

### 20. *Monarthrum umbrinum* (Blandford)

*Pterocyclon umbrinum* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):275 (Holotype, female; Purulá, Verapaz, Guatemala; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *robustum* (Schedl) by the larger size, by the less strongly impressed lines on the pronotal disc, and by the less extensive,

shallower sutural sulcus anterior to spine 1 on the male declivity.

MALE.— Length 2.9–3.2 mm, 2.7 times as long as wide; color dark brown.

Frons as in *robustum* except upper areas more brightly shining. Pronotum as in *robustum* except punctures on posterior areas slightly finer, transverse lines passing through those near base much finer, less extensive. Elytra as in *robustum* except declivity commencing slightly behind middle, disc about 55 percent of elytral length; sutural sulcus anterior to declivital spine 1 less extensive, about half as deep.

FEMALE.— As in female *robustum* except frons less strongly convex.

DISTRIBUTION.— Puebla to Guatemala.

MEXICO: **Puebla**: 9 km NE Teziutlan, 2-VII-67, 1600 m, Nos. 141 and 145 in *Alnus*, No. 154, tree limb, S. L. Wood. GUATEMALA: Purulá, Verapaz, G. C. Champion.

HOST.— *Alnus* sp.

BIOLOGY.— Specimens were taken from recently cut material from 5–40 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 58 other specimens.

### 21. *Monarthrum consimile* (Blandford)

*Pterocyclon consimile* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):275 (Holotype, female; Volcán de Chiriquí, Chiriquí, Panama; British Mus. Nat. Hist.)

*Pterocyclon pseudosulcatum* Schedl, 1935, Rev. de Ent. 5:348 (Holotype, male; Vara Blanca, Heredia, Costa Rica; Schedl Coll.); Wood, 1974, Great Basin Nat. 34:284. *Synonymy*

DIAGNOSIS.— This species is distinguished from *umbrinum* (Blandford) by the larger average size, by the distinctive epistomal process, by the reticulate elytra, including the declivity, and by the absence of punctures on the declivity.

MALE.— Length 3.0–4.0 mm, 2.6 times as long as wide; color dark brown.

Frons similar to *umbrinum* except dull, mostly reticulate, punctures usually slightly smaller, epistomal process weakly elevated on median sixth and apparently overlapping epistoma, attaining margin.

Pronotum as in *umbrinum* except transverse lines absent.

Elytra as in *umbrinum* except entire surface, including declivity, reticulate, discal punctures smaller, declivital punctures absent; sutural sulcus anterior to spine 1 not as deep, lower declivity more narrowly, more deeply sulcate.

FEMALE.— Similar to male except posterior face of antennal club ornamented by long hair; anterior margin of pronotum more weakly serrate, more broadly rounded; declivital impression less extensive, not as deep, spines smaller.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: 15 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 16, log, S, L. Wood; Tapantí, Cartago, 24-X-63, 1300 m, No. 269, log, S. L. Wood; Volcán Poás, Heredia, 14-VII-63, 2500 m, No. 50, log, S. L. Wood. PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, No. 426, *Ochroma* log, S. L. Wood; Volcán de Chiriquí, 25–4000 ft, G. C. Champion.

HOSTS.— *Ochroma* sp., etc.

BIOLOGY.— Specimens were cut from logs 30–120 cm in diameter.

NOTES.— The above treatment was based on the holotype of *consimile*, on 2 males compared to the holotype of *pseudosulcatum*, and on 66 other specimens. The type locality of *pseudosulcatum* is on the lower slopes of Volcán Poas.

### 22. *Monarthrum egenum* (Blandford)

*Pterocyclon egenum* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):280 (Holotype, female; San Juan, Verapaz, Guatemala; British Mus. Nat. Hist.)

*Brachyspartus bisetosus* Schedl, 1954, Dusenia 5:38 (Syntypes, female; Río Caraguata, Matto Grosso, Brazil; Schedl Coll., etc.)

DIAGNOSIS.— This species is distinguished by the small size, by the obliquely truncate male declivity that is armed by two pairs of spines, and by the peculiar female frons.

MALE.— Length 1.4–1.8 mm, 2.9 times as long as wide; color yellowish brown, anterior third of pronotum and elytral declivity very dark brown.

Frons broadly convex, with a weak transverse impression immediately above epistomal margin; surface rugose-reticulate from impression to upper level of eyes, smooth and shining above, punctures rather coarse, moderately close; vestiture of sparse, fine, inconspicuous hair. Antennal club oval, 1.37 times as long as wide; sutures straight, segment 3 distinctly longer.

Pronotum 1.27 times as long as wide; essentially as in *scutellare* (LeConte).

Elytra 1.4 times as long as wide, 1.2 times as long as pronotum; sides almost straight and parallel almost to sutural apex, then rather broadly rounded behind, narrowly, rather shallowly emarginate at suture; disc occupying basal two-thirds, its surface shining, almost lmooth, small strial punctures very obscurely indicated. Declivity abrupt, steep, shallowly, broadly concave; basal margin obtusely angled, not precipitous, a small, pointed spine on margin at interstriae 3; spine 2 on margin at middle of declivity, margin below spine 2 acute but not elevated; surface of excavated area smooth, shining, punctures on sutural row sparse, rather widely spaced, other punctures on upper half almost obsolete. Vestiture confined to declivity, moderately abundant, short except on margin.

FEMALE.— Similar to male except frons with median third moderately elevated from epistomal margin to upper level of eyes, its lateral margins usually ornamented by a row of long hair directed orad, often absent, punctures almost obsolete; antennal club 1.4 times as long as wide, with suture 2 strongly arcuate on median half, distal half strongly tapered to subacute apex; without a tuft of long hair on posterior face; anterior margin of pronotum unarmed; elytral disc reticulate, punctures obscure to obsolete; lateral margins of declivity on upper two-thirds rounded; declivital spine 1 reduced to a tubercle on interstriae 3 slightly below upper margin, spine 2 a small tubercle similarly placed immediately below 1.

DISTRIBUTION.— Guatemala to Brazil.

GUATEMALA: San Juan, Verapaz, G. C. Champion. COSTA RICA: Hamburgfarm on Río Reventazón, Limón, 13-III-25, Nevermann; Guápiles, Limón, 22-VIII-66, 100 m, No. 109, leguminous tree, S. L. Wood; Pandora, Limón, 23-VIII-63, 50 m, No. 152, leguminous log, S. L. Wood. OTHER COUNTRIES: Colombia, Brazil.

HOSTS.— Leguminous trees.

BIOLOGY.— Specimens were cut from logs 20–50 cm in diameter.

NOTES.— The above treatment was based on the holotype of *egenum*, on 2 female syntypes of *bisetosus*, and on 37 other specimens.

### 23. *Monarthrum dimidiatum* (Ferrari)

*Corthylus dimidiatus* Ferrari, 1867, die Forst- und Baumzuchtschädlichen Borkenkäfer, p. 57 (Syntypes; Venezuela; Vienna Mus.)

*Pterocyclon moritzi* Schedl, 1939, Rev. de Ent. 10:727 (Holotype, male; locality not given; Schedl Coll.); Wood, 1979, Great Basin Nat. 39:135. *Synonymy*

DIAGNOSIS.— Superficially very similar to *egenum* (Blandford) but distinguished by the slightly larger size, by the more gradual, more densely punctured male declivity, by the absence of a female frontal elevation, by the presence of a strong impression on the dorsomedian margin of the female eye, and by the very different female antennal club.

MALE.— Length 1.8–2.2 mm, 2.9 times as long as wide; color yellowish brown, anterior half of pronotum and posterior third of elytra very dark brown.

Frons, pronotum, and elytral disc as in *egenum*; antennal club 1.3 times as long as wide. Elytral disc occupying basal 60 percent of elytral length; declivity more gradual than in *egenum*, its basal margin precipitous, projecting slightly, with 1–3 pairs of minute denticles between suture and spine 1; other features essentially as in *egenum* except floor of excavated area closely, rather deeply punctured, punctures on striae 1 in a row, very closely spaced.

FEMALE.— Similar to female *egenum* except median frontal elevation absent, a conspicuous, small impression on dorsomedian margin of eye; antennal club as wide as long, its posterior face with a conspicuous tuft of long hair; spine 2 at middle of declivity, much more widely spaced from 1.

DISTRIBUTION.— Costa Rica to Colombia and Venezuela.

COSTA RICA: Turrialba, Cartago, 20-VIII-66, in flight, S. L. Wood. PANAMA: Cerro Punta, 11-I-64, in flight, S. L. Wood. OTHER COUNTRIES: Colombia, Venezuela.

NOTES.— The above treatment was based on the 2 male syntypes of *dimidiatum*, on the holotype of *moritzi*, and on 33 other specimens. Although the types of *dimidiatum* and *moritzi* are slightly different, the variability in the Venezuelan material in my collection clearly bridges the gap between these two forms.

### 24. *Monarthrum proprium* Wood

*Monarthrum proprium* Wood, 1974, Great Basin Nat. 34:136 (Holotype, male; Cerro Punta near Volcán Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *dimidiatum* (Ferrari) by the smaller

size, by the smoother, more brightly shining frons, by the more narrowly oval antennal club, and by the shorter, less strongly explanate elytral declivity.

MALE.— Length 1.6–2.1 mm, 3.2 times as long as wide; color yellowish brown to dark reddish brown.

Frons convex; lower area, sides, and vertex rugose-reticulate, large central area smooth, shining, punctures rather coarse, close; vestiture sparse, inconspicuous. Antennal club oval, 1.3 times as long as wide, sutures feebly procurved.

Pronotum 1.4 times as long as wide; sides almost straight and parallel on basal two-thirds, rather broadly rounded in front; anterior margin armed by about 10 serrations; summit on anterior third; anterior slope very steep, rather finely asperate; posterior areas reticulate, punctures minute. Glabrous.

Elytra 1.8 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal half, very slightly converging to level of sutural apex, then broadly rounded, rather deeply, obtusely emarginate on median fourth behind; surface reticulate, punctures obscure. Declivity rather steep, rather shallowly, broadly concave; margins rounded except acute near apex and at margins of emargination; lateral margins with spine 1 one-third and spine 2 two-thirds of declivital length from base, both on inner margins of lateral margin, each moderately small, conical, pointed, subequal in size; excavated area rugose-reticulate, except smooth and shining on median third, punctures on shining area small, sparse. Subglabrous.

FEMALE.— Similar to male except antennal club 1.0 times as long as wide, ornamented on posterior face by long hair; anterior margin of pronotum more finely serrate; elytral declivity slightly less strongly impressed, spines smaller.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: 15 km SE Cartago, Cartago, 1800 m, 3-VII-63, No. 17B, tree limb, 24-IX-63, No. 249, log, S. L. Wood. PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, Nos. 371 and 404, in *Inga*, No. 398 in a limb, S. L. Wood.

HOSTS.— *Inga* sp.

BIOLOGY.— Specimens were cut from material 10–30 cm in diameter.

NOTES.— The above treatment was based on the type series of 16 specimens.

### 25. *Monarthrum pennatum* (Schedl)

*Pterocyclon pennatum* Schedl, 1963, Ent. Arb. Mus. Frey 14:167 (Holotype, female; Cordoba, Veracruz, Mexico; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *proprium* Wood by the smaller size, by the more strongly reticulate frons, and by the smaller, more obscure punctures on frons, pronotum, and elytra.

MALE.— Length 1.4–1.6 mm, 3.4 times as long as wide; color yellowish brown.

Frons as in *proprium* except entirely reticulate, punctures slightly smaller, less distinctly impressed.

Pronotum and elytra as in *proprium* except punctures on pronotum very slightly smaller; elytral disc largely smooth and shining on posterior half. Elytral declivity slightly steeper, more narrowly impressed, spines slightly smaller.

FEMALE.— Differing from female *proprium* in same ways as males; declivity also less strongly impressed.

DISTRIBUTION.— Nayarit and Veracruz to Colombia and Venezuela.

MEXICO: Nayarit: 6 km W Tepic, 13-VII-65, 1000 m, No. 240, tree limb, S. L. Wood. Veracruz: Cordoba. GUATEMALA: Volcán Pacaya, 1-VI-64, 1300 m, No. 671 in tree branch, No. 700 in Caldo de Frijol limbs, S. L. Wood. HONDURAS: La Ceiba, Atlántida, 20-V-49, at light, E. C. Becker. COSTA RICA: San Isidro del General, San José, 5-XII-63, 1000 m, No. 284, *Miconia pubescens*, S. L. Wood; 15 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 249, tree bole, S. L. Wood; Tapantí, Cartago, 2-VII-63, 1300 m, No. 10, *Conostegia oerstediana*, S. L. Wood; Turrialba, Cartago, 9-III-64, 700 m, No. 468, new fence post, S. L. Wood. OTHER COUNTRIES: Colombia, Venezuela.

BIOLOGY.— Specimens were taken from material 5–15 cm in diameter.

NOTES.— The above treatment was based on 59 specimens, one of which was compared to the holotype.

### 26. *Monarthrum flohri* (Schedl)

*Pterocyclon flohri* Schedl, 1950, Dusenia 1:168 (Holotype, male; Mexico; Schedl Coll.)

DIAGNOSIS.— This species is distinguished by the smaller size, by the more slender form, by the near absence of punctures and reticulation on the elytral disc, and by the elytral declivity.

FEMALE.— Length 1.7 mm, 3.1 times as long as wide; color yellowish brown.

Frons convex, moderately inflated on triangular area from median line at upper level of eyes to epistoma; surface reticulate except minutely, densely punctured on median half of lower half, punctured area ornamented by rather abundant, moderately long hair, glabrous on median line and on reticulate areas; a very small, rounded tubercle on median line slightly below upper level of eyes.

Pronotum 1.3 times as long as wide; as in *dentigerum* (LeConte) except anterior slope shorter, steeper.

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; outline and disc as in *dentigerum* except disc less distinctly reticulate and punctures almost obsolete. Declivity very steep, deeply concave; lateral margins strongly elevated, narrowly rounded from apex to interstriae 1 at base, armed on basal margin at interstriae 3 by a small, acutely pointed spine, two small granules on crest of margin at middle of declivity, lower spine on lower fourth, similar to spine 1 but displaced mesad from lateral margin about one-fourth distance from lateral margin to suture. Glabrous except for sparse hair on and near margins of declivity.

DISTRIBUTION.— Mexico (area not specified).

MEXICO: "Mexico, sammlung Flohr."

NOTES.— The above treatment was based on the unique female holotype. The designation of sex was reversed in the original description.

### 27. *Monarthrum dentigerum* (LeConte)

*Cryphalus dentiger* LeConte, 1868, Trans. Amer. Ent. Soc. 2:154 (Holotype, male; Middle California; Mus. Comp. Zool., 1011)

DIAGNOSIS.— This species is distinguished from *proprium* Wood by the larger size, by the different frons, by the more strongly, more coarsely punctured elytral disc, and by the much steeper, less strongly explanate elytral declivity.

MALE.— Length 1.8–2.2 mm, 3.0 times as long as wide; color reddish brown.

Frons strongly convex, epistomal process weakly elevated and armed by a small median tubercle at its margin; surface strongly rugose-reticulate, punctures obscure, evidently coarse, close.

Pronotum about as in *proprium*.

Elytra 1.7 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal two-thirds, very slightly arcuately converging to level of sutural apex, very broadly rounded behind, narrowly, rather shallowly emarginate at suture; surface shining, mostly obscurely reticulate, punctures fine, distinct, confused at base, in obscure rows toward declivity. Declivity similar to *proprium* but much steeper, lateral margins on upper half slightly higher; spine 2 at middle of declivity, acute ventrolateral margin much longer; excavated area reticulate above, rugose-reticualte below, fine punctures sparse; a very small denticle present near apex of interstriae 2.

FEMALE.— Similar to male except posterior face of antennal club ornamented by long hair; anterior margin of pronotum weakly serrate; declivital denticles smaller, denticle near apex of interstriae 2 usually obsolete; elytral disc reticulate.

DISTRIBUTION.— S California and Baja California to S Arizona and W Texas.

USA: **Arizona**: Chiricahua Mts., 4-IX-62, J. N. Knull; Miller Canyon, Huachuca Mts., H. A. Kaeber; Patagonia Mts., Santa Cruz, 2-VIII-52, H. B. Leech. **California**: Palo Alto, 22-II-17, *Quercus agrifolia*; Pasadena; Pomona; San Diego; San Mateo; St. Helena. **Texas**: Davis Mts., 24-VI-56, J. N. Knull. MEXICO: **Baja California**: Arroyo Santo Tomás, 30-XI-57, E. L. Sleeper.

HOSTS.— *Quercus agrifolia*, *Q.* spp.

BIOLOGY.— Specimens were taken from large limbs and boles.

NOTES.— The above treatment was based on the holotype and on 39 other specimens.

### 28. *Monarthrum bifoveatum* Wood

*Monarthrum bifoveatum* Wood, 1974, Great Basin Nat. 34:137 (Holotype, female; San José, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is rather similar, in the male, to *proprium* Wood except for the frons that is as in *dentigerum* (LeConte); the female frons is radically different and suggests a relationship to *fimbriacorne* (Blandford).

MALE.— Length 1.8–2.0 mm, 3.0 times as long as wide; color light brown, anterior half of pronotum and posterior third of declivity often darker.

Frons about as in *dentigerum* except reticulation and punctures finer. Pronotum,

elytral outline, and sculpture of elytral disc about as in *dentigerum* except elytral disc entirely reticulate, punctures much finer, rather obscure. Elytral declivity very similar to *proprium* except much less strongly explanate, emargination at suture much narrower, not as deep, floor of excavated area slightly wider.

FEMALE.— Similar to male except frons divided into thirds by two shallow, parallel grooves from epistomal margin to upper level of eyes, each groove with a row of short, stout bristles, median third smooth, shining, lateral thirds mostly reticulate, with lower area at inner margin of eye rather strongly, subfoveately impressed; a few setae along epistomal margin; posterior face of antennal club ornamented by long hair; anterior margin of pronotum unarmed; elytral declivity less strongly impressed, much as in female *proprium*.

DISTRIBUTION.— Costa Rica and Venezuela.

COSTA RICA: Escasú, San José, 2-X-63, 1300 m, No. 216, *Spondias purpurea*, S. L. Wood; San José, San Josŵ, 22-X-63, 1300 m, No. 187, broken limb, S. L. Wood. OTHER COUNTRIES: Venezuela.

BIOLOGY.— Specimens were taken from recently cut or broken limbs 10–20 cm in diameter.

NOTES.— The above treatment was based on the type series of 43 specimens.

### 29. *Monarthrum lobatum* (Ferrari)

*Corthylus lobatus* Ferrari, 1867, Die Forst- und Baumzuchtschädlichen Borkenkäfer, p. 57 (Holotype, female; Venezuela; Vienna Mus.)

DIAGNOSIS.— This unique species is most easily recognized by the oddly impressed female frons that has a large, conspicuous median process arising from the epistoma; the male declivity is deeply excavated and of unusual sculpture.

MALE.— Length 3.0–3.4 mm, 3.0 times as long as wide; color light to median brown, anterior half of pronotum and posterior third of elytra usually dark brown.

Frons convex, a moderately strong, transverse impression immediately above epistoma except interrupted at median line by a short, blunt carina; surface smooth in large central area, reticulate near epistoma, at sides, and above, punctures rather coarse, close, deep, except sparse near center. Antennal club 1.8 times as long as wide; sutures weakly procurved.

Pronotum 1.3 times as long as wide; essentially as in *scutellare* (LeConte).

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on basal two-thirds, then converging very slightly to level of sutural apex, broadly rounded, broadly, rather shallowly emarginate on median third; reticulate near base, posterior two-thirds smooth, shining, punctures minute, confused. Declivity rather steep, broadly, rather deeply excavated, basal margin projecting; spine 1 on interstriae 2, its median basal margin three to four times longer than its lateral margin, extending almost to suture; spine 2 very small but with a very broad, subacutely elevated base extending almost to middle of declivity on lateral margin; posterolateral margin acute, rather weakly explanate, extending from suture to subtuberculate, obtuse angle on lateral margin about two-thirds of declivital length from base; surface of excavated area almost smooth, shining, punctures on median two-thirds moderately coarse, close, deep, punctures sparse in lateral areas. Glabrous except for a few bristles on margins of declivity.

FEMALE.— Similar to male except frons strongly, irregularly impressed from epistoma to vertex, a strong transverse impression on lower third, strong impressions in lateral area above eye; epistoma armed by a stout, median horn (angle at which it arises variable); median area ornamented by two rows of long setae from deep transverse groove to a point well above eyes where they converge; antennal club ornamented on posterior face by long hair; anterior margin of pronotum unarmed but ornamented by abundant, short, fine hair; lateral margins of declivity less strongly elevated, subtuberculate elevated angle replaced by a pointed tubercle.

DISTRIBUTION.— Guatemala to Venezuela.

GUATEMALA: Purulá, G. C. Champion. COSTA RICA: San José, San José, 4-VIII-63, 1300 m, No. 166, *Spondias purpurea*, S. L. Wood. OTHER COUNTRIES: Venezuela.

HOSTS.— *Clusia* sp., *Nectandra* sp., *Spondias purpurea*, etc.

BIOLOGY.— Specimens were cut from logs 20–80 cm in diameter.

NOTES.— The above treatment was based on the one remaining male in Ferrari's

collection that is regarded as the holotype, on one Guatemalan, on one Costa Rican, and on 82 Venezuelan specimens.

### 30. *Monarthrum laterale* (Eichhoff)

*Pterocyclon laterale* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:278 (Holotype, male; Mexico; lost with Hamburg Mus.); Wood, 1966, Great Basin Nat. 26:25 (Neotype, male; Toxpam, Mexico; British Mus. Nat. Hist., designated by Wood, 1966, Great Basin Nat. 26:25–26)

*Cosmocorinus trifasciatus* Schedl, 1950, Dusenia 1:173 (Holotype, female; Mexico; Schedl Coll.); Wood, 1966, Great Basin Nat. 26:25. *Synonymy*

DIAGNOSIS.— The female is distinguished from other species in the genus, except *fimbriaticorne* (Blandford), by the strongly flattened antennal scape, by the triangular antennal club that is wider than long, and by the very elaborately sculptured and ornamented frons; the male is similar to the male of *bifoveatum* except that the elytral declivity is much more gradual and more deeply impressed. See also the diagnosis of *fimbriaticorne*.

MALE.— Length 2.6–3.1 mm, 3.0 times as long as wide; color light brown, usually with anterior half of pronotum and posterior third or more of elytra dark brown.

Frons broadly convex, a weak, transverse impression on lower third, epistomal margin weakly elevated, epistomal process weakly elevated on median fourth; surface rugose-reticulate below upper level of eyes, smooth and shining above, punctures rather coarse, moderately close; vestiture confined to epistomal area. Antennal scape slender, club oval, 1.2 times as long as wide.

Pronotum 1.3 times as long as wide; as in *lobatum* (Ferrari).

Elytra 1.7 times as long as wide, 1.5 times as long as pronotum; sides straight and parallel on less than basal half, gradually tapered to 60 percent of basal width at level of sutural apex; disc occupying basal 60 percent of elytral length; surface reticulate except shining near declivity, punctures minute, confused, rather abundant. Declivity rather gradual, rather broadly, concavely, excavated, concave area elongate; spines small, pointed, conical, spine 1 on interstriae 2, spine 2 on interstriae 3, spine 3 on inner face of lateral margin on lower third, a small granule on margin at middle of declivity; posterolateral margin acutely elevated from suture to lateral margin well below spine 3; surface of concave area smooth, shining, punctures moderately small, rather close, confused. Subglabrous.

FEMALE.— Similar to male except frons profoundly, transversely impressed on procurved arc commencing on dorsomedian margin of eye, an extension of this impression extending from this arc along median line almost to epistoma, epistoma armed by a median tubercle; lateral areas on lower half irregularly elevated and ornamented by two separate tufts of long hair; median area of vertex ornamentd by a very long tuft of hair. Antennal scape strongly flattened distally, 1.4 times as long as wide; antennal club subtriangular, 1.5 times as wide as long, most of distal margin straight and ornamented by a row of very long hair; anterior margin of pronotum feebly serrate; elytral declivity shorter, steeper, less deeply excavated, denticles smaller, surface strongly reticulate.

DISTRIBUTION.— Michoacán and Puebla to Venezuela.

MEXICO: **Michoacán**: 53 km E Morelia, 7-VI-65, 3000 m, No. 51, *Quercus*, S. L. Wood. **Puebla**: 9 km NE Teziutlan, 2-VII-67, 1600 m, Nos. 141, 145 in *Alnus*, No. 146, tree limb, S. L. Wood. COSTA RICA: Tapantí, Cartago, 24-X-63, 1300 m, No. 269, log, S. L. Wood. VENEZUELA: Rancho Grande, Pittier N.P., Aragua.

HOSTS.— *Alnus* sp., *Quercus* sp., etc.

BIOLOGY.— Specimens were cut from logs 25–65 cm in diameter.

NOTES.— This species and *fimbriaticorne* are the only species from Mexico fitting the description of *laterale*; the size was given in 1869 as 1 lin (= 2.12 mm) but as 3 mm in 1878; the minimum size of *laterale* specimens before me is 2.6 mm. In naming other species in the 1869 paper, the size of most appears to be underestimated by 0.3–0.5 mm; therefore, if this margin of error is applied to this species, it brings Eichhoff's specimen within the known size limits of *laterale* and suggests that the 1878 size is the most nearly correct of these two figures. Because the Eichhoff type was destroyed with the Hamburg Museum, the first male specimen in the Blandford series was designated as the neotype of this species to fix the identity of the name *Pterocyclon* (Wood 1966). The neotype of

*laterale*, the female holotype of *trifasciatus*, and 71 other specimens were examined.

### 31. *Monarthrum fimbriaticorne* (Blandford)

*Pterocyclon fimbriaticorne* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):285 (Holotype, female; Purula, Alta Verapaz, Guatemala; British Mus. Nat. Hist.)

*Pterocyclon turbinatum* Schedl, 1961, Pan-Pacific Ent. 37:230 (Holotype, male; Cordoba, Veracruz, Mexico; California Acad. Sci.)

DIAGNOSIS.— This species is distinguished from *laterale* (Blandford) by the smaller size, by the presence of a pair of epistomal tubercles near the bases of the mandibles in the female, by the impressed area on the female vertex from which the median tuft of hair arises, and, usually, in the male, by the more numerous, minute, impressed points on the frons and elytral declivity.

MALE.— Length 2.0–2.4 mm, 3.0 times as long as wide; as in *laterale* except minute impressed points on frons and elytral declivity usually much more abundant.

FEMALE.— Similar in all respects to female *laterale* except epistoma with a pair of tubercles at bases of mandibles and vertex slightly impressed on median area where tuft of hair arises.

DISTRIBUTION.— Veracruz to Brazil.

MEXICO: Veracruz: Cordoba, A. Fenyes. GUATEMALA: Purula, Alta Verapaz, G. C. Champion. COSTA RICA: San Pedro de Monte de Oca, San José, 7-II-33, *Parkinsonia aculeata*, C. H. Ballou; San José, San José, 4-VIII-63, 1300 m, No. 108, *Erythrina costaricensis*, 4-X-63, No. 188, *Spondias purpurea*, S. L. Wood; Escasú, San José, 2-X-63, 1300 m, No. 218, tree sapling, S. L. Wood; Turrialba, Cartago, 7-I-62, *Theobroma cacao*, J. S. Saunders. OTHER COUNTRIES: Venezuela, Brazil.

HOSTS.— *Erythrina costaricensis*, *Parkinsonia aculeata*, *Spondias purpurea*, *Theobroma cacao*.

BIOLOGY.— Specimens were cut from material 10–30 cm in diameter.

NOTES.— The above treatment was based on the holotypes of *fimbriaticorne* and *turbinatum* and on 111 other specimens.

### 32. *Monarthrum sulcatum* (Blandford)

*Pterocyclon sulcatum* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):284 (Holotype, male; Volcán de Chiriquí; British Mus. Nat. Hist.)

DIAGNOSIS.— This species and *ferrarii* (Blandford) have a conspicuously impressed sutural sulcus that commences on the basal fourth of the elytral length and continues toward the declivity. This species differs from *ferrarii* by the larger size, by the sutural sulcus that becomes obsolete before reaching the declivity, and by the female frons.

MALE.— Length 3.8–4.0 mm, 2.9 times as long as wide; color light brown, anterior half of pronotum, elytral declivity, and sutural sulcus darker.

Frons broadly concave, a shallow, transverse impression above epistoma, margin of epistomal process armed by a low, subcarinate, median tubercle; surface reticulate near epistoma and sides, smooth and shining in central area and above, punctures rather coarse, moderately close; vestiture confined to epistomal area. Antennal club somewhat obovate, 1.7 times as long as wide.

Pronotum 1.2 times as long as wide; essentially as in *scutellare*.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on basal two-thirds, then moderately tapered to level of sutural apex, very broadly rounded behind except rather deeply emarginate on median one-fifth; disc occupying basal two-thirds, interstriae 1 and 2 rather abruptly impressed one-fourth of discal length from base, sulcus gradually becoming obsolete before declivity; general discal area subreticulate, punctures fine, shallow, confused, surface of sulcus finely rugose-reticulate and with fine, sparse tubercles mostly on interstriae 1. Declivity rather steep, broadly, shallowly concave; lateral margin rounded on basal third, more strongly, narrowly rounded on middle third, acutely, rather weakly elevated on lower fourth; spine 1 on interstriae 2 very small, pointed, 2 on interstriae 3 slightly larger than 1, pointed, 3 on mesal side of margin just below middle of declivity; resembling female *lobatum* except at basal margin. A few setae on or near margin of declivity.

FEMALE.— Similar to male except lateral thirds of frons each with a concave impression on middle third, central area with a large, smooth, shining triangular area extending from near bases of mandibles to median point on vertex, upper half of its lateral margins ornamented by a row of very long hair, lower half may bear short hair, epistomal

area with abundant, rather short hair; antennal club more subtriangular, 1.1 times as long as wide, its posterior face and apical margin ornamented by long hair; anterior margin of pronotum unarmed; elytral declivity convex on upper two-thirds and narrowly sulcate, flattened below, spines 2 and 3 represented by small tubercles on interstriae 3, lateral margin rounded, indefinite.

DISTRIBUTION.— Panama.

PANAMA: Volcán de Chiriquí, G. C. Champion; Cerro Punta near Volcán de Chiriquí, 11-I-64, 1800 m, No. 373, *Quercus*, S. L. Wood.

BIOLOGY.— Specimens were cut from a log 20 cm in diameter.

NOTES.— The above treatment was based on the holotype and on two other specimens compared to it.

### 33. *Monarthrum ferrarii* (Blandford)

*Pterocyclon ferrarii* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):284 (Holotype, female; Volcán de Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *sulcatum* (Blandford) by the smaller size, by the different female frons, by the deeper discal sulcus on the elytra, and by the less strongly excavated elytral declivity.

MALE.— Length 2.4–2.5 mm, 2.5 times as long as wide; color dark brown, basal halves of pronotum and elytra usually lighter.

Frons as in *sulcatum* except surface below upper level of eyes rugose-reticulate. Antennal club 1.4 times as long as wide.

Pronotum 1.16 times as long as wide; as in *sulcatum*.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; basically as in *sulcatum* except surface reticulate only near base, discal sulcus conspicuously deeper and continued to declivity, its basal margin on interstriae 1 armed by a small, subdentate process, its lateral margin armed by a sparse row of rather coarse granules; declivity similar to *sulcatum* but less strongly impressed, margins rounded, spines 1 and 2 conical, mesad of margin.

FEMALE.— Similar to female *sulcatum* except smooth, shining area on frons confined to median fourth, oval, extending from epistoma to upper level of eyes, long hair around its margins much more abundant, only slightly longer at vertex; antennal club similar but less strongly modified; discal sulcus on elytra similar to male except not as deep, denticles and granules smaller.

DISTRIBUTION.— Veracruz and Panama.

MEXICO: Veracruz: Lago Catemaco, 16–20-V-69, D. E. Bright. PANAMA: Volcán de Chiriquí, G. C. Champion.

NOTES.— The above treatment was based on two specimens; the holotype had been examined prior to their collection.

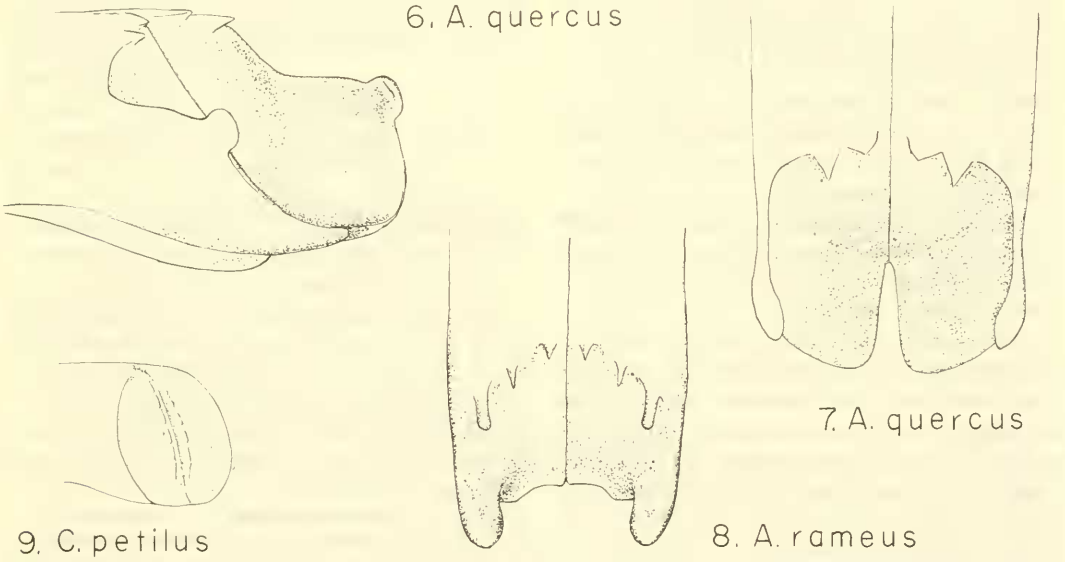



Fig. 217. Corthylini spp., declivities: 6–7, *Monarthrum quercum*; 8, *Amphicranus rameus*; 9, *Corthylus petilus*. (After Wood 1967:54.)

### 34. *Monarthrum bicavum* Wood
Fig. 216

*Monarthrum bicavum* Wood, 1967, Great Basin Nat. 27:51 (Holotype, female; Laguna Santa María, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is unique in the genus. The female frons is shallowly biconcave and finely pubescent from epistoma to vertex and the declivity in both sexes is broadly convex, with the sutural apex entire.

MALE.— Length 2.9–3.3 mm, 3.0 times as long as wide; color very dark brown.

Frons broadly convex, shallowly, transversely impressed above epistoma; a low, obtuse, median carina from impressed area to well above eyes; surface rugose-reticulate from epistoma to well above eyes, smooth and shining on vertex, punctures rather coarse, close. Antennal club 1.5 times as long as wide.

Pronotum 1.2 times as long as wide; about as in *scutellare* except anterior slope less strongly declivous, anterior margin more weakly serrate.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; disc occupying basal two-thirds; strial punctures moderately coarse, deep, in rows on posterior third, surface almost smooth, with moderately abundant, fine, impressed points. Declivity rather abrupt, steep, subsulcate on basal third, feebly convex below; ventrolateral margin acute, not explanate, not at all emarginate at suture; small spines at base of interstriae 1 and 2, three or four pairs of smaller, conical spines arranged on middle third of declivity in an approximate circle remote from lateral margin. Subglabrous.

FEMALE.— Similar to male except epistomal area moderately produced, frons shallowly, broadly concave from epistoma to vertex, divided on median line by a carina; surface of concave area, including carina, minutely, densely punctured; vestiture of abundant, fine, erect, short hair; antennal club 1.4 times as long as wide, ornamented on posterior face by long hair; anterior slope of pronotum feebly declivous, anterior margin unarmed; lower two-thirds of elytral declivity with only one pair of tubercles on interstriae 3 near middle of declivity.

DISTRIBUTION.— Nayarit.

MEXICO: **Nayarit**: Laguna Santa María, 6-VII-65, 1000 m, No. 203, *Quercus*, S. L. Wood.

BIOLOGY.— Specimens were cut from an oak log 25 cm in diameter.

NOTES.— The above treatment was based on the type series of 21 specimens.

### 35. *Monarthrum mali* (Fitch)
Fig. 211

*Tomicus mali* Fitch, 1855, Trans. New York St. Agric. Soc. 15:326 (Syntypes?; New York; not located)

*Pterocyclon longulum* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:278 (Syntypes?; Carolina; lost with Hamburg Mus.); LeConte, 1876, Proc. Amer. Philos. Soc. 15:349. *Synonymy*

DIAGNOSIS.— In this species the male and female are very similar, and the declivity is flattened and armed by two pairs of small denticles, both of which are near the suture.

MALE.— Length 1.8–2.4 mm, 3.2 times as long as wide; color yellowish to light reddish brown.

Frons convex, reticulate, somewhat rugose toward epistoma; punctures moderately coarse, close; vestiture inconspicuous. Antennal club 1.5 times as long as wide.

Pronotum 1.3 times as long as wide; essentially as in *scutellare*.

Elytra 1.7 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on basal two-thirds, then converging slightly to level of sutural apex, broadly rounded behind and rather deeply emarginate on median fifth; disc occupying basal two-thirds, surface reticulate, punctures obscure, minute, strial punctures in rows near declivity. Declivity steep, rather narrowly sulcate on more than basal half, flattened below; armed by two pairs of small, usually blunt denticles on interstriae 2, denticle 1 near base, 2 slightly below middle; ventrolateral margin acute, not explanate; surface reticulate. Subglabrous.

FEMALE.— Similar to male except antennal club 1.2 times as long as wide, its posterior face ornamented by long hair; declivital sulcus slightly less strongly impressed.

DISTRIBUTION.— British Columbia (?), California; Minnesota and Maine to E Texas and Florida.

CANADA: **British Columbia** (accidental or error in labeling?). USA: **Alabama**: Selma. **Arkansas**: Bradley Co. **California**: Felton in Santa Cruz Mts., Nacimiento Reservoir in San Luis Obispo. **Connecticut**: Samford. **District of Columbia**: Washington. **Florida**: Crescent City,

Enterprise, Gainesville, Orlando, Tampa, Royal Palm Hammock St. Pk., St. Johns Co. **Illinois**: Farina, Urbana. **Indiana**: Mitchell, Vincinnes. **Iowa**: Ames, Iowa City. **Kentucky**: Barbourville, Lebanon. **Louisiana**: Tallulah. **Maine**: Paris. **Maryland**: Baltimore, Bladensburg. **Massachusetts**: Boston, Petersham, W. Springfield. **Michigan**: Ann Harbor, Detroit, Grand Ledge, Marquette. **Minnesota**: Hennepin Co. **Mississippi**: Hancock Co., Holly Springs, Laurel, Nicholson, Poplarville, Vicksburg. **New Jersey**: Dundee Lake, Essex Co., Orange, Summit. **New York**: Axton, Catskill Mts., Central, Cranberry Lake, Elka Park, Ithaca, Lancaster, New Rochelle, New York, Pelham, Staten Island, West Point. **North Carolina**: Asheville, Black Mts., Boardman, Durham, Gray Beard Mt., Tryon. **Ohio**: Ada, Canfield, Cincinnati, Clinton Co., Columbus, Franklin Co., Gomer, Ira in Summit Co., Wooster. **Pennsylvania**; Castle Rock, Charter Oak, Frankford, Harrisburg, Johnsonburg, Landisburg, Philadelphia, Potsville. **South Carolina**: Jacksonboro, Myrtle Beach, Nichols. **Tennessee**: Gatlinburg, Oak Ridge. **Texas**: Kirbyville. **Virginia**: Blacksburg, Carter Bridge, Falls Church, Hawless, Penington Gap, Virginia Beach. **West Virginia**: Bayard, Dellslow, Monongaliala, Morgantown, Pickens, Raleigh Co., Taylor Co., Wayne Co., Wood Co. **Wisconsin**: Buffalo Co., Hartland, Plattville.

HOSTS.— *Acer rubrum*, *Betula lutea*, *Fagus americana*, *Liquidambar styraciflua*, *Nyassa* sp., *Quercus rubra*, *Tilia* sp.

BIOLOGY.— Unthrifty, injured, or recently cut material larger than about 10 cm in diameter is selected for attack.

NOTES.— The type was not located and probably is lost. I examined material in the LeConte collection and the U.S. National Museum, where specimens based on the Fitch material is located. There appears to be no problem in identifying this species in the absence of a type; 373 specimens were examined.

### 36. *Monarthrum fasciatum* (Say)
Fig. 211

*Bostrichus fasciatus* Say, 1826, J. Acad. Nat. Sci. Philadelphia 5:255 (Syntypes; Sinnipuxent, probably Pennsylvania; lost)

*Pterocyclon simile* Eichhoff, 1869, Berliner Ent. Zeitschr. 12:277 (Syntypes? America bor., lost with Hamburg Mus.); LeConte, 1876, Proc. Amer. Philos. Soc. 15:348. *Synonymy*

*Pterocyclon gracile* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:444 (Syntypes; Tennessee, Pennsylvania, Carolina; lost with Hamburg Mus.); Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:444. *Synonymy*

DIAGNOSIS.— This species is distinguished from *mali* (Fitch) by the larger size, by the bicolored coloration, and by the absence of declivital spine 2.

MALE.— Length 2.3–2.8 mm, 3.2 times as long as wide; color yellowish brown, anterior half of prothorax and posterior third of elytra usually dark brown.

Head, pronotum, and elytral disc as in *mali*. Elytral declivity as in *mali* except sulcus limited to upper half, denticle 2 absent; sutural interstriae at middle of declivity armed by a rather indefinite row of four to six small granules; surface rugose-reticulate.

FEMALE.— Similar to male except differing as female *mali* differs from male.

DISTRIBUTION.— Wisconsin and Massachusetts to E Texas and Florida.

USA: **Arkansas**: Bradley Co., Huttig, Maynard, Randolph. **Connecticut**: Glastonburg, Stanford. **District of Columbia**: Brookland. **Florida**: Crescent City, Enterprise, Gainesville, Jacksonville, Orlando, Putnam Co. **Georgia**: Dunwoody, Thomasville. **Illinois**: Dubois, Macomb, Urbana. **Indiana**: Centralville, Ft. Wayne, Indianapolis, Mitchell, Vicennes. **Iowa**: Iowa City. **Kansas**: Benedict, Topeka. **Kentucky**: LeBanon Junction, Paducah. **Louisiana**: Tallulah. **Maryland**: Beltsville, Bladensburg, Chevy Chase. **Massachusetts**: Framingham. **Michigan**: Detroit, Grand Ledge, Port Huron. **Mississippi**: Agricultural College, Corinth, Meridian, Nicholson, Vicksburg. **Missouri**: St. Louis. **New Jersey**: Boonton, Orange, Paterson, Summit. **New York: Buffalo, Flatbush, Ithaca, Jamaica, Mt. Vernon, Staten Island, West Point. North Carolina**: Boardman, Charlotte, Raleigh, Tryon. **Ohio**: Cincinnati, Clinton Co., Columbus, Delaware Co., Franklin Co., Green Co., Hocking Co., Lakeside, Logan Co., Wooster. **Pennsylvania**: Frankford, Harrisburg, Inglenook, Johnsonburg, Philadelphia. **South Carolina**: Table Rock St. Pk. **Tennessee**: Memphis, Nashville. **Texas**: Brownsville. **Virginia**: Blacksburg, Hewlin, Onville. **West Virginia**: Dellslow, Taylor Co., Wood Co. **Wisconsin**: Madison.

HOSTS.— *Acer rubrum*, *Carya* sp., *Castanea dentata*, *Liquidambar styraciflua*, *Mimosa* sp., *Nyosa* sp., *Pinus* sp., *Prunus* sp., *Quercus alba*, *Q. digitata*, *Q. rubra*, *Q.* spp.

BIOLOGY.— As in *mali*.

NOTES.— The above treatment was based on the LeConte material that presumably was compared to Say's series.

### 37. *Monarthrum tetradontium* Wood

*Monarthrum tetradontium* Wood, 1974, Great Basin Nat. 34:137 (Holotype, male; SE Slope Mt. Colima, Jalisco, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *exornatum* (Schedl) by the smoother, much more deeply punctured elytral disc and by the larger, much stouter declivital spines.

MALE.— Length 2.4 mm, 3.3 times as long as wide; color dark brown, basal half of elytra slightly lighter.

Frons convex, reticulate, becoming rugose-reticulate toward epistoma, punctures moderately coarse, close; vestiture inconspicuous.

Pronotum 1.4 times as long as wide; sides straight and parallel on basal two-thirds, broadly rounded in front; anterior margin subserrate; otherwise as in *scutellare* (LeConte).

Elytra 1.9 times as long as wide, 1.3 times as long as pronotum; sides straight and parallel on basal half, distinctly tapered on posterior half, rather narrowly rounded behind, deeply emarginate on median sixth; surface almost smooth, obscurely reticulate in some areas, punctures rather small, moderately deep, confused except strial and interstrial punctures almost in rows near declivity. Declivity rather steep, flattened, lateral margins rounded, not elevated, apex moderately explanate; interstriae 2 (actually displaced interstriae 3) armed one-third and two-thirds distance from base by spines; spine 1 conical, pointed, about as high as its basal width, spine 2 slightly higher, very stout, blunt; surface near base of spine 1 rugose-reticulate, remaining area almost smooth and deeply punctured. Vestiture sparse, confined to declivity.

DISTRIBUTION.— Jalisco.

MEXICO: Jalisco: SE slope of Mt. Colima, 2-XII-48.

NOTES.— The above treatment was based on the holotype.

### 38. *Monarthrum conversum* Wood

*Monarthrum conversum* Wood, 1974, Great Basin Nat. 34:138 (Holotype, male; 6 km or 4 miles W Tepic, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *exornatum* (Schedl) by the larger, stouter size and by the very different elytral declivity. Also see *tomicoides* (Blandford), to which it is much more closely related.

MALE.— Length 3.1–3.6 mm, 3.0 times as long as wide; color very dark reddish brown, basal half of pronotum lighter.

Frons essentially as in *exornatum* except upper area almost smooth and with minute, impressed points.

Pronotum 1.3 times as long as wide; sides straight and parallel on basal half, rather narrowly rounded in front; anterior margin armed by about 10 coarse serrations; about as in *scutellare* (LeConte) except punctures on posterior areas slightly larger, those near base of disc transversely elongate. Glabrous.

Elytra 1.5 times as long as wide, 1.2 times as long as pronotum; outline about as *exornatum* except stouter; surface shining, with rather numerous fine, irregular lines, numerous impressed points, punctures rather small, moderately deep, confused. Declivity steep, broadly, concavely excavated; lateral margins moderately elevated, rounded except on apical fifth of declivital length; spine 1 on interstriae 3 at basal margin, as high as basal width, subconical; spine 2 two-thirds declivital length from base, displaced less than its basal width from margin, subcylindrical, very slightly longer than its basal width, its apex subtruncate, its dorsal angle subacute; excavated area mostly shining, with numerous minute, impressed points, punctures moderately coarse, rather deep, lateral areas near margins rugose-reticulate. Subglabrous.

FEMALE.— Similar to male except antennal scape with fine, short hair; anterior margin of pronotum obscurely serrate; elytral disc reticulate, punctures somewhat obscure; declivity mostly broadly convex, moderately sulcate on upper half, subconcave below; spine 1 much smaller; spine 2 at middle of declivity midway between lateral margin and suture, of similar size and shape to spine 1; declivital surface rugose-reticulate, punctures small, obscure.

DISTRIBUTION.— Nayarit to Jalisco.

MEXICO: Jalisco: Volcán Colima, 23-VI-65, 2500 m, in flight, S. L. Wood. Nayarit: 6 km W Tepic, 13-VII-65, 1000 m, No. 240, tree limb, S. L. Wood.

BIOLOGY.— One pair was cut from a limb about 8 cm in diameter.

NOTES.— The above treatment was based on the type series of three specimens.

### 39. *Monarthrum morsum* Wood

*Monarthrum morsum* Wood, 1974, Great Basin Nat. 34:139 (Holotype, male; Pandora, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *exornatum* (Schedl) by the smaller size and by the steeper, narrower elytral declivity with different sculpture and arrangement of spines.

MALE.— Length 1.5 mm, 2.8 times as long as wide; color yellowish brown, posterior half of elytra darker.

Frons and pronotum as in *exornatum* except pronotum 1.15 times as long as wide.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; outline as in *conversum* Wood except more strongly tapered on posterior third; disc obscurely reticulate on basal third, smooth and shining elsewhere, numerous impressed points present, punctures fine, distinct, in strial rows on posterior half. Declivity moderately steep, rather broadly, strongly sulcate; spine 1 on interstriae 2 near base, rather small, pointed, its upper margin feebly subcostate; spine 2 small, conical, two-thirds declivital length from base, displaced from lateral margin one-third distance toward suture; feebly explanate below; surface of impressed area shining, numerous impressed points present, punctures evident only near suture. Vestiture confined to declivity, of short moderately abundant hair.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Pandora, Limón, 23-VIII-63, 50 m, No. 135, tree limb, S. L. Wood.

BIOLOGY.— The holotype was cut from a limb 8 cm in diameter.

NOTES.— The above treatment was based on the holotype.

### 40. *Monarthrum exornatum* (Schedl)

*Pterocyclon exornatum* Schedl, 1939, Mitt. Münchn. Ent. Ges. 29:575 (Holotype, male; Colonia, apparently Mexico; Schedl Coll.)

*Pterocyclon gracilicornum* Schedl, 1939, Mitt. Münchn. Ent. Ges. 29:576 (Holotype, male; Jalapa, Veracruz, Mexico; Schedl Coll.); Wood, 1966, Great Basin Nat. 26:25. *Synonymy*

DIAGNOSIS.— This species is distinguished from *tetradontium* Wood by the smaller size, by the more deeply impressed elytral declivity, with a much different arrangement of spines, and by the reticulate elytral surfaces, with the punctures obscure to obsolete.

MALE.— Length 1.8–2.1 mm, 3.2 times as long as wide; color dark brown.

Frons broadly convex; surface rugose-reticulate, punctures rather coarse, close, not sharply impressed; vestiture inconspicuous. Antennal club 1.2 times as long as wide.

Pronotum 1.4 times as long as wide; sides straight and parallel on basal two-thirds, rather broadly rounded in front; anterior margin broadly subserrate; summit indefinite, one-third pronotum length from anterior margin; anterior slope rather strongly declivous, finely asperate; posterior areas reticulate, minutely, rather sparsely punctured. Glabrous.

Elytra 1.9 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on basal two-thirds, then very slightly tapered to level of sutural apex, broadly rounded behind except rather deeply emarginate on median one-fifth; surface reticulate, punctures minute, shallow, confused. Declivity moderately steep, shallowly sulcate on upper half, shallowly concave below; spine 1 on interstriae 2 slightly above middle, small, pointed, conical, spine 2 almost at level of sutural apex slightly nearer to lateral margin than to suture, variable in size but usually smaller than spine 1; surface reticulate except sometimes shining near suture; slightly explanate at apex. Vestiture confined to declivity, of fine, short hair.

FEMALE.— Similar to male except antennal club ornamented on posterior face by long hair; elytral declivity less strongly, more narrowly impressed.

DISTRIBUTION.— Veracruz to Colombia and Venezuela.

MEXICO: **Veracruz**: Cordoba. **Oaxaca**: Totolapan, 7-VII-53, 1000 m, S. L. Wood. COSTA RICA: Escasú, San José, 2-X-63, 1300 m, No. 217, *Ficus*, S. L. Wood. OTHER COUNTRIES: Colombia, Venezuela.

HOSTS.— *Alexia imperatricia* (Venezuela), *Coffea arabica* (Colombia), *Ficus* sp.

BIOLOGY.— Specimens were taken in limbs 5–10 cm in diameter.

NOTES.— The above treatment was based on seven specimens, two of which were compared directly to the holotypes of *exornatum* and *gracilicornum*.

### 41. *Monarthrum carinatum* Wood

*Monarthrum carinatum* Wood, 1974, Great Basin Nat. 34:139 (Holotype, male; Cerro de la Muerte, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *exornatum* (Schedl) by the larger size, by the fine, median, frontal carina, and by the steeper, more strongly impressed, more weakly explanate elytral declivity.

MALE.— Length 2.5–2.8 mm, 3.0 times as long as wide; color dark brown.

Frons convex, a fine, acute, low carina from epistoma almost to upper level of eyes; surface on lower half etched by minute, subaciculate lines, more nearly smooth and shining above, punctures fine but superficially appearing large, indistinct, obscurely subaciculate; obscure vestiture confined to epistomal margin. Antennal club broadly oval, 1.3 times as long as wide.

Pronotum 1.3 times as long as wide; about as in *exornatum* except anterior margin rather coarsely serrate.

Elytra 2.0 times as long as wide, 1.5 times as long as pronotum; outline more broadly rounded behind than *exornatum*; disc as in *exornatum*, declivity steeper, more deeply, more broadly impresed; spines 1 and 2 small, conical, pointed, 1 one-third declivital length from base, on rounded lateral margin, 2 two-thirds declivital length from base, slightly mesad of margin; surface of impressed area finely rugose-reticulate except almost smooth and very finely punctured near suture on lower half; apical margin acute, weakly explanate. A few setae on or near margins of declivity.

FEMALE.— Similar to male except frontal carina longer; posterior face of antennal club ornamented by longer hair; elytral declivity less strongly impressed, denticles slightly smaller.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Cerro de la Muerte, San José, 6-VIII-63, 2600 m, No. 113, tree bole, S. L. Wood.

BIOLOGY.— Specimens were taken from the bole of a standing tree 30 cm in diameter; it apparently was a Melastomaceae.

NOTES.— The above treatment was based on the type series of 14 specimens.

Several similar South American species have a median frontal carina, but in those species the antennal club, particularly in the female, is much more elongate.

### 42. *Monarthrum desum* (Wood)

Fig. 216

*Microcorthylus desus* Wood, 1967, Great Basin Nat. 27:52 (Holotype, male; 16 miles or 25 km E Morelia, Michoacán, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *punctifrons* (Blandford) by the subvertical male declivity that lacks a sutural emargination and denticles at the base on interstriae 1, by the presence of a median carina on the frons, and by other characters. The true relationship probably is remote.

MALE.— Length 1.8–2.1 mm, 2.5 times as long as wide; color brown.

Frons convex, coarsely, not closely or deeply punctured, with a small, elongate median tubercle at upper level of eyes; vestiture inconspicuous. Antennal club oval, 1.5 times as long as wide, widest at middle, two sutures very weakly angulate; funicle one-segmented.

Pronotum 1.3 times as long as wide; sides straight and subparallel on basal half, rather broadly rounded in front; anterior margin unarmed; summit at middle; posterior area reticulate, dull, very finely, sparsely punctured; disc glabrous.

Elytra about 1.5 times as long as wide; sides straight and parallel to declivital base, posterior margin straight, posterior angles curving caudomesad to form lower declivital spines with their apices directed mesad; elytral punctures small, indistinct, confused, surface reticulate, dull. Declivity abrupt, subvertical, somewhat more gradually rounded at base near suture; face broadly, rather shallowly concave, lateral margin rather strongly, broadly elevated and armed by a rather large, pointed tubercle on upper third about in line with normal position of striae 3 and a larger incurved, hooked spine two-thirds of declivital length from top; height of lower spine about equal to its basal width, its apex directed mesad; apical margin acutely, not strongly elevated on median half of elytral width, not at all emarginate at suture. Vestiture not conspicuous, limited to sides and declivity.

FEMALE.— Similar to male except elytral declivity less strongly sculptured, only moderately impressed, lateral areas not high, tubercles small; apical margin of elytra, frons, and antenna as in male.

DISTRIBUTION.— Chihuahua to Michoacán.

MEXICO: **Chihuahua**: San Juanito, 4-V-77, *Quercus*, M. M. Furniss. **Michoacán**: 25 km E Morelia, 14-VI-65, 2500 m, No. 32, *Quercus*, S. L. Wood.

HOSTS.— *Quercus* sp.

BIOLOGY.— Specimens were taken from a limb of a large, recently felled oak tree.

NOTES.— The above treatment was based on the type series of 20 specimens.

### 43. *Monarthrum punctifrons* (Blandford)

*Pterocyclon punctifrons* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):278 (Holotype, female; Volcán de Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *conversum* Wood by the smaller size, by the more slender body form, by the more broadly, more shallowly concave elytral declivity, with more slender spines, and by other characters.

MALE.— Length 2.7–3.2 mm, 2.8 times as long as wide; color light brown, anterior half of pronotum and posterior half of elytra often darker.

Frons as in *conversum* except reticulation restricted to lower half of area below upper level of eyes, and transverse epistomal impression more abrupt and deeper.

Pronotum 1.2 times as long as wide; as in *conversum* except punctures in posterior areas minute and not extended by transverse lines.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; outline as in *conversum* except more broadly rounded behind; disc reticulate, punctures minute, almost obsolete, confused. Declivity rather abrupt, very steep, shallowly, broadly concave; lateral margins rather narrowly rounded on upper two-thirds, acute on lower third; interstriae 1 at base with a rounded tubercle, spine 1 on interstriae 3 at basal margin, conical, as long as wide, spine 2 slightly below middle of declivity, displaced from lateral margin about one-fourth distance from lateral margin to suture; surface of impressed area rugose-reticulate, obscure punctures indicated on mesal half; margins of deep emargination slightly elevated. Subglabrous.

FEMALE.— Similar to male except posterior face of antennal club ornamented by long hair; anterior margin of pronotum weakly serrate; declivity as in female *conversum* except entirely reticulate, without punctures.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: 15 km SE Cartago, 3-VII-63, 1800 m, No. 16, 29-VII-63, No. 20, log, S. L. Wood; Volcán Poás, 14-VII-63, 2500 m, No. 50, log, S. L. Wood. PANAMA: Volcán de Chiriquí, G. C. Champion.

BIOLOGY.— Specimens were cut from logs 20–40 cm in diameter.

NOTES.— The above treatment was based on 37 specimens, 2 of which were compared directly to the holotype.

### 44. *Monarthrum pseudoscutellare* (Schedl)

*Pterocyclon pseudoscutellare* Schedl, 1935, Rev. de Ent. 5:349 (Holotype, female; Laguna Volcán Poas, Costa Rica; Schedl Coll.)

*Monarthrum adustum* Wood, 1974, Great Basin Nat. 34:140 (Holotype, male; Cerro de la Muerte, San José, Costa Rica; Wood Coll.). *New synonymy*

DIAGNOSIS.— This species is distinguished from *punctifrons* (Blandford) by the larger size and by the very different elytral declivity in both sexes.

MALE.— Length 2.8–3.4 mm, 3.1 times as long as wide; color dark brown, bases of pronotum and elytra often of lighter color.

Frons, pronotum, and elytral disc as in *punctifrons*. Elytral declivity similar to *punctifrons* but much more narrowly impressed, deeply sulcate on basal half; tubercle at base on interstriae 1 almost obsolete; spines 1 and 2 subequal in size, small, conical, 2 at middle of declivity; surface reticulate. Vestiture largely confined to declivity, of short, moderately abundant hair.

FEMALE.— Similar to male except posterior face of antennal club ornamented by long hair; anterior margin of pronotum weakly serrate; elytral declivity less strongly, more narrowly impressed; space between members of first pair of denticles equal to distance between members of second pair.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Cerro de la Muerte, San José, 1-VIII-63, 3000 m, No. 45, *Quercus*, 6-VIII-63, 2800 m, No. 110, *Q. costaricensis*, S. L. Wood; Volcán Irazu, Cartago, 2300 m, No. 40, *Quercus*, S. L. Wood; Volcán Poás, Heredia, 19-VI-66, 2600 m, No. 4, *Quercus*, S. L. Wood.

HOSTS.— *Quercus costaricensis*, *Q.* spp.

BIOLOGY.— Specimens were cut from standing boles and cut logs 30–80 cm in diameter.

NOTES.— The above treatment was based on the type series of 65 specimens.

### 45. *Monarthrum difficile* (Blandford)

*Pterocyclon difficile* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):276 (Holotype, female; Volcán de Chiriquí, Chiriquí Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— The female of this species is distinguished from *insignatum* Wood by the larger size, by the much more coarsely punctured frons, with the transverse impression above the epistoma less strongly developed and the median tubercle moderately to obscurely developed, and by the stouter body form.

FEMALE.— Length 2.8–3.1 mm, 2.5 times as long as wide; color very dark brown.

Frons broadly convex, transverse impression above epistoma about half as deep as in *insignatum*, median tubercle poorly developed (about as in *hoegei* Blandford); surface reticulate on lower third, smooth and shining above, punctures very coarse, deep, much closer in lateral areas. Antenna, pronotum, and elytra as in *insignatum* except discal punctures on elytra smaller, mostly obsolete; declivital sulcus narrower, not quite so deep, ascending more gradually from suture to lateral convexities; lower pair of declivital spines more closely spaced from one another than upper spines.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Escasú, San José, 2-X-63, 1300 m, No. 218, tree seedling, S. L. Wood. PANAMA: Volcán de Chiriquí, Chiriquí, 3–4000 ft, G. C. Champion.

NOTES.— The above treatment was based on the female holotype and on two other specimens.

## 46. *Monarthrum insignatum* Wood

*Monarthrum insignatum* Wood, 1974, Great Basin Nat. 34:141 (Holotype, female; Volcán Poás, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *heogei* (Blandford) by the median third of the declivity being smooth, with numerous minute, impressed points, and by the minute features on the frons as described below.

MALE.— Length 2.4–2.6 mm, 2.9 times as long as wide; color dark brown.

Frons as in *hoegei* except punctures slightly coarser, deeper, median carina slightly sharper. Pronotum and elytra as in *hoegei* except median third of declivital excavation smooth, with numerous minute, impressed points.

FEMALE.— Similar to female *hoegei* except transverse impression above epistoma deeper, its upper margin on median line rising very abruptly to a conspicuous median tubercle, tubercle much larger than in *hoegei*, frons protruding slightly toward tubercle; elytral declivity smooth, with points.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Poas, Heredia, 14-VII-63, 1500 m, No. 44, tree branch, and 19-VI-66, 2600 m, No. 4, shrub, S. L. Wood.

NOTES.— The above treatment was based on the type series of nine specimens. In all probability future collecting will prove this to be a geographical race of *hoegei*.

## 47. *Monarthrum fastigiorum* Wood

*Monarthrum fastigiorum* Wood, 1974, Great Basin Nat. 34:141 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *insignatum* Wood by the smaller size, by the more protuberant female frons with a subcarinate dorsal continuation of the median tubercle, and by the different male declivity.

MALE.— Length 2.0 mm (female 2.3 mm), 2.7 times as long as wide; color brown, somewhat bicolored.

Frons as in *insignatum* except with a fine, low median carina.

Pronotum and elytral disc as in *insignatum*. Elytral declivity similar to *insignatum* except steeper, more widely, more shallowly impressed, about one-third of impressed area laterad of a line drawn from spine 1 to spine 2, spine 2 equal distance from suture and lateral margin.

FEMALE.— Similar to female *insignatum* except frons more protuberant, median tubercle larger, with weak carina extending from its summit to upper level of eyes, surface more coarsely, more uniformly reticulate; declivital spine 2 almost as close to suture as to lateral margin.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 24-X-63, 1300 m, No. 245, woody vine, S. L. Wood.

NOTES.— The above treatment was based on the type series of three specimens.

## 48. *Monarthrum bidentatum* Wood

*Monarthrum bidentatum* Wood, 1974, Great Basin Nat. 34:142 (Holotype, male; 6 miles or 9 km NE Teziutlán, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *bidens* (Blandford) by the smaller size, by the more finely punctured frons, and by

other differences on the female frons and on the male declivity.

MALE.— Length 2.3–2.5 mm, 2.8 times as long as wide; color dark brown.

Frons broadly convex, a distinct, transverse impression just above epistoma; surface almost smooth except rugose-reticulate in impressed area, upper areas with impressed points and a few fine punctures; vestiture inconspicuous.

Pronotum 1.2 times as long as wide; as in *punctifrons* (Blandford) and other allied species.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; sides straight and parallel on basal two-thirds, converging very slightly to level of sutural apex, then abruptly rounded behind except moderately emarginate on median fourth; surface reticulate, punctures minute, confused. Declivity rather abrupt, steep, broadly sulcate; sulcus widest between spines 1 and 2; spine 1 at base on interstriae 3, very small; spine 2 closer to suture than to either spine 1 or lateral margin, its lower margin at level of sutural apex; spine 2 laterally compressed, not as high as length of its longitudinal, basal axis, its summit emarginate and bituberculate; surface reticulate. Vestiture sparse, confined to declivity.

FEMALE.— Similar to male except transverse frontal impression very deep, deepest on its median third, occupying lower two-thirds of area below upper level of eyes, punctures in lateral areas larger, deeper; posterior face of antennal club ornamented by long hair; anterior margin of pronotum unarmed; declivity much more shallowly, more narrowly sulcate, lateral margins more evenly rounded, spines 1 and 2 of similar size and conical shape, equally spaced from suture.

DISTRIBUTION.— Puebla and possibly Costa Rica.

MEXICO: Puebla: 9 km NE Teziutlán, 2-VII-67, 1600 m, Nos. 135 and 145 in *Alnus*, No. 140 in a tree limb, S. L. Wood.

BIOLOGY.— Specimens were taken from recently cut material 5–25 cm in diameter.

NOTES.— The above treatment was based on the type series of 33 specimens. Two specimens from 15 km SE Cartago, Cartago, Costa Rica, 24-IX-63, 1800 m, No. 203, *Siparuna nicaraguensis*, are tentatively assigned here, although the female frons is more coarsely punctured, with the transverse groove partly rugose and not quite as deep on its median third.

### 49. *Monarthrum bidens* (Blandford)

*Pterocyclon bidens* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):277 (Holotype, male; Volcán de Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *bidentatum* Wood by the larger size, by the coarser punctures on the frons, and by differences on the female frons and on the male declivity.

MALE.— Length 2.7–2.8 mm, 3.0 times as long as wide; color dark brown.

Frons as in *bidentatum* except transverse impression greatly reduced, punctures larger. Pronotum and elytra as in *bidentatum* except posterior half of elytral disc smooth; elytral declivity not as steep, more broadly, subconcavely impressed, spine 2 as high or higher than its longitudinal, basal width; declivital surface smooth, with numerous minute, impressed points.

FEMALE.— As in female of *bidentatum* except frontal impression deepest on lateral thirds, punctures much coarser; declivital spines 1 and 2 coarser.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: 15 km SE Cartago, 3-VII-63, 1800 m, No. 17B, *Conostegia oerstediana*, S. L. Wood. PANAMA: Volcán de Chiriquí, G. C. Champion.

BIOLOGY.— Specimens were taken from recently cut branches 1–3 cm in diameter.

NOTES.— The above treatment was based on 11 specimens, one of which was compared directly to the holotype.

### 50. *Monarthrum notatum* Wood

*Monarthrum notatum* Wood, 1974, Great Basin Nat. 34:143 (Holotype, female; Volcán Poás, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *bidentatum* Wood by the color, by the conical spine 2 on the male declivity, and by the deeper, narrower declivital impression.

MALE.— Length 2.2–2.5 mm, 3.2 times as long as wide; color dark brown, most specimens with elytral disc yellowish brown.

Frons as in *bidentatum* except punctures larger. Pronotum and elytral disc as in

*bidentatum*; elytral declivity much more deeply impressed than in *bidentatum*, lateral margins more narrowly rounded, spine 2 conical, much larger than 1, its height equal to its basal width, much closer to lateral margin than to suture, surface reticulate except smooth on interstriae 2. Vestiture confined to declivity, sparse.

FEMALE.— Similar to female *dentatum* except frons more evenly convex, deepest part of transverse impression rugose-reticulate (smooth in *dentatum*); declivital sulcus much deeper, narrower, sutural emargination deeper, narrower, its margins distinctly elevated.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Volcán Poás, Heredia, 14-VII-63, 2500 m, No. 50, log, 19-VI-66, 2600 m, No. 7, leguminous shrub, S. L. Wood. PANAMA: Cerro Punta; Chiriquí, 11-I-64, 1800 m, No. 371, *Inga*, S. L. Wood.

BIOLOGY.— Specimens were cut from logs 8 and 100 cm in diameter.

NOTES.— The above treatment was based on the type series of 17 specimens.

### 51. *Monarthrum vittatum* (Blandford)

*Pterocyclon vittatum* Blandford, 1905, Biol. Centr. Amer., Coleopt. 4(6):282 (Holotype, female; Volcán de Chiriquí; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *notatum* Wood by the larger size, by the narrow transverse groove above the epistoma in both sexes, and by the less strongly impressed male declivity that has rather coarse, impressed punctures on its median third.

MALE.— Length 2.6–3.0 mm, 2.7 times as long as wide; usually bicolored, middle third of pronotum, elytral disc, and appendages light brown, remaining areas dark brown.

Frons broadly convex, a narrower, moderately deep groove extending entire width immediately above epistoma, its fundus usually ornamented by one row of very minute granules; remaining surface reticulate near groove, smooth above with minute impressed points, punctures rather fine, moderately abundant almost to vertex; glabrous except a few hairs on epistoma.

Pronotum and elytral disc as in *punctifrons* (Blandford). Elytral declivity similar to but less strongly impressed than in *notatum*, spine 2 distinctly smaller; basal half with punctures on striae 1 rather coarse, impressed, their dorsomedian margins often subgranulate, lower half with similar punctures confused and somewhat more widely distributed; surfaces reticulate. Subglabrous.

FEMALE.— Similar to male except frontal groove more perfectly formed and slightly deeper; posterior face of antennal club ornamented by a tuft of long hair; declivity slightly less strongly impressed, spine 2 as small as spine 1, punctures reduced to obsolete.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Cerro de la Muerte, San José, 6-VIII-63, 2500 m, No. 112, *Brunellia costaricensis*, S. L. Wood; Volcán Poás, Heredia, 6-IX-63, 2500 m, No. 170, *Clusia*, S. L. Wood; intercepted at San Pedro, California in *Quercus* logs from Costa Rica, 28-VI-46.

HOSTS.— *Brunellia costaricensis*, *Clusia* sp., *Quercus* sp.

BIOLOGY.— Specimens were cut from material 25–100 cm in diameter. Although cut or broken material is preferred, in one area apparently healthy trees were killed by this species as a result of population buildup in slash.

NOTES.— The above treatment was based on 79 specimens, 2 of which were compared directly to the holotype.

### 52. *Monarthrum limulum* Wood

*Monarthrum limulum* Wood, 1974, Great Basin Nat. 34:143 (Holotype, male; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *robustum* (Schedl) by the smoother pronotal disc, by the minute declivital granules that have replaced the punctures, and by having spine 2 strongly displaced toward the suture.

MALE.— Length 2.2–2.6 mm, 2.5 times as long as wide; color brown.

Frons essentially as in *robustum*.

Pronotum as in *robustum* except disc smooth, minutely reticulate, punctures very minute.

Elytra with basic contours about as in *robustum*, with declivity commencing at middle, except lower half steeper; disc reticulate, punctures very fine, confused; declivital punctures anterior to spine 1 replaced by minute granules, granules on middle third almost obsolete, granules below spine 2 rather coarse; spine 1 conical, without ridge extending cephalad from its summit; spine 2 slightly

closer to lateral margin than to suture, not connected to lateral margin, conical, slightly larger than in *robustum*; declivital surfaces reticulate, almost rugose in some areas. Vestiture confined to declivity, of fine, short, moderately abundant hair.

FEMALE.— Similar to female *robustum* except frons more coarsely punctured; pronotal disc more finely punctured; declivity reticulate, punctures minute, with most of them accompanied by a very fine granule; declivital spine 2 almost as close to suture as to lateral margin.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 17-IX-63, 1300 m, No. 178, woody vine, S. L. Wood.

NOTES.— The above treatment was based on the type series of 14 specimens.

### 53. *Monarthrum glabrifrons* (Blandford)

*Pterocyclon glabrifrons* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):278 (Lectotype, female; Quiché Mts., Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species was named from two female syntypes that do not match any of the material before me. They are very similar to females of *limulum* Wood, but their exact position in the genus cannot be determined until males are available for study. The females of this species are distinguished from female *limulum* by the uniformly reticulate, much more finely punctured frons, with the epistomal margin somewhat abruptly, slightly elevated (without a definite transverse impression as in *limulum*), by the distinct, fine, confused punctures on the elytral disc, and by the more shallowly impressed elytral declivity, with tubercles 1 and 2 slightly smaller.

FEMALE.— Length 2.7 mm, 2.7 times as long as wide; as in *limulum* except as noted in the above diagnosis.

DISTRIBUTION.— Guatemala.

GUATEMALA: Quiché Mts., 7000–9000 ft, G. C. Champion.

NOTES.— The above treatment was based on the two syntypes that are mounted on one microcard on one pin. The specimen on the left side of the card, marked by an arrow and the word "type," is here designated as the lectotype of *glabrifrons* (Blandford).

### 54. *Monarthrum carinulum* Wood

*Monarthrum carinulum* Wood, 1974, Great Basin Nat. 34:144 (Holotype, male; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *vittatum* (Blandford) by the absence of a transverse frontal groove and the presence of a median frontal carina in both sexes and by the different female declivity.

MALE.— Length 2.3–2.6 mm, 2.7 times as long as wide; color brown.

Frons broadly convex, a low, subacute median carina extending from epistoma almost to upper level of eyes; surface strongly reticulate, punctures fine, moderately abundant; glabrous.

Pronotum and elytral disc and declivity as in *insignatum* Wood.

FEMALE.— Similar to male except frontal carina higher and longer; posterior face of antennal club ornamented by a tuft of hair; declivity less strongly impressed, slightly narrower, spines 1 and 2 slightly smaller, tubercle at apex of striae 1 entirely absent.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 1300 m, 17-IX-63, No. 178 in a woody vine, No. 184 in *Miconia caudata*, 26-XI-63, No. 265, *Phoebe mexicana*, S. L. Wood.

BIOLOGY.— Specimens were taken from branches 3–8 cm in diameter.

NOTES.— The above treatment was based on the type series of 16 specimens.

### 55. *Monarthrum subgranulatum* Wood

*Monarthrum subgranulatum* Wood, 1974, Great Basin Nat. 34:144 (Holotype, male; Cerro Peña Blanca, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *granulatum* Bright by the frontal and declivital characters described below.

MALE.— Length 2.4–2.8 mm, 2.7 times as long as wide; color dark reddish brown.

Frons broadly convex, a weak transverse impression just above epistomal margin; lower half of area below upper level of eyes strongly rugose-reticulate, upper area smooth, with moderately abundant impressed points and rather small punctures, transition between areas rather abrupt; rugose area sparsely, finely pubescent.

Pronotum and elytral disc essentially as in *punctifrons* (Blandford), elytral declivity

steep, strongly sulcate, more broadly flattened below spine 2; sulcus occupying median half on upper two-thirds, sutural interstriae feebly elevated, gradually ascending to broadly rounded, rather strongly elevated lateral margins; spine 1 small, at middle on margin; spine 2 one-fourth declivital length from apex, slightly closer to lateral margin than to suture, moderately large, conical, about as high as its basal width; inner margin of middle third of sulcus, just mesad of spine 1, armed by a row of about four to six small granules all smaller than spine 1; surface reticulate. Vestiture very sparse, confined to margins of declivity.

FEMALE.— Similar to male except rugose area on frons slightly larger and with much more abundant, fine, hairlike pubescence; posterior face of antennal club ornamented by a tuft of long hair; anterior margin of pronotum unarmed; declivity less strongly impressed, lateral margins more broadly rounded, spine 2 smaller, granules absent near summit of inner margin.

DISTRIBUTION.— Honduras.

HONDURAS: Cerro Peña Blanca, 23-IV-64, 1900 m, No. 531, *Persea popenoi*, S. L. Wood.

BIOLOGY.— Specimens were taken from a limb 15 cm in diameter.

NOTES.— The above treatment was based on the type series of 28 specimens.

### 56. *Monarthrum granulatum* Bright

*Monarthrum granulatum* Bright, 1972, Canadian Ent. 104:1382 (Holotype, male; 24 km or 15 miles S Valle Nacional, Oaxaca, Mexico; Canadian Nat. Coll., 12653)

DIAGNOSIS.— This species is distinguished from *subgranulatum* Wood as indicated below.

MALE.— Length 2.6–2.8 mm, 2.7 times as long as wide; color dark reddish brown.

Frons as in *subgranulatum* except slightly more coarsely punctured, rugose area less definite, some reticulation extending to upper level of eyes; glabrous except on epistomal margin. Elytral declivity with floor of sulcus more broadly impressed, its lateral walls subvertical; sutural interstriae more distinctly elevated; granules on inner margin of lateral convexities much larger, almost as large as spines 1 and 2.

FEMALE.— Similar to female of *subgranulatum* except devoid of pubescence, rugose area less definite as in male; declivity slightly steeper.

DISTRIBUTION.— Puebla to Oaxaca.

MEXICO: Oaxaca: 24 km (15 miles) S Valle Nacional, 20-V-71, 1300 m, D. E. Bright. Puebla: 9 km NE Teziutlán, 2-VII-67, 1600 m, No. 146, tree branch, S. L. Wood.

NOTES.— The above treatment was based on the holotype, on two paratypes, and on five other specimens.

### 57. *Monarthrum infradentatum* Wood

*Monarthrum infradentatum* Wood, 1974, Great Basin Nat. 34:145 (Holotype, male; Rincón de Osa, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from all preceding species by the obliquely truncate elytral declivity, with the ventrolateral margin acutely elevated from the sutural emargination to the level of spine 1, and by the absence of spine 2. It is distinguished from the three following species by the presence of a large spine on the margin of the apical emargination of the elytra.

MALE.— Length 1.4 mm, about 3.0 times as long as wide (elytra spread); color dark reddish brown, base of pronotum pale.

Frons broadly convex, a weak transverse impression just above epistoma; surface reticulate, small punctures obscurely indicated.

Pronotum 1.3 times as long as wide; about as in *punctifrons* (Blandford) except anterior margin armed by eight serrations.

Elytra about 1.7 times as long as wide, about 1.3 times as long as pronotum; sides almost straight and parallel to level of sutural apex, very broadly rounded to apical denticles and emargination; surface reticulate, minute punctures apparently in rows except confused near base. Declivity very steep, truncate, shallowly concave; basal margin rather abruptly rounded to striae 3, acutely margined from there to apical emargination; spine 1 small, conical, situated just below margin on interstriae 3; face of declivity smooth, shining, with minute points and small punctures, except somewhat rugose near margins; sutural emargination rather narrow, deep, its margin extended perpendicular to declivital surface and forming a large denticle on its basal half, denticle

height equal to its greatest basal width. Vestiture confined to declivity near margins, sparse, mostly short.

FEMALE.— Similar to male except posterior face of antennal club ornamented by long hair; anterior margin of pronotum unarmed; declivity weakly convex, lateral margin acutely raised on lower third, margin of emargination weakly elevated, denticle not evident.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 86, tree limb, S. L. Wood.

NOTES.— The above treatment was based on the type series of three specimens.

### 58. *Monarthrum corculum* Wood

*Monarthrum corculum* Wood, 1974, Great Basin Nat. 34:146 (Holotype, male; Turrialba, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *infradentatum* Wood by the larger size and by characters of the elytral declivity.

MALE.— Length 1.7–1.9 mm, 2.8 times as long as wide; color dark reddish brown except base of pronotum pale.

Frons, pronotum, and elytral disc as in *infradentatum*. Elytral declivity similar to *infradentatum* except declivital outline heart shaped, spine 1 on basal margin at interstriae 3, spine 2 two-thirds declivital length from base, equal distances from suture and lateral margin; sutural emargination strongly obtuse, shallow, its margin moderately elevated but not forming a tooth; declivital surface shining, finely, rather closely punctured. Vestiture confined to declivity, consisting of moderately abundant, short hair.

FEMALE.— Similar to male except frons with a rather strong, transverse impression just above epistoma; posterior face of antennal club ornamented by a tuft of long hair; anterior margin of pronotum unarmed; declivity with acute margin only on lower third, apical margin less strongly elevated.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Finca La Lola, Limón, 22-VI-63, *Theobroma cacao*, J. L. Saunders; Turrialba, Cartago, 9-III-64, 700 m, No. 497B, woody vine, S. L. Wood.

NOTES.— The above treatment was based on the type series of 45 specimens.

### 59. *Monarthrum posticum* Wood

*Monarthrum posticum* Wood, 1974, Great Basin Nat. 34:146 (Holotype, male; Santa Ana, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *corculum* Wood by the much more coarsely punctured frons, by the smooth elytra, and by the different declivity.

MALE.— Length 1.7–2.1 mm, 2.6 times as long as wide; color dark reddish brown except base of pronotum usually pale.

Frons as in *corculum* except surface smooth, with rather dense impressed points and rather coarse punctures.

Pronotum and elytra similar to *corculum* except slightly stouter; elytral disc smooth and shining except obscurely reticulate near base, strial punctures minute, in rows. Elytral declivity as in *corculum* except much less strongly impressed, posterolateral angles much more abrupt, surface smoother, brightly shining, punctures much larger.

FEMALE.— Similar to male except frons more nearly subgranulate; posterior face of antennal club ornamented by a tuft of long hair; anterior margin of pronotum unarmed; declivity with margin on basal third more broadly rounded, lateral two-thirds more nearly convex.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, Nos. 57, 61, 80, woody vines and tree seedlings, S. L. Wood; Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 85, tree limb, S. L. Wood; Santa Ana, San José, 4-X-63, 1300 m, No. 222, tree seedling, S. L. Wood; Tapantí, Cartago, 24-X-63, 1300 m, No. 268, tree limb, S. L. Wood.

BIOLOGY.— Specimens were cut from material 8–30 cm in diameter.

NOTES.— The above treatment was based on the type series of 53 specimens.

### 60. *Monarthrum proximum* Wood

*Monarthrum proximum* Wood, 1974, Great Basin Nat. 34:147 (Holotype, male; San Isidro del General, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *posticum* Wood by the larger average size and by characters of the frons and declivity described below.

MALE.— Length 1.9–2.3 mm, 2.4 times as long as wide. As in *posticum* except frons more finely punctured, reticulate on lower

half; distance between apical and subapical margins greater.

FEMALE.— Similar to female *posticum* except transverse impression above epistoma deeper, more abrupt, frons almost entirely reticulate.

DISTRIBUTION.— Costa Rica and Venezuela.

COSTA RICA: Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 57, log, S. L. Wood; Rincón de Osa, Puntarenas, 11-VIII-66, 30 m, No. 85, tree limb, S. L. Wood; San Isidro del General, San José, 5-XII-63, 1000 m, No. 284, *Miconia pubescens*, S. L. Wood; Río Damitas, Dota Mts., San José, 22-VIII-63, 250 m, S. L. Wood. VENEZUELA: 30 km E Palamar, Bolivar, 12-VI-70, 70 m, No. 557, *Alexa imperatricia*, S. L. Wood.

BIOLOGY.— Specimens were taken from recently cut or broken material 10–25 cm in diameter.

NOTES.— The above treatment was based on the type series of 32 specimens.

## GENUS *GLOCHINOCERUS* BLANDFORD

*Glochinocerus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):266 (Type-species: *Glochinocerus retusipennis* Blandford, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:122)

DIAGNOSIS.— This genus is distinguished by the 3-segmented antennal funicle, by the slender antennal club, which is 2.2 or more times as long as wide, with two straight sutures dividing the club into equal units, by the slender, subinflated protibiae with numerous small tubercles on its posterior face in both sexes, by the concave and distinctively ornamented female frons, and by other characters.

FEMALE.— Length 3.0–3.8 mm, 2.5 times as long as wide.

Frons dimorphic, convex in male, concave and characteristically ornamented by setae in female; eye rather deeply emarginate. Antennal scape elongate, funicle 3-segmented, club elongate and equally divided into three units by straight sutures. Pronotum slightly longer than wide, weakly declivous on anterior half; lateral margins rounded, without a fine, raised line; anterior margin unarmed in female, armed by two teeth in male. Scutellum rather large, flat. Elytra subtruncate, declivity steep; punctures on disc confused. Protibiae slender, lateral margin partly serrate, posterior face convex, armed by many fine tubercles.

DISTRIBUTION.— Hidalgo to Guatemala; two species.

BIOLOGY.— The species are monogamous ambrosia beetles; both infest logs up to 30 cm in diameter and broken branches 7 cm in diameter. The gallery system is similar to most species of *Corthylus* and *Tricolus*.

### Key to the Species of *Glochinocerus*

1. Interstriae 3 weakly, continuously elevated on upper two-thirds of declivity, its crest armed by a row of three or more small tubercles, remainder of declivity entirely devoid of tubercles or granules; longest female epistomal setae capable of being extended half distance to vertex; elytral declivity glabrous; Guatemala; 3.1–3.8 mm ..... 1. ***retusipennis* Blandford**

— Interstriae 3 not elevated, small, confused granules or tubercles scattered over entire declivity, none of them forming a row; longest setae on female epistoma capable of attaining vertex; elytral declivity with rather short, conspicuous hair, some setae equal in length to width of scutellum; Hidalgo to Guatemala; 3.0–3.8 mm ..... 2. ***gemellus* Blandford**

### 1. *Glochinocerus retusipennis* Blandford

Fig. 215

*Glochinocerus retusipennis* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):266 (Lectotype, female; Cerro Zunil, Quezaltenango, Guatemala; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished from *gemellus* Blandford by characters summarized in the above key.

FEMALE.— Length 3.1–3.8 mm, 2.5 times as long as wide; color very dark brown.

Frons flat and ascending slightly from upper level of eyes to median area of epistoma, shallowly concave from upper level of eyes to vertex; surface subshining, slightly irregular, small punctures obscure; lateral and particularly upper margins of concave area ornamented by a dense row of very long,

coarse, subplumose hair, a few shorter setae scattered on floor of concave area; ventrolateral angles between eye and mandible each bearing a tuft of long, curled, reddish hair, longest of these setae reaching about half distance to upper margin of concave area. Antennal club 1.5 times as long as wide, suture 2 at middle.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on basal half, very broadly rounded in front; summit indefinite, near middle; anterior slope weakly declivous, asperities small, numerous; posterior areas reticulate, punctures almost obsolete. Glabrous except at margins.

Elytra 1.5 times as long as wide, 1.4 times as long as pronotum; sides straight and parallel on basal three-fourths, slightly narrowed, then abruptly, very broadly rounded behind; disc smooth, shining, punctures rather small, close, confused. Declivity very steep, essentially broadly convex except sulcate on triangular area beginning at suture above, occupying median half and ending one-third declivital length from apex; interstriae 3 distinctly, rather narrowly elevated on upper two-thirds and armed by a row of about 3 to 10 fine granules; posterolateral margin acutely, not strongly elevated on lower half to apex; surface reticulate, without punctures or granules except on interstriae 3. Declivity glabrous, sides with sparse, short hair.

MALE.— Similar to female except frons convex, glabrous, with sparse, rather fine punctures; antennal club 2.4 times as long as wide, suture 2 on apical half; anterior margin of pronotum armed by two coarse serrations.

DISTRIBUTION.— Guatemala.

GUATEMALA: Cerro Zunil, Quezaltenango, G. C. Champion; Volcán Pacaya, Esquintla, 1-VI-64, 1300 m, No. 671 in tree branch, No. 688 in bole of Caldo de Frijol, S. L. Wood.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on 57 specimens, 4 of which were compared to Blandford's 4 syntypes. The first female syntype in Blandford's series is here designated as the lectotype of *retusipennis* Blandford. It has been labeled "type" and has been regarded as the type for many years, although it has never been formally so designated.

### 2. *Glochinocerus gemellus* Blandford

*Glochinocerus gemellus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):267 (Lectotype, female; Quiché Mountains, El Quiché, Guatemala; British Mus. Nat. Hist., present designation.)

DIAGNOSIS.— This species is distinguished from *retusipennis* Blandford by characters mentioned in the above key.

FEMALE.— Length 3.0–3.8 mm, 2.5 times as long as wide; color very dark brown.

As in female *retusipennis* except epistoma deeply emarginate, tips of longest lateral epistomal setae attaining vertex; suture 2 on distal half of antennal club; elytral declivity with granules sparsely distributed over entire surface, confused, interstriae 3 not elevated or granulate, sparsely, conspicuously pubescent, longest setae equal in length to width of scutellum.

MALE.— Similar to female except frons convex, punctured, glabrous, epistoma entire; anterior margin of pronotum armed by two coarse serrations.

DISTRIBUTION.— Hidalgo to Guatemala.

MEXICO: **Hidalgo**: 31 km E Tulancingo, 12-VI-67, 2300 m, No. 15, *Quercus* log, S. L. Wood. **Mexico**: Amecameca, 26-IX-80, 2700 m, *Alnus*, T. H. Atkinson. **Puebla**: Zacatlán, 18-II-57, *Prunus*. GUATEMALA: Volcán Pacaya, 1-VI-64, 1300 m, No. 688, tree branch, S. L. Wood. Quché Mts.

BIOLOGY.— As described for the genus.

NOTES.— The above treatment was based on 24 specimens, 2 females of which were compared to the 2 female syntypes of *gemellus*. The first syntype, from the Quiché Mountains, is here designated as the lectotype of *gemellus* Blandford.

## GENUS *METACORTHYLUS* BLANDFORD

*Metacorthylus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):263 (Type-species: *Metacorthylus nigripennis* Blandford, monobasic)

*Paracorthylus* Wood, 1968, Great Basin Nat. 28:7 (Type-species: *Paracorthylus velutinus* Wood, original designation.); Wood, 1976, Great Basin Nat. 36:347. *Synonymy*

DIAGNOSIS.— This genus is distinguished from *Glochinocerus* Blandford by characters of the frons, antennae, elytra, and vestiture. The fore tibiae are somewhat sexually dimorphic, as in *Monarthrum* Kirsch.

DESCRIPTION.— Length 1.9–2.7 mm, 2.2 times as long as wide; antennae, elytra, and protibiae sexually dimorphic.

Frons convex; pubescence sparse. Eye two-thirds divided by an emargination. Antennal scape elongate; funicle 2-segmented; club sexually dimorphic, with two procurved sutures on basal half. Pronotum as in *Corthylus*. Scutellum large, almost flat. Elytra subtruncate and entire behind; pubescence minute, recumbent, dense on pronotum and elytra. Protibia sexually dimorphic, posterior face inflated and finely tuberculate in female, almost flat and with few tubercles in male.

DISTRIBUTION.— Costa Rica to Colombia; four species.

Key to the Species of *Metacorthylus*

1. Upper margin of male elytral declivity armed by three pairs of teeth on interstriae 1–3, lateral pair distinctly larger; sutural apex slightly divaricate; male declivity shallowly concave, its margin subacutely, weakly elevated on more than three-fourths of a circle, sutural interstriae distinctly elevated, female declivity subconcave, margins rounded; Panama; 1.9–2.0 mm ..... 1. ***mutilus*** **(Wood)**

– Upper margin of elytral declivity unarmed in either sex; sutural apex of elytra entire; declivity weakly convex to subconcave, margins rounded on at least upper three-fourths ..... 2

2(1). Elytral declivity slightly convex; pronotal disc subreticulate, punctures minute, close, spaced by less than about two diameters of a puncture; female interstriae 3 on declivity armed by one tubercle; color yellowish brown to brown; pronotum and elytral disc with abundant, minute, recumbent hair; Costa Rica to Colombia; 1.9–2.0 mm ..... 2. ***velutinus*** **(Wood)**

– Elytral declivity shallowly subconcave; pronotal disc reticulate, punctures very fine, widely spaced by about four to six diameters of a puncture; female interstriae 3 on declivity armed by two tubercles; color reddish brown; pronotum and elytral disc sparsely pubescent ..... 3

3(2). Female antennal club 1.9 times as long as wide; elytral declivity not as steep, spine 2 on female almost on lateral margin; Costa Rica; 2.3–2.6 mm ..... 3. ***concisus*** **(Wood)**

– Female antennal club 1.0 times as long as wide; declivity very steep, spine 2 on female almost as close to suture as to lateral margin; Panama; 2.7 mm ..... 4. ***nigripennis*** **Blandford**

### 1. *Metacorthylus mutilus* (Wood)

*Paracorthylus mutilus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):66 (Holotype, female; Fort Sherman, Canal Zone, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *concisus* (Wood) by the smaller size, by the shallowly divaricate sutural apex of the elytra, and by the distinctive elytral declivity.

FEMALE.— Length 1.9–2.0 mm, 2.7 times as long as wide; color reddish brown.

Frons as in *velutinus* (Wood) except surface reticulate above shining epistomal margin. Antennal club 1.4 times as long as wide, apical segment only slightly modified.

Pronotum 1.1 times as long as wide; as in *velutinus* except surface reticulate, punctures very fine, much less closely spaced.

Elytra 1.4 times as long as wide, 1.2 times as long as pronotum; as in *velutinus* except declivity. Declivity subvertical, subtruncate, shallowly concave; lateral margins distinctly elevated, rounded, armed on middle third on median margin by two pointed tubercles, upper one slightly larger; sutural interstriae weakly elevated; posterolateral margin subacute at apex, suture weakly emarginate; surface rugose-reticulate; punctures obscure. Very minute setae moderately abundant on declivity, similar but less abundant on disc.

MALE.— Similar to female except apical segment of antennal club slightly shorter and

more broadly rounded; anterior margin of pronotum armed by eight serrations of moderate size; declivity more evenly concave, its margins weakly, subacutely elevated on more than lower three-fourths, upper margin armed by three pairs of small teeth on interstriae 1–3, lateral pair conspicuously larger, sutural apex more distinctly emarginate, sutural interstriae more distinctly elevated.

DISTRIBUTION.— Panama.

PANAMA: Ft. Sherman, Canal Zone, 10-XI-57, at light.

NOTES.— The above treatment was based on the type series of four specimens.

### 2. *Metacorthylus velutinus* (Wood)

Fig. 218

*Paracorthylus velutinus* Wood, 1968, Great Basin Nat. 28:7 (Holotype, female; Moravia, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— The sexually dimorphic antennae and armature of the elytral declivity and the minute, recumbent vestiture serve to distinguish this species from other species with which it might possibly be confused.

FEMALE.— Length 1.9–2.0 mm, 2.2 times as long as wide; color brown, anterior and posterior extremities somewhat darker.

Frons rather weakly concave; slightly, transversely impressed just above epistomal margin; epistomal margin produced into a small lobe in front of mandibles; an acute median carina on lower half extending to apex of epistomal lobe; surface shining, marked by small points and moderately large, close, deep punctures; vestiture erect, minute, inconspicuous. Eye almost two-thirds divided by a narrow emargination. Antennal funicle 2-segmented; club 1.6 times as long as wide, narrowly triangular, apex acutely pointed; sutures 1 and 2 subangulately procurved, 2 not extending beyond basal third; mediodistal margin bearing a row of rather long hair, other setae minute.

Pronotum 1.1 times as long as wide; widest on basal half, sides on basal two-thirds feebly arcuate, rather broadly rounded in front; summit rather indefinite, about one-third pronotum length from anterior margin; very finely asperate on anterior slope, dull, very minutely reticulate-granulate behind. Vestiture consisting of rather abundant, minute, recumbent hair, somewhat longer and more nearly erect in asperate area.

Elytra 1.1 times as long as wide, 1.0 times as long as pronotum; sides almost straight and parallel to a point beyond level of declivital base, very broadly rounded behind; declivity restricted to posterior fourth; strial and interstrial punctures obsolete, surface of disc finely reticulate, dull, a very slight irregularity where small, confused punctures might have been. Declivity abrupt, very steep, weakly convex; surface obscurely, rather closely punctured, impressed toward suture on upper two-thirds; interstriae 3 weakly elevated on upper half, with one blunt tubercle on summit just above middle of declivity. Vestiture minute, recumbent, rather abundant.

MALE.— Similar to female except frons more nearly convex, carina shorter; antennal club shorter, broader, much less strongly acuminate; elytral disc near declivity more nearly shining, more clearly punctured; declivital interstriae 3 armed by two moderately large, pointed tubercles, 1 one-third of declivity length from upper margin, 2 slightly larger, two-thirds from upper margin; lower margin of declivity more distinctly elevated.

DISTRIBUTION.— Costa Rica to Colombia.

COSTA RICA: Moravia, Cartago, 11-III-64, 500 m, fallen tree, S. L. Wood. COLOMBIA: Montegrande, Caicedonia, Valle de Cauca, 19-VI-59, guamo seco, J. Restrepo.

BIOLOGY.— These monogamous beetles were in simple, straight tunnels 2–3 cm below the surface in the bole of a fallen tree where bark had been removed. The tree was in land being cleared and had been down two to three months. The wood was unusually dry and hot and was fully exposed to the sun. The beetles were on the shaded side and appeared to be completely inactive until disturbed.

NOTES.— The above treatment was based on the type series of 19 specimens and on 2 other specimens.

### 3. *Metacorthylus concisus* (Wood)

*Paracorthylus concisus* Wood, 1974, Brigham Young Univ. Sci. Bull., Biol. Ser. 19(1):67 (Holotype, female; Moravia, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *velutinus* (Wood) by the larger size, by

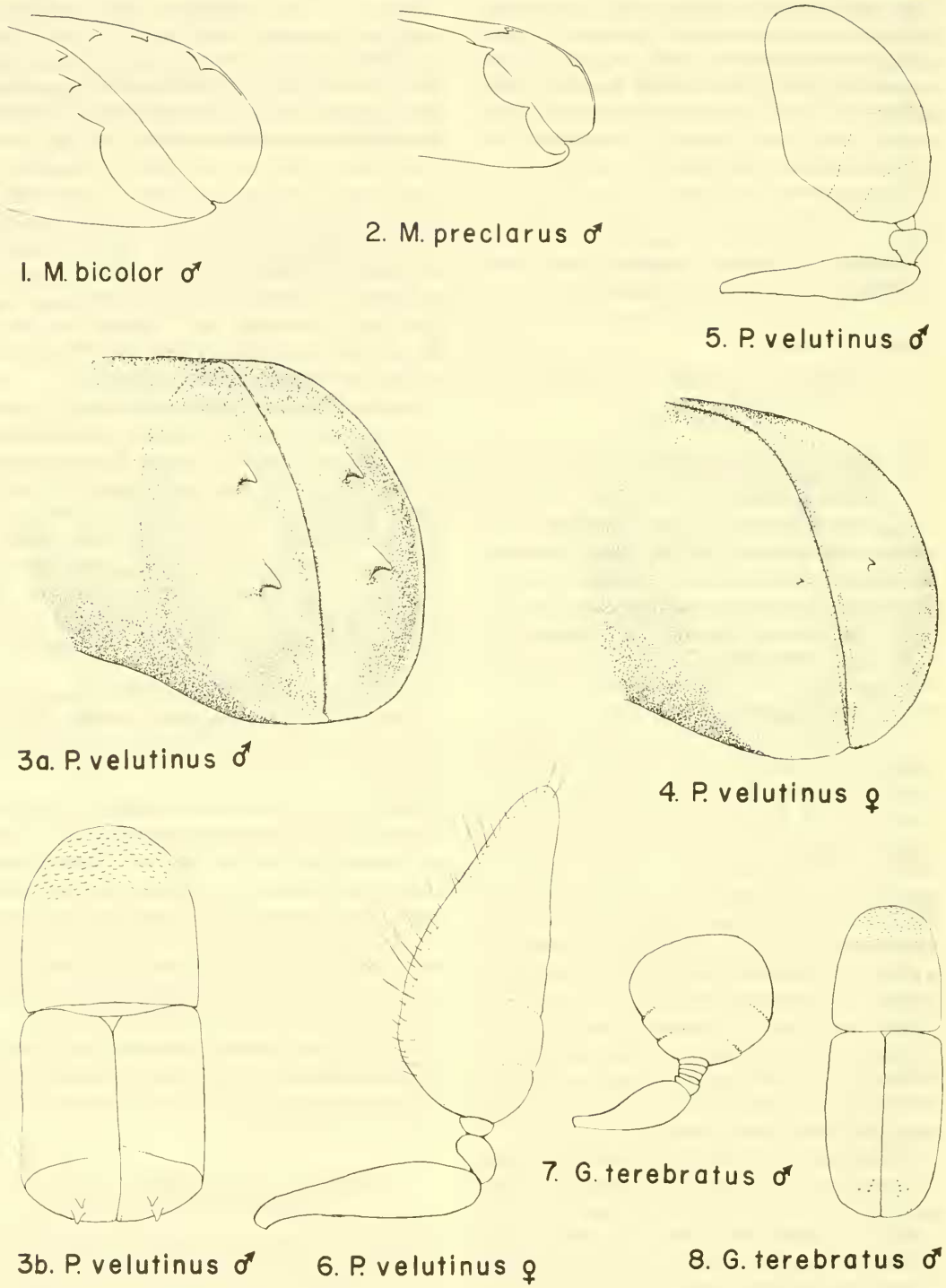



Fig. 218. Corthylini spp., outlines of dorsal aspect, declivities, and antennae: 1, *Monarthrum bicolorum* (=*bicolor*) (Guyana); 2, *Monarthrum parvum* (=*preclarus*) (Guyana); 3a, 3b, 5, *Metacorthylus velutinus*, male, 4, 6, same, female; 7–8, *Gnathotrupes terebratus*. (After Wood 1968:5.)

the subconcave elytral declivity, with different armature in the female, by the sparse pubescence, and by other characters.

FEMALE.— Length 2.3–2.6 mm, 2.6 times as long as wide; color reddish brown.

Frons as in *velutinus* except obscurely reticulate, shining, median carina extending from epistomal margin to median callus on lower third. Antennal club 1.9 times as long as wide, about intermediate in shape between *velutinus* and *mutilus*.

Pronotum 1.1 times as long as wide; as in *mutilus*.

Elytra 1.4 times as long as wide, 1.2 times as long as pronotum; as in *mutilus* except tubercles slightly larger and apex of suture entire.

MALE.— Similar to female except antennal club less elongate, its apex more broadly rounded; anterior margin of pronotum armed by eight serrations; declivity much more broadly, evenly impressed, margins on lower half more distinctly, more narrowly elevated but not angulate, sutural apex entire and bent slightly dorsad, two pairs of tubercles on interstriae 3 displaced mesad from lateral margin, lower one at middle, upper one on basal fourth.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Moravia, 11-III-64, 500 m, No. 473, felled tree, S. L. Wood.

BIOLOGY.— Specimens were taken in the same cleared area as *velutinus* but from a different host tree 35 cm in diameter.

NOTES.— The above treatment was based on the type series of 16 specimens.

### 4. *Metacorthylus nigripennis* Blandford

*Metacorthylus nigripennis* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):263 (Holotype, female; Bugaba, Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *concisus* (Wood) by the larger size, and by characters of the female antennal club and elytral declivity.

FEMALE.— Length 2.7 mm, 2.4 times as long as wide; color yellowish brown with very dark brown elytra.

Frons as in *concisus* except median callus very slightly larger. Antennal club 1.0 times as long as wide, widest on apical third; sutures feebly procurved; posterior face with a small tuft of hair near apex.

Pronotum and elytral disc as in *concisus*. Declivity as in *concisus* except steeper, basal angle more abrupt, upper fourth very slightly more narrowly, more deeply impressed, spine 2 more strongly displaced from lateral margin, almost as close to suture as to lateral margin, vestiture very slightly longer.

DISTRIBUTION.— Panama.

PANAMA: Bugaba, Chiriquí, 800–1500 ft, G. C. Champion.

NOTES.— The above treatment was based on the holotype.

## GENUS *MICROCORTHYLUS* FERRARI

*Microcorthylus* Ferrari, 1867, Die Forst- und Baunzuchtschädlichen Borkenkäfer, p. 58 (Type-species: *Microcorthylus parvulus* Ferrari, monobasic)

DIAGNOSIS.— This genus is distinguished from *Corthylus* Erichson by the rounded lateral margins of the pronotum, which are not marked by a fine, raised line, by the impunctate pronotal and elytral discs (obscure punctures occasionally present), by the unique elytral declivity that always has the lateral margins armed by two pairs of very small denticles (some South American species have several), by the rather simple antennal club, and by other characters.

DESCRIPTION.— Length 1.2–2.4 mm, 2.5–3.1 times as long as wide; color yellowish to dark brown, most body vestiture greatly reduced or absent.

Frons evenly convex (except slightly modified in female of *grandiclavatus*), subglabrous. Eye emarginate, finely to coarsely granulate. Antennal scape elongate; funicle 1-segmented; club longer than scape, oval to obscurely subtriangular, sutures 1 and 2 present except in one species, usually with a tuft of hair on posterior face in female. Pronotum longer than wide; summit obscure, in front of middle; anterior slope with low asperities, anterior margin usually very feebly serrate in female, coarsely serrate in male; posterior areas reticulate, punctures minute and obscure or absent. Scutellum rather large, flat. Elytra about 1.4–1.8 times as long as wide, sides almost straight and parallel on basal two-thirds; discal punctures obscure to obsolete, in rows or confused, surface usually reticulate; declivity steep, sulcate on basal third, variously, more broadly impressed below,

excavated area usually reticulate and without punctures, lateral margins armed by spine 1 near base on interstriae 3, spine 2 at or slightly above middle, spines very small, pointed. Precoxal piece on prosternum forming a simple vertical, transverse partition, procoxae contiguous; protibia slightly inflated and armed by tubercles on posterior face.

DISTRIBUTION.— Veracruz to Argentina; 26 species are known; 13 occur in Mexico and Central America.

BIOLOGY.— Apparently all species are monogamous, xylomycetophagous, and breed in recently cut or injured woody stems about 2–5 cm in diameter. The parental tunnel is started by the male; it usually follows a spiral pattern along a particular growth ring in the wood and has a turning niche just inside from the entrance hole. The larvae are reared in cradles they enlarge as they grow, as in *Monarthrum*.

NOTES.— This genus includes a compact group of small species that exhibit very conservative characters. The differences between species are consistent but often minute, making classification unusually difficult.

## Key to the Species of *Microcorthylus*

1. Elytral declivity with sutural interstriae on right elytral feebly, distinctly elevated, lateral margin of this elevation marked by a subacute, continuous costa on at least lower half of declivity, granules on interstriae 1 absent, punctures on striae 1 obsolete; posterior face of female antennal club usually with tuft of long hair ..... 2

— Elytral declivity with floor of impressed area rising gradually to suture, striae 1 with two or more distinctly impressed punctures, or interstriae 1 with a row of two or more tubercles near middle of declivity, or both; female antennal club without tuft of long hair on posterior face ..... 10

2(1). Subapical margin of elytral declivity parallel to costal margin, without any elevated connection to elevated lateral margin of declivity ..... 3

— Subapical margin of declivity acutely, continuously elevated from near suture to lateral margin of declivity ..... 9

3(2). Elytral declivity less strongly, less broadly impressed, slope from suture to summit of lateral margins of impressed area more gradual, uniform ..... 4

— Elytral declivity more strongly, more broadly impressed, lateral convexities abruptly elevated at mesal margin of spines, particularly noticeable just below spine 2 ..... 6

4(3). Frons with coarser punctures longitudinally elongate, in male rugose-reticulate above epistoma, gradually becoming longitudinally, minutely strigose above to vertex, in female reticulate below, more nearly shining above with longitudinal strigose lines indicated at least in lateral area; Guatemala; 1.6–1.9 mm ..... 1. ***debilis*** **Wood**

— Male frons finely, regularly reticulate from epistoma to vertex, punctures normal, female frons similar but largely smooth, with normal punctures; smaller .... 5

5(4). Epistoma armed by a small, median tubercle (often obscure in female); male frons reticulate; eyes normal; body stouter; elytra subshining, weakly reticulate; Puebla to Costa Rica; 1.3–1.5 mm ..... 2. ***demissus*** **Wood**

— Epistoma smoother, almost shining, unarmed (female sometimes with a feeble median tubercle); eyes greatly enlarged, coarsely faceted; body slender; elytra usually more strongly reticulate; Costa Rica; 1.3–1.4 mm ..... 3. ***ocularis*** **Wood**

6(3). Impressed area of declivity triangular, its lateral margins straight from base to apex of lateral elevations; male pronotum usually armed by two to four serrations ..... 7

– Impressed area of declivity heart-shaped, its lateral margins conspicuously curved, particularly below spine 2; male pronotum usually armed by six to eight serrations ..... 8

7(6). Elytra uniformly reticulate; impressed area on declivity more broadly triangular, its sides converging above at an angle greater than 45 degrees; Costa Rica to Panama; 1.5–1.6 mm ..... 4. ***inermis*** **Wood**

– Elytral disc subshining, except strongly reticulate near declivity; impressed area on declivity narrowly triangular, its lateral margins converging above at an angle of less than 30 degrees; Nayarit; 1.5–1.6 mm ..... 5. ***invalidus*** **Wood**

8(6). Declivital spine 2 well above middle of declivity, distance from apical margin to spine 2 at least twice as great as distance from spine 1 to spine 2; elytra more slender, 1.6 times as long as wide, disc shining, without any reticulation except on declivity; Costa Rica to Colombia and Venezuela; 1.6–1.7 mm ..... 6. ***parvulus*** **Ferrari**

– Declivital spine 2 at middle of declivity, distance from apical margin to spine 2 only slightly greater than from spine 1 to spine 2; elytra stouter, 1.4 times as long as wide, disc at least partly reticulate near declivity; Veracruz and Jamaica to Brazil; 1.2–1.3 mm (see also 7. ***vicinus*** **Wood**) ..... 8. ***minimus*** **Schedl**

9(2). Declivital spine 2 closer to spine 1 than to posterior margin of declivity (both spines sometimes obsolete); frons very broad, evenly convex; Costa Rica and Panama; 1.7–1.9 mm ..... 9. ***pumilus*** **Wood**

– Declivital spine 2 closer to posterior margin than to spine 1; male frons with a short median carina at epistoma, an obscure median callus to upper level of eyes, female frons below upper level of eyes almost flat on lateral thirds; a rather strongly convex elevation on median third; Guatemala to Honduras; 2.0–2.4 mm ..... 10. ***pusillus*** **Wood**

10(1). Declivital interstriae 1 without granules, minute punctures usually present; antennal club with suture 2 indicated only near margins, apex of club much more broadly rounded; Costa Rica to Panama; 1.5–1.6 mm ..... 11. ***lassus*** **Wood**

– Declivital interstriae 1 with granules, punctures often also present; antennal club with suture 2 marked by a groove and apparently septate throughout its length, segment 3 somewhat triangular; larger species ..... 11

11(10). Female frons slightly impressed on lateral thirds and also on median third just above epistoma, this impressed area strongly reticulate, dull, median third from slightly below upper level of eyes to near vertex conspicuously inflated and shining; declivity more strongly impressed, male interstriae 1 with four conspicuous granules and accompanying strial punctures, female granules and punctures smaller; Costa Rica and Panama; 1.9–2.2 mm ..... 12. ***grandiclavatus*** **Eggers**

– Female frons uniformly convex; declivital impression not as strong, male granules somewhat smaller ..... 12

12(11). Declivital granules on interstriae 1 varying from two to four in males, zero to four in females; frons weakly carinate on lower third, impressed points and punctures in upper areas usually finer and not at all strigose; Costa Rica; 1.6–1.8 mm ..... 13. ***concisus*** **Wood**

– Declivital granules on interstriae 1 varying from four to eight; median epistomal tubercle not at all carinate; frons with impressed points and punctures larger, usually rather distinctly, longitudinally substrigose; Guatemala; 2.0–2.3 mm ..... 14. ***vescus*** **Wood**

### 1. *Microcorthylus debilis* Wood

*Microcorthylus debilis* Wood, 1973, Great Basin Nat. 33:265 (Holotype, female; Volcán Pacaya, Guatemala; Wood Coll.)

DIAGNOSIS.— In this species the frontal punctures are rather coarse and elongate and the elytral declivity is only moderately impressed and devoid of an elevation between the costal margin and the lateral margin.

FEMALE.— Length 1.6–1.9 mm, 2.8 times as long as wide; color yellowish brown.

Frons convex, with a distinct transverse impression just above epistoma, a weak, median epistomal process indicated; surface obscurely reticulate in central area, becoming almost rugose-reticulate in marginal areas; punctures coarse for this genus, elongate; subglabrous. Antennal club 1.1 times as long as scape, 1.4 times as long as wide, broadly, somewhat obovate; sutures 1 and 2 almost straight; posterior face with small tuft of hair.

Pronotum 1.1 times as long as wide; widest near base, sides parallel on basal half, broadly rounded in front; about a dozen weakly raised serrations on anterior margin; indefinite summit just anterior to middle; anterior slope moderately steep, rather finely asperate; posterior areas strongly reticulate, sparse, very minute, shallow punctures indicated. Glabrous.

Elytra 1.6 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, then arcuately converging to lateral margin of declivity, broadly rounded behind on median half; strial punctures very obscurely indicated, interstrial punctures obsolete, dical surface subreticulate, subshining. Declivity steep, broadly sulcate; impressed area extending from suture to about striae 1 above and striae 3 or 4 below; sutural interstriae feebly, abruptly elevated, forming a distinct, continuous crest on its lateral margin on right elytron; lateral margins increase in height gradually on upper two-thirds, obsolete below, crest of upper half armed by two pairs of rather widely separated, small, pointed denticles; all punctures obsolete; surface reticulate. Glabrous.

MALE.— Similar to female except epistomal process forming a definite median tubercle; serrations on anterior margin of pronotum larger.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán Pacaya, Esquintla, 1-VI-64, 1300 m, No. 670, tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from a branch 3 cm in diameter.

NOTES.— The above treatment was based on the type series of 60 specimens.

### 2. *Microcorthylus demissus* Wood

*Microcorthylus demissus* Wood, 1973, Great Basin Nat. 33:266 (Holotype, female; 6 miles or 9 km NE Teziutlán, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *debilis* Wood by the smaller size, by the more shining, less strongly punctured female frons, male frons finely reticulate, and by the less strongly impressed elytral declivity.

FEMALE.— Length 1.3–1.5 mm, 2.9 times as long as wide; color yellowish brown.

Frons as in *debilis* except central half smooth, shining, punctures not elongate; antennal club 1.3 times as long as scape, 1.5 times as long as wide.

Pronotum as in *debilis* except anterior margin more narrowly rounded.

Elytra as in *debilis* except declivity less strongly impressed, lateral margins much less strongly elevated.

MALE.— Similar to female except frons uniformly, finely reticulate; anterior margin of pronotum armed by six rather coarse serrations; declivital denticles slightly larger.

DISTRIBUTION.— Puebla and Costa Rica.

MEXICO: Puebla: 9 km NE Teziutlán, 1500 m, 27-VI-53, No. 45, and 2-VII-67, No. 137, *Miconia*, S. L. Wood. COSTA RICA: Tapantí, Cartago, 2-VII-63, 1300 m, No. 7B in *Bochmeria ulmifolia*, No. 10 in *Conostegia oerstediana*, S. L. Wood.

BIOLOGY.— Specimens were taken from cut branches 2–4 cm in diameter.

NOTES.— The above treatment was based on the type series of 54 specimens and on 9 other specimens.

### 3. *Microcorthylus ocularis* Wood

*Microcorthylus ocularis* Wood, 1973, Great Basin Nat. 33:266 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *demissus* Wood by the absence of a median epistoma tubercle, by the narrow frons, by the enlarged, coarsely faceted eyes, and by the slender body form.

FEMALE.— Length 1.3–1.4 mm, 3.0 times as long as wide; color yellowish brown.

Frons as in *demissus* except mostly weakly reticulate and epistomal tubercle reduced or absent. Eyes twice as large as normal, coarsely faceted. Pronotum and elytra rather weakly reticulate.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 2-VII-63, No. 1300 mm, 7B in *Boehmeria ulmifolia*, No. 10 in *Conostegia oerstediana*, S. L. Wood; 15 km SE Cartago, Cartago, 24-XI-63, 1800 m, No. 248, *Siparuna nicaraguensis*, S. L. Wood.

BIOLOGY.— Specimens were taken from cut branches 5–7 cm in diameter.

NOTES.— The above treatment was based on the type series of seven specimens.

### 4. *Microcorthylus inermis* Wood

*Microcorthylus inermis* Wood, 1973, Great Basin Nat. 33:267 (Holotype, female; 9 miles or 15 km SE Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *demissus* Wood by the more strongly impressed elytral declivity, with the lateral margins abruptly but not strongly elevated, by the uniformly, finely, rugose-reticulate frons, and by the broader antennal club.

FEMALE.— Length 1.5–1.6 mm, 2.8 times as long as wide; color dark brown.

Frons broadly convex, a conspicuous median tubercle just above epistomal process; entire surface from epistoma to vertex rugose-reticulate, minute punctures almost obsolete. Antennal club 1.3 times as long as scape, 1.3 times as long as wide; broadly obovate; a small tuft of setae on posterior face.

Pronotum 1.1 times as long as wide; as in *debilis* Wood except posterior areas much more strongly reticulate.

Elytra 1.8 times as long as wide; as in *debilis* except entire surface uniformly reticulate; declivity more strongly impressed, lateral margins abruptly elevated.

MALE.— Similar to female except frontal punctures more distinct; antennal club slightly smaller and devoid of tuft of hair on posterior face; serrations on anterior margin of pronotum rather coarse.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: 15 km SE Cartago, Cartago, 24-IX-63, 1800 m, Nos. 199, 248, *Siparuna nicaraguensis*, S. L. Wood; Escasú, San José, 2-X-63, 1300 m, No. 215, *Guazuma ulmifolia*, No. 218, cut seedling, S. L. Wood. PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, Nos. 381, 399, woody vine, S. L. Wood.

BIOLOGY.— Specimens were taken from branches less than 4 cm in diameter.

NOTES.— The above treatment was based on the type series of 43 specimens.

### 5. *Microcorthylus invalidus* Wood

*Microcorthylus invalidus* Wood, 1973, Great Basin Nat. 33:268 (Holotype, female; 4 miles or 6 km W Tepic, Nayarit, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *demissus* Wood by the more nearly reticulate frons, by the much more deeply impressed elytral declivity with its margins more abruptly elevated, and by the reticulate female scutellum.

FEMALE.— Length 1.5–1.6 mm, 2.8 times as long as wide; color light brown.

Frons as in *demissus* except reticulation more extensive in lateral areas. Antennal club 1.2 times as long as wide.

Pronotum 1.2 times as long as wide; as in *demissus*.

Elytra as in *demissus* except declivity much more strongly impressed; declivity about as in *inermis* Wood except lateral margins of impressed area converge toward base at an angle of about 30 degrees (about 45 degrees in *inermis*).

MALE.— Similar to female except frons rugose-reticulate, punctures minute; antennal club smaller, without tuft of hair on posterior face; anterior margin rather coarsely serrate.

DISTRIBUTION.— Nayarit.

MEXICO: Nayarit: 6 km W Tepic, 13-VII-65, 1000 m, Nos. 239, and 240, S. L. Wood.

BIOLOGY.— Specimens were taken from recently cut tree limbs 3 cm in diameter.

NOTES.— The above treatment was based on the type series of four specimens.

### 6. *Microcorthylus parvulus* Ferrari

*Microcorthylus parvulus* Ferrari, 1867, Die Forst- und Baumzuchtschädlichen Borkenkäfer, p. 58 (Holotype, male; Venezuela, probably Colonia Tovar; Vienna Mus.)

*Pterocyclon exile* Eichhoff, 1878, preprint of Mém. Soc. Roy. Sci. Liége (2)8:451 (Holotype, male; Nova Grenada; Brussels Mus.); Wood, 1974, Great Basin Nat. 34:283. *Synonymy*

DIAGNOSIS.— This species is distinguished from *demissus* Wood by the steeper, more strongly, more broadly impressed elytral declivity, with spine 2 placed well above the middle, and by the dense, very minute, impressed points on the declivity that superficially resemble reticulation.

FEMALE.— Length 1.6–1.7 mm, 2.7 times as long as wide; color light brown.

Frons as in *demissus* except less brightly shining, marginal areas weakly reticulate, punctures slightly smaller, more definite. Antennal club 1.4 times as long as scape, 1.4 times as long as wide; a small tuft of long hair on posterior surface.

Pronotum and elytral disc about as in *demissus*, except elytral disc smooth, shining, punctures very minute to obsolete, suture distinctly elevated on posterior half in most specimens. Elytral declivity very steep, much more broadly impressed than in allied species, margins abruptly elevated; surface with very dense minute points, superficially resembling reticulation on lower two-thirds, evidently becoming reticulate toward base; spine 2 placed slightly above middle and closer to 1 than in allied species.

MALE.— Similar to female except antennal club without tuft of hair; anterior margin of pronotum armed by six rather coarse serrations; elytra apparently slightly bicolored, punctures more definite, spine 2 slightly larger.

DISTRIBUTION.— Costa Rica to Venezuela.

COSTA RICA: San Ignacio de Acosta, San José, 5-VII-63, 1500 m, No. 28, tree branch, S. L. Wood; Escasú, San José, 2-X-63, 1300 m, No. 216, *Spondias purpurea*, S. L. Wood. OTHER COUNTRIES: "Nova Grenada," Colombia, Venezuela.

BIOLOGY.— Specimens were taken from cut branches less than 5 cm in diameter.

NOTES.— The above treatment was based on the holotypes of *parvulus* and *exile* and on 159 other specimens. Slight variation occurs within a series in details of the frons, particularly the median tubercle.

### 7. *Microcorthylus vicinus* Wood

*Microcorthylus vicinus* Wood, 1977, Great Basin Nat. 37:213 (Holotype, female; 32 miles or 51 km S Valle Nacional, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *minimus* Schedl by the larger size, by the larger epistomal tubercle, by the more strongly reticulate elytra, and by the slightly narrower declivital impression.

FEMALE.— Length 2.0 mm (paratypes 1.5–2.0 mm), 2.9 times as long as wide; color brown.

Frons as in *minimus* except epistomal tubercle distinctly larger and more nearly carinate.

Pronotum and elytra about as in *minimus* except elytra strongly reticulate, strial punctures more distinctly indicated, declivity less strongly, more narrowly impressed, lateral elevations and ending more remote from costal margin.

MALE.— Similar to female except antennal club without long setae on posterior face.

DISTRIBUTION.— Chiapas to Oaxaca.

MEXICO: **Chiapas**: 51 km S Valle Nacional, 21-V-71, D. E. Bright; Mt. Tzontehuiz, 12-VI-69, *Quercus*, D. E. Bright; 13 km E San Cristóbal, 6-VI-69, D. E. Bright. **Oaxaca**: 51 km S Valle Nacional, 21-V-71, D. E. Bright; 5 km N Suchextepec on Highway 175, 4-VI-71, 2300 m, *Salix*, D. E. Bright.

NOTES.— The above treatment was based on the type series of 66 specimens.

### 8. *Microcorthylus minimus* Schedl

*Microcorthylus minimus* Schedl, 1950, Dusenia 1:160 (Syntypes, females; Nova Teutonia, Santa Catarina, Brazil; Schedl and Plaumann colls.)

*Microcorthylus minutissimus* Schedl, 1952, Dusenia 3:361 (Syntypes, Jamaica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *parvulus* Ferrari by the stouter body form, by frontal characters, and by the less extensively impressed declivity, with spine 2 at the middle.

FEMALE.— Length 1.2–1.3 mm, 2.5 times as long as wide; color yellowish brown.

Frons convex, a weak, transverse impression on lower third, a small, pointed median tubercle just above epistomal margin; impressed and lateral areas rugose-reticulate, almost smooth and shining in central area, punctures small, shallow. Antennal club 1.3 times as long as scape, 1.2 times as long as wide; subcircular in outline.

Pronotum 1.15 times as long as wide; essentially as in *parvulus*.

Elytra 1.3 times as long as wide, 1.2 times as long as pronotum; punctures obscure, almost obsolete; surface subshining, almost smooth except reticulate near declivity. Declivity very steep, rather broadly impressed much as in *parvulus*, surface with dense, minute, impressed points on lower two-thirds, becoming reticulate toward base; spine 2 at level of middle of declivity.

MALE.— Similar to female except antennal club without tuft of hair on posterior face; anterior margin of pronotum armed by six to eight serrations.

DISTRIBUTION.—aVeracruz to Panama, Jamaica, and Brazil.

MEXICO: Veracruz: 37 km N Matías Romero, 29-VI-67, No. 130, tree branch, S. L. Wood. HONDURAS: La Ceiba, Atlantida, 26-VIII-49, at light, E. C. Becker; Zamorano, Morazan, 18-IV-64, 700 m, No. 546, *Acacia pennatula*, S. L. Wood. COSTA RICA: Beverley, Limón, 26-VIII-63, 7 m, No. 154, woody vine, S. L. Wood; Dominical, Puntarenas, 9-XII-63, 3 m, No. 298, tree branch, S. L. Wood; Santa Ana, San José, 30-VIII-63, 1300 m, No. 160, tree seedling, S. L. Wood. PANAMA: Ft. Clayton, Canal Zone, 22-XII-63, 30 m, No. 319, *Serjania*, S. L. Wood. OTHER AREAS: Jamaica, Brazil.

BIOLOGY.— Specimens were taken from stems 2–4 cm in diameter.

NOTES.— The above treatment was based on 2 syntypes of *minimus* and one of *minutissimus*, and on 59 other specimens.

### 9. *Microcorthylus pumilus* Wood

*Microcorthylus pumilus* Wood, 1973, Great Basin Nat. 33:268 (Holotype, female; 9 miles or 15 km SE Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species differs from all preceding forms in having a continuous, submarginal, subacute line extending from the suture along the costal submargin to the lateral margin of the declivity; it is also unique in having a very broad female frons, with the mandibles proportionately lengthened.

FEMALE.— Length 1.7–1.9 mm, 2.9 times as long as wide; color very dark brown.

Frons very broad, particularly below, broadly convex; surface very finely punctured, finely rugose-reticulate to upper level of eyes, smooth and shining above. Antennal club 1.1 times as long as scape, 1.3 times as long as wide; obovate, widest through suture 2; posterior face without a tuft of long hair.

Pronotum 1.2 times as long as wide; sides almost straight and parallel on basal half, very broadly rounded in front; anterior margin weakly serrate; summit indefinite, on anterior third; anterior third finely asperate; posterior areas strongly reticulate, punctures minute, shallow. Glabrous.

Elytra 1.8 times as long as wide, 1.7 times as long as pronotum; sides almost straight and parallel on basal three-fourths, then arcuately converging, almost straight behind on median two-thirds; strial punctures obscurely indicated, almost obsolete; surface reticulate. Declivity very steep, almost vertical on lower half; rather narrowly sulcate on upper third, broadly impressed below; punctures obsolete, surface reticulate; suture narrowly elevated, lateral margin of this line subacute, continued without interruption along costal submargin to lateral margin of declivity; impressed area somewhat heart-shaped; spines 1 and 2 almost obsolete. Glabrous except for a few hairlike setae near declivity.

MALE.— Similar to female except lower frons normal, not as broad; antennal club more slender; anterior margin of pronotum more strongly serrate, with 10 serrations.

DISTRIBUTION.— Costa Rica and Panama.

COSTA RICA: 15 km SE Cartago, Cartago, 3-VII-63, 1800 m, No. 17B, *Conostegia oerstediana*, S. L. Wood; Tapantí, Cartago, 2-VII-63, 1300 m, No. 10, *C. oerstediana*, S. L. Wood. PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, No. 376, tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from recently cut branches.

NOTES.— The above treatment was based on the type series of 13 specimens.

### 10. *Microcorthylus pusillus* Wood

*Microcorthylus pusillus* Wood, 1973, Great Basin Nat. 33:269 (Holotype, female; Buenos Aires, Cortéz, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *pumilus* Wood by the larger size, by the very different frons, by the tuft of hair on the posterior face of the female antennal club, and by the larger declivital denticles.

FEMALE.— Length 2.0–2.4 mm, 2.9 times as long as wide; color light reddish brown.

Frons with lateral thirds impressed from epistoma to slightly above eyes, median third strongly elevated, attaining a rather broad summit at a level slightly below upper level of eyes; surface reticulate in impressed areas, smooth and shining on median third and on entire area above eyes. Antennal club 1.2 times as long as wide; a small tuft of hair on posterior face.

Pronotum 1.02 times as long as wide; about as in *pumilus*; 14 serrations on anterior margin. Glabrous.

Elytra about 1.6 times as long as wide; 1.7 times as long as pronotum; about as in *pumilus* except lower declivity narrower, and spines 1 and 2 small, but distinctly larger.

MALE.— Similar to female except frons broadly, rather evenly convex, with a short median carina on lower fourth, central area very slightly elevated, surface reticulate and with moderately coarse, shallow punctures; serrations on anterior margin of pronotum slightly larger.

DISTRIBUTION.— Guatemala to Honduras.

GUATEMALA: Volcán Pacaya, 1-VI-64, 1300 m, No. 668, tree branch, S. L. Wood. HONDURAS: Buenos Aires, Cortéz, 7-V-64, 2300 m, No. 576B, tree seedling, S. L. Wood.

BIOLOGY.— Specimens were taken from branches less than 5 cm in diameter.

NOTES.— The above treatment was based on the type series of 10 specimens.

### 11. *Microcorthylus lassus* Wood

*Microcorthylus lassus* Wood, 1973, Great Basin Nat. 33:270 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from all preceding species in this genus by the complete absence of an elevation on the crest of declivital interstriae 1, and by the complete absence of sutures on the male antennal club; suture 1 and the ends of 2 occur in the female antennal club.

FEMALE.— Length 1.5–1.6 mm, 2.8 times as long as wide; color dark brown.

Frons as in *pumilus* Wood except mandibles normal. Antennal club 1.5 times as long as scape, 1.2 times as long as wide, suture 1 complete, 2 obsolete except at extreme margins.

Pronotum and elytral disc as in *pumilus*. Elytral declivity essentially as in *debilis* Wood except interstriae 1 not elevated, its lateral crest entirely obsolete; all punctures obsolete; surface reticulate.

MALE.— Similar to female except sutures of antennal club obsolete (one specimen with suture 1 very feebly indicated); anterior margin of pronotum armed by two, basally contiguous, coarse, pointed serrations.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Tapantí, Cartago, 17-VIII-63, 1300 m, No. 106, woody vine, S. L. Wood. PANAMA: Cerro Punta, 11-I-64, 1800 m, No. 388, tree seedling, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 2–4 cm in diameter.

NOTES.— The above treatment was based on the type series of seven specimens.

### 12. *Microcorthylus grandiclavatus* Eggers

*Microcorthylus grandiclavatus* Eggers, 1935, Rev. de Ent. 5:156 (Holotype, male; San José, Costa Rica; lost with Hamburg Mus.; neotype, male, Escasu, San José, Costa Rica; U.S. Nat. Mus., present designation)

DIAGNOSIS.— This species is distinguished from *lassus* Wood by the larger size, by the presence of a series of tubercles on declivital interstriae 1, and by the very different female frons.

FEMALE.— Length 1.9–2.0 mm, 2.5 times as long as wide; color dark brown.

Frons broadly convex, with median third convexly elevated, this smooth, shining elevation commencing slightly below upper level of eyes and extending toward vertex; lower and lateral areas rugose-reticulate, with fine, sparse punctures; vestiture fine, sparse, inconspicuous. Antennal club 1.4 times as long as scape, 1.4 times as long as wide; obscurely triangular; suture 1 weakly procurved, 2 straight, widest through distal part of segment 2; without a tuft of hair on posterior face.

Pronotum 1.1 times as long as wide; essentially as in *pumilus* Wood.

Elytra 1.4 times as long as wide, 1.4 times as long as pronotum; sides feebly arcuate, subparallel on basal two-thirds, broadly rounded behind, narrowly, rather shallowly emarginate at suture, punctures obscure, confused, almost obsolete; surface reticulate. Declivity very steep; excavation similar to but deeper than in *lassus*; surface reticulate, punctures obscure except striae 1 on middle half of declivity with about four to eight moderately coarse punctures, dorsomedian margin of each puncture armed by a small tubercle; upper half of lateral margin armed by two pairs of small spines as in other species. Vestiture sparse, inconspicuous.

MALE.— Similar to female except frons almost evenly convex, a small, median, subtuberculate carina at epistomal margin, surface entirely rugose-reticulate; anterior margin of pronotum with several serrations, median pair usually conspicuously larger; posterior third of elytral disc almost smooth, more brightly shining, tubercles on declivital striae 1 conspicuously larger, spines 1 and 2 on lateral margin slightly larger.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Escasú, San José, 2-X-63, 1300 m, No. 218, tree seedling, S. L. Wood. PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, No. 424, tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 2–5 cm in diameter.

NOTES.— The above treatment was based on 70 specimens.

The holotype was lost in the destruction of the Hamburg Museum. Because only one species in this easily recognized South American species group occurs in Central America, from Costa Rica, and because this species is easily recognized from the description, a male was selected from the Escasú (a suburb of San José) series and is here designated as the neotype of *grandiclavatus* Eggers. The neotype fits the original description of this species precisely except that a second pair of serrations on the anterior margin of the pronotum are almost as large as the median pair. It was selected because it exhibited other characters more clearly than did other males in the series.

### 13. *Microcorthylus concisus* Wood

*Microcorthylus concisus* Wood, 1973, Great Basin Nat. 33:270 (Holotype, female; Volcán, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *grandiclavatus* Eggers by the smaller size, by the uniformly convex female frons, and by the less strongly impressed elytral declivity.

FEMALE.— Length 1.6–1.8 mm, 2.6 times as long as wide; color dark brown.

Frons broadly convex, a slight transverse impression just above epistoma, a short, weak, median carina at epistomal margin; central area almost smooth, lower and lateral areas rugose-reticulate, punctures fine in smooth area, slightly coarser elsewhere. Antenna about as in *grandiclavatus*.

Pronotum and elytra as in *grandiclavatus* except declivity less strongly impressed; punctures and tubercles on declivital striae 1 smaller, varying in number from zero to four.

MALE.— Similar to female except frons uniformly rugose-reticulate; anterior margin of pronotum serrate, one or two median pairs larger; elytra obscurely to weakly reticulate; tubercles on declivital striae 1 larger, strial punctures almost or entirely obsolete.

DISTRIBUTION.— Costa Rica.

COSTA RICA: San Ignacio de Acosta, San José, 5-VII-63, 1500 m, No. 35, *Croton gossypiifolius*, S. L. Wood; Volcán, Puntarenas, 11-XII-63, 1000 m, No. 304, tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from branches 2–5 cm in diameter.

NOTES.— The above treatment was based on the type series of 17 specimens.

### 14. *Microcorthylus vescus* Wood

*Microcorthylus vescus* Wood, 1973, Great Basin Nat. 33:271 (Holotype, female; Volcán Zunil, Quezaltenango, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *concisus* Wood by the larger size, by the absence of a median epistomal carina, by the more nearly strigose punctures on the frons, and by the strongly reticulate male elytra.

FEMALE.— Length 2.0–2.3 mm, 2.5 times as long as wide; color brown.

Frons as in *concisus* except epistomal tubercle not at all carinate; punctures and impressed points slightly larger and more nearly longitudinally strigose.

Pronotum and elytra as in *concisus* except punctures on declivital striae 1 obsolete, accompanying tubercles minute.

MALE.— Similar to female except frons more uniformly rugose-reticulate; anterior margin of pronotum serrate; elytral disc strongly reticulate to declivity (also in female); tubercles and punctures on declivital interstriae 1 larger, but smaller than in *grandiclavatus* Eggers.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán Zunil, Quezaltenango, 27-V-64, 1000 m, No. 628, tree seedling, S. L. Wood.

NOTES.— The above treatment was based on the type series of 26 specimens.

## GENUS *CORTHYCYCLON* SCHEDL

*Corthycyclon* Schedl, 1951, Dusenia 2:128 (Type-species: *Corthycyclon ustum* Schedl, monobasic)

DIAGNOSIS.— This genus is distinguished from *Corthylus* Erichson by the club-shaped antennal scape, by the complete absence of sutures on the antennal club, by the subinflated, tuberculate posterior face of the female protibia, and by the apical fringe of hair on the female antennal club.

DESCRIPTION.— Length 1.3–2.4 mm, 2.1–2.6 times as long as wide; color very dark brown or bicolored.

Frons sexually dimorphic, male convex, subglabrous, female concave from eye to eye from epistoma to vertex, sculpture and ornamentation by hair simple. Eye emarginate, finely granulate. Antennal scape slender, club-shaped; funicle 1-segmented, club aseptate, sutures not indicated, female club larger and ornamented by long hair on apical margin. Scutellum large, flat. Elytral disc with punctures obscure, in rows or confused; declivity convex, conservatively sculptured. Female protibia subinflated and finely tuberculate on posterior face.

DISTRIBUTION.— Puebla to Brazil; six species are known from Mexico and Central America; a larger number of species occurs in South America.

BIOLOGY.— These monogamous species breed in recently cut or broken small branches of trees, shrubs, and woody vines (lianas) about 1–4 cm in diameter. The gallery systems are as in *Corthylus*. They usually occur at elevations higher than 2000 m.

NOTES.— Most of the South American species that belong to this genus were described in other genera and have not yet been transferred here. The features that distinguish it from *Brachyspartus* and *Corthylus* have not been clearly defined; it is entirely possible that these genera will intergrade in South America.

Key to the Species of *Corthycyclon*

1. Elytral declivity reticulate, punctures largely obsolete, interstriae 1 abruptly, moderately elevated; if present, granules minute and restricted to interstriae 3; female antennal club compact, 1.4–1.5 times as long as wide ..... 2
— Elytral declivity shining, contours variously irregular, punctures in strial rows usually evident, interstriae 1 feebly if at all elevated, interstrial granules usually conspicuous on several interstriae; female antennal club elongate, 1.8–2.5 times as long as wide (except 1.2 in *morulum*) ..... 3

2(1). Female frons planoconcave, punctures very fine, largely obsolete; body 2.3 times as long as wide; declivital interstriae 3 with a row of very fine granules; Costa Rica; 2.0–2.1 mm ..... 1. ***caliginis*** **Wood**
— Female frons moderately concave, punctures rather fine, distinct, moderately abundant; body 2.1 times as long as wide; declivital interstriae 3 with a row of subgranulate punctures; Costa Rica; 1.3–1.6 mm ..... 2. ***furvum*** **Wood**

3(1). Declivital interstriae 2 feebly impressed and unarmed by granules, 1 and 3 each with a row of fine granules; female antennal club 1.2 times as long as wide; Costa Rica; 2.1 mm ..... 3. ***morulum*** **Wood**
— Declivital interstriae 1–3 about equal in height and armed by granules; female antennal club 1.8–2.5 times as long as wide ..... 4

4(3). Female antennal club widest on basal third, apex acutely pointed; declivital vestiture sparse, consisting of one long hair arising from each granule; declivity very steep, very broadly convex; Panama; 2.25 mm ..... 4. ***ebeninum*** **(Blandford)**
— Female antennal club narrowly rounded at apex, not acutely angled; declivity moderately steep, more strongly convex, its vestiture more abundant ..... 5

5(4). Declivity with strial punctures very small, in rows, granules minute, not clearly evident, vestiture of moderately abundant short hair and sparse much longer hair (presumably on alternate interstrial rows); female antennal club subacuminately tapered from near basal third to apex; Costa Rica to Panama; 1.5–1.7 mm ..... 5. ***tardum*** **Wood**

– Strial punctures on declivity mostly obsolete, granules clearly evident, long hair more abundant than short hair; female antennal club obtusely tapered from middle; Puebla to Costa Rica; 1.8–2.4 mm ..... 6. ***aztecum*** **(Bright)**

### 1. *Corthycyclon caliginis* Wood

Fig. 219

*Corthycyclon caliginis* Wood, 1974, Great Basin Nat. 34:148 (Holotype, female; 16 km SE Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from others in the genus by the size, by the rather strongly, continuously elevated declivital interstriae 1, with 2 moderately impressed, and by the absence of punctures and tubercles on the declivity.

FEMALE.— Length 2.0–2.1 mm, 2.3 times as long as wide; color almost black.

Frons feebly concave from eye to eye from epistoma to vertex, surface reticulate except almost smooth on lower median area, punctures small to minute, shallow, not clearly impressed; vestiture of very fine, moderately long hair of uniform distribution, slightly longer at margins. Antennal club 1.5 times as long as wide; a small tuft of hair at apex.

Pronotum 1.04 times as long as wide; sides almost straight and parallel on basal half, rather narrowly rounded in front; anterior margin armed by a pair of slender, median teeth; summit indefinite, slightly behind middle; anterior half closely asperate; posterior half reticulate, reticulation also extending between asperities on anterior half, punctures small, moderately abundant, those near base of disc finely tuberculate on their posterior margins. Pubescence of fine, short, moderately abundant hair.

Elytra 1.4 times as long as wide, 1.5 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; disc subshining, surface with obscurely impressed lines and other minute irregularities; punctures obsolete on posterior half, very small and confused on basal half. Declivity steep, convex, except moderately sulcate on interstriae 2, 1 uniformly elevated from base to near apex; surface reticulate, punctures and granules obsolete. Vestiture largely confined to posterior third of elytra, of fine, short, confused hair.

MALE.— Similar to female except frons moderately convex, strongly reticulate, with fine punctures, subglabrous; antennal club without apical tuft of hair.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 16 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 196, woody vine, No. 195, tree seedling, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 1–2 cm in diameter.

NOTES.— The above treatment was based on the type series of four specimens.

### 2. *Corthycyclon furvum* Wood

*Corthycyclon furvus* Wood, 1974, Great Basin Nat. 34:148 (Holotype, female; Peralta, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *caliginis* Wood by the smaller size, by the stouter body form, by the more deeply concave female frons, and by the row of subgranulate punctures on declivital interstriae 3.

FEMALE.— Length 1.3–1.6 mm, 2.1 times as long as wide; color almost black.

Frons as in *caliginis* except rather deeply concave, rather strongly reticulate over entire surface, punctures moderately coarse, most of them distinctly impressed. Pronotum and elytra as in *caliginis* except declivity more finely, more uniformly reticulate and interstriae 3 with a row of subreticulate punctures.

MALE.— Similar to female except sexual differences as in *caliginis*.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Peralta, Cartago, 10-III-64, 500 m, No. 461, woody vine, S. L. Wood; Tapantí, Cartago, 24-X-63, 1300 m, woody vine, S. L. Wood.

BIOLOGY.— Specimens were taken from woody vines (lianas) 1–2 cm in diameter.

NOTES.— The above treatment was based on the type series of five specimens.

### 3. *Corthycyclon morulum* Wood

*Corthycyclon morulum* Wood, 1974, Great Basin Nat. 34:149 (Holotype, female; 16 km SE Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished by the compact antennal club and by the

characters of the elytral declivity indicated below.

FEMALE.— Length 2.1 mm, 2.5 times as long as wide; color almost black.

Frons essentially as in *furvum* Wood except surface subreticulate, punctures rather fine, abundant, distinct, vestiture of very fine hair. Antennal club 1.2 times as long as wide.

Pronotum and elytra essentlaly as in *caliginis* Wood except pronotal disc more coarsely punctured and interstriae 2 rather weakly impressed and without granules, 1 distinctly, moderately elevated, 1 and 3 each armed by a row of small, rounded, rather widely spaced granules. Vestiture sparse, confined to odd-numbered declivital interstriae, fine, rather short.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 16 km SE Cartago, Cartago, 3-VII-63, 1800 m, No. 18, *Conostegia oerstediana*, S. L. Wood.

BIOLOGY.— The species was taken from a recently cut branch 1–2 cm in diameter.

NOTES.— The above treatment was based on the unique holotype.

### 4. *Corthycyclon ebeninum* (Blandford)

*Brachyspartus ebeninus* Blandford, 1904, Biol. Centr. Amer., Coelopt. 4(6):265 (Holotype, female; Volcán de Chiriquí, Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished by the strongly acuminate female antennal club and by the very steep, broadly convex elytral declivity.

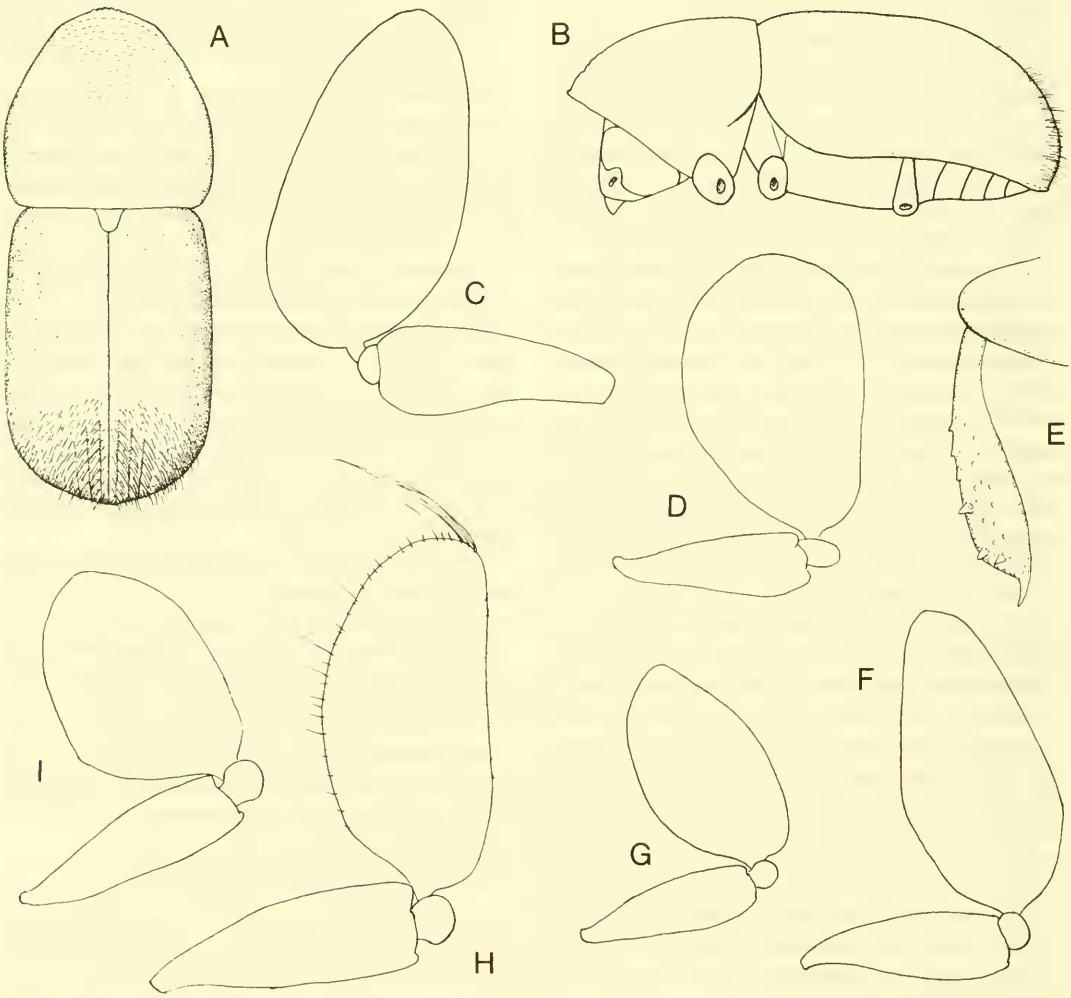



Fig. 219. *Corthycyclon* spp., outlines of dorsal aspect, antennae, and tibiae: A, B, C, *caliginus*, female, D, same, male; E, F, *tardus*, female, G, same, male; H, *aztecus*, female, I, same, male. Setae omitted except on A.

FEMALE.— Length 2.25 mm, 2.5 times as long as wide; color black.

Frons as in *morulum* Wood except median fifth on lower half impunctate and glabrous, punctures on remaining area slightly larger. Antennal club 2.0 times as long as wide, widest on basal third, apex acutely pointed.

Pronotum 1.1 times as long as wide; sides straight and parallel on basal half, rather broadly rounded in front; anterior margin serrate; indefinite summit in front of middle; asperities on anterior slope not as close or as high as in other species of this genus; posterior areas smooth, shining, punctures very small, distinct. Glabrous.

Elytra 1.5 times as long as wide, 1.3 times as long as pronotum; sides straight and parallel on basal three-fourths, very obtusely subangulate behind; surface almost smooth, shining, a few obscure lines, punctures minute, largely confused. Declivity very steep, very broadly convex; strial punctures minute, in irregular rows; suture feebly elevated, interstriae each with a row of very small, rounded granules; posterolateral margin weakly, subacutely elevated from near sutural apex toward interstriae 8. Vestiture of long hairs arising from declivital granules.

DISTRIBUTION.— Panama.

PANAMA: Volcán de Chiriquí, Chiriquí, 4–6000 ft, G. C. Champion.

NOTES.— The above treatment was based on the holotype.

### 5. *Corthycyclon tardum* Wood
Fig. 219

*Corthycyclon tardus* Wood, 1974, Great Basin Nat. 34:149 (Holotype, female; 16 km SE Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *aztecum* (Bright) by the smaller size, by the smaller declivital granules, by the more abundant short and sparse long declivital hair, and by the female antennal club.

FEMALE.— Length 1.5–1.7 mm, 2.5 times as long as wide; color dark brown.

Frons about as in *morulum* Wood except obscurely reticulate, punctures smaller, median half of epistomal margin transversely carinate. Antennal club 2.5 times as long as wide, tapered from basal third to apex; apex ornamented by a tuft of about two or three long hairs.

Pronotum and elytral disc as in *morulum* except pronotal disc with punctures minute, almost obsolete. Elytral declivity steep, convex; interstriae 1 feebly if at all elevated, strial punctures minute to obsolete; surface shining; with numerous very minute, confused punctures, those bearing short hair often minutely granulate, particularly near base of declivity, interstriae 1 and 3 each bearing a few slightly larger granules at bases of longest setae. Vestiture confined to declivity, of moderately abundant fine, short hair and sparse rows of long hair on odd-numbered interstriae.

MALE.— Similar to female except frons convex, reticulate, sparsely punctured, subglabrous; antennal club less than twice as long as wide, without long hair.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: 16 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 197, *Siparuna nicaraguensis*, S. L. Wood; Volcán Poás, Heredia, 6-IX-63, 2500 m, No. 169, *Vaccinium consaguineum*, S. L. Wood. PANAMA: Cerro Campana, 26-VII-66, 1000 m, No. 33, *Cecropia* petiole, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 1–2 cm in diameter.

NOTES.— The above treatment was based on the type series of nine specimens.

### 6. *Corthycyclon aztecum* (Bright)
Fig. 219

*Corthylus aztecus* Bright, 1972, Canadian Ent. 104:1374 (Holotype, female; 5.6 km or 3.5 miles S Suchixtepec, Oaxaca, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *tardum* Wood by characters mentioned in the above key and in the following description.

FEMALE.— Length 1.8–2.4 mm, 2.6 times as long as wide; newly emerged specimens bicolored, with anterior half of pronotum and posterior half of elytra dark brown, remaining areas yellowish brown, older specimens uniformly dark brown.

Frons as in *tardus* except punctures very small, hair on margins much longer than that in concave area. Antennal club 1.8 times as long as wide, arcuately tapered from middle to apex; tuft of hair arising from margin of apical third.

Pronotum and elytra as in *tardum* except declivital granules larger on all interstriae (variable). Vestiture largely confined to

declivity, of sparse short hair and slightly more abundant long hair; long hair on all interstriae.

MALE.— Similar to female except sexual differences as in *tardum*.

DISTRIBUTION.— Puebla to Costa Rica.

MEXICO: **Chiapas**: 13 km NE San Cristóbal de las Casas, 15-V-69, D. E. Bright. **Puebla**: 9 km NE Teziutlán, 1600 m, 27-VI-53, 2-VII-67, No. 148, *Miconia*, S. L. Wood. **Oaxaca**: 5.6 km S Suchixtepec, 2-VI-71, 2600 m, D. E. Bright. COSTA RICA: 16 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 196, woody vine, No. 199, *Siparuna nicaraguensis*, No. 202, *Miconia dodecandra*, S. L. Wood; Volcán Irazu, Cartago, 28-VI-63, 2700 m, No. 2, *Bocconia frutescens*, No. 4, *Oreopanax xalapense*, S. L. Wood; Volcán Poas, Heredia, 6-IX-63, 1300 m, No. 169, *Vaccinium consanguineum*, S. L. Wood; Cerro de la Muerte, San José, 1-VIII-66, 3000 m, No. 46, woody vine, S. L. Wood.

BIOLOGY.— This species was taken from stems 1–3 cm in diameter.

NOTES.— The above treatment was based on the holotype, on 2 paratypes, and on 105 other specimens.

The elytral declivity of this species is variable within and between series. In most specimens the strial punctures are obsolete and the interstrial tubercles are in definite rows. In others, small strial punctures are present, some or all of which may be finely to rather coarsely tuberculate. In part of the type series part of the tubercles on interstriae 2 were absent. In the material at hand I see no clines or other means of subdividing this species.

## GENUS *CORTHYLOCURUS* WOOD

*Corthylocurus* Wood, 1966, Great Basin Nat. 26:18 (Type-species: *Brachyspartus barbatus* Blandford, original designation)

DIAGNOSIS.— This genus is distinguished from *Corthylus* Erichson by a combination of characters: the distintive female frons, the antennal club that has two almost straight sutures and a different tuft of hair on the posterior face in the female, the inflated and tuberculate posterior face of the female protibia, and the somewhat different elytral declivity.

DESCRIPTION.— Length 1.5–2.8 mm, 2.1–2.5 times as long as wide; color yellowish brown to light brown.

Frons sexually dimorphic, male convex, female longitudinally bi- or trisulcate to deeply concave and with a pair of conspicuous longitudinal, carinae. Eye emarginate; rather coarsely faceted. Scape slender, club shaped; funicle 1-segmented; club large, flat, with two straight or feebly procurved sutures, posterior face with a tuft of hair arising from at least one-third of surface near apex. Pronotum about as in *Corthylus*. Scutellum large, flat. Elytra with punctures confused or in strial rows; declivity weakly to strongly sulcate, conservatively sculptured. Female protibiae modestly inflated, with several small, confused tubercles.

DISTRIBUTION.— Nayarit and Puebla to Brazil; six species occur in North and Central America; a larger number of species occurs in South America, but most of them have not yet been transferred to this genus.

BIOLOGY.— These monogamous species breed in small branches where they construct tunnels similar to those of *Corthylus*, although the spiral galleries predominate.

A peculiar habit was noted in some specimens of *barbatus* (Blandford) and in two unnamed similar South American species. The *barbatus* entrance hole was located 5–10 mm above or below the entrance hole of *Corthylus concisus*. Wood. After the gallery systems of both species were nearly complete, but before oviposition commenced, the *barbatus* female bored into the *Corthylus* gallery and either evicted or apparently killed the *Corthylus*, then plugged the *Corthylus* entrance hole with frass and produced brood in both systems of tunnels. Because the spacing of the entrance holes was abnormally close in dozens of instances, this appeared to be a normal habit of at least some species in this genus.

NOTES.— A thorough review of South American Corthylini might indicate the necessity of combining this distinctive group of species with *Corthylus*. Nevertheless, as presently understood it appears to have an independent origin sufficiently remote to justify separate generic status. Five additional species were taken in Venezuela and at least four others have been named in various genera from other South American localities, thus suggesting that much more remains to be learned about this genus.

Key to the Species of *Corthylocurus*

1. Female frons longitudinally bi- or trisulcate, vertex not ornamented by a dense tuft of long hair; male declivity without an acutely elevated posterolateral margin diverging from costal margin; smaller species ..... 2

— Female frons rather deeply concave from eye to eye from epistoma to vertex, epistoma bearing a pair of curls of long hair, vertex ornamented by a dense brush of long plumose hair; male declivity with an acutely elevated posterolateral margin extending from costal margin near sutural apex toward interstriae 8; larger species ..... 5

2(1). Smaller species; elytral disc shining, strial punctures minute, in distinct rows; female frons less strongly impressed to upper level of eyes or less, sulci and carinae obscurely developed, vestiture mostly very short and more generally distributed ..... 3

— Larger species; elytral disc with punctures larger, confused at least on basal half; female frons with sulci strongly to very strongly impressed to upper level of eyes or higher, carinae rather strongly, subacutely developed, vestiture in approximate rows or greatly reduced in distribution ..... 4

3(2). Frons narrow, 1.3 times as wide as long; impressed area on female frons ending well below upper level of eyes, lateral areas shallowly impressed and ornamented by very short, stout setae over entire impressed area, narrow median line weakly elevated, shining, very narrowly divided throughout its length by a fine, impressed, median line; declivital interstriae 3 with granules almost obsolete; Costa Rica to Panama; 1.5 mm ..... 1. ***debilis*** **Wood**

— Frons rather broad, 1.7 times as wide as long; impressed area on female frons feebly indicated and glabrous on lateral thirds to upper level of eyes, sulcus on median sixth moderately deep, glabrous, with longitudinal carinae on its margins feebly elevated and marked at dorsal end by a small rounded tubercle, carinae bearing numerous very short, stout setae; granules on declivital interstriae 3 minute; Nayarit to Morelos; 1.8–1.9 mm ..... 2. ***aguacatensis*** **(Schedl)**

4(2). Body rather slender, 2.5 times as long as wide; elytral disc shining, strial punctures essentially in rows on posterior half; female lateral frontal sulci glabrous, extending to slightly above eyes, carinae subparallel, dividing frons into almost equal thirds, entire length of margins of carinae with moderately long hair; declivity narrowly, rather weakly bisulcate, granules on interstriae 3 very small; Veracruz to Panama; 1.8–2.0 mm ..... 3. ***mexicanus*** **(Schedl)**

— Body stout, 2.1 times as long as wide; elytral disc reticulate, punctures confused; female frons with strongly impressed, glabrous lateral sulci extending well above eyes, carinae on lower half on strongly elevated median fourth, subcontiguous, moderately diverging above, lower end of median elevated area ornamented by a dense tuft of rather short setae, a small, similar tuft of hair on each mandible; declivity moderately, rather broadly sulcate, lateral convexities armed by two pairs of small, pointed tubercles; Costa Rica; 1.5–1.8 mm ..... 4. ***costaricensis*** **(Schedl)**

5(1). Female frons slightly less strongly concave, median pair of parallel carinae abruptly, rather strongly elevated from slightly above epistomal area to vertex, paired curls of hair on epistoma larger, longer, reddish; declivital sulcus narrower, not as deep, tubercles on lateral margins smaller; Chiapas to Costa Rica; 2.0–2.2 mm ..... 5. ***cincinnatus*** **Bright**

– Female frons more strongly convex, median carina largely obsolete on lower half, dividing slightly above middle into low, diverging carinae to vertex, paired curls of hair on epistoma smaller, shorter, yellow; declivital sulcus deeper, wider, tubercles on lateral convexities slightly larger; Puebla to Panama; 2.1–2.5 mm ..... 6. ***barbatus*** **(Blandford)**

### 1. *Corthylocurus debilis* Wood
Fig. 220

*Corthylocurus debilis* Wood, 1974, Great Basin Nat. 34:150 (Holotype, female; Beverley, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *aguacatensis* (Schedl) by the characters of the female frons and elytral declivity as indicated below.

FEMALE.— Length 1.5 mm, 2.4 times as long as wide; color yellowish brown.

Frontal area narrow for this genus, 1.3 times as wide as long, somewhat shallowly, biconcavely impressed on quadrate area from epistoma to about three-fourths distance to upper level of eyes; narrow median line sharply impressed, its lateral margins shining, weakly elevated, lateral impressed area covered by rather dense, very short, stout setae, those near median line apparently on a spongy area; upper areas convex, reticulate, glabrous. Antennal club large, broadly obovate, 1.2 times as long as wide; tuft of hair on posterior face very poorly developed.

Pronotum and elytra as in *aguacatensis* except elytral declivity more brightly shining, very feebly sulcate, and granules on interstriae 3 obsolete.

MALE.— Similar to female except frons convex and devoid of special sculpture, reticulate, sparsely punctured, subglabrous; anterior margin of pronotum armed by six serrations, median pair much longer.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Beverley, Limón, 26-VIII-63, 7 m, No. 154, woody vine, S. L. Wood. PANAMA: Ft. Clayton, Canal Zone, 22-XII-63, 30 m, No. 319, *Serjania*, S. L. Wood.

BIOLOGY.— Specimens were taken from woody vines 1 cm in diameter.

NOTES.— The above treatment was based on the holotype and allotype.

### 2. *Corthylocurus aguacatensis* (Schedl)
Fig. 220

*Metacorthylus aguacatensis* Schedl, 1940, An. Esc. Nac. Cienc. Biol., Mexico 1:357 (Syntypes; Xochitlán, Morelos; Mexico; Schedl and Dampf colls.)

DIAGNOSIS.— This species is distinguished from *debilis* Wood by the larger size and by the characters of the female frons and declivity indicated below.

FEMALE.— Length 1.8–1.9 mm, 2.5 times as long as wide; color yellowish brown.

Frons similar to *debilis* except lateral areas less distinctly concave, extending to upper level of eyes; median sulcus occupying median fifth of area between eyes to upper level of eyes, much deeper spongy areas on its margins weakly elevated and larger and more conspicuous than in *debilis*, their upper limits marked by a pair of small tubercles; median half of lateral impressed area with abundant, very short, stout setae as in *debilis*, its lateral half glabrous, several long setae at point of transition.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on basal half, rather narrowly rounded in front; anterior margin with about 10 weak, contiguous serrations; summit indefinite, anterior to middle; anterior slope with coarse, low asperities; entire surface reticulate except for asperities; punctures on posterior areas obsolete. Glabrous.

Elytra 1.4 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; disc almost smooth, shining, punctures minute, mostly distinct, in strial rows. Declivity convex, steep; sutural interstriae feebly elevated, interstriae 3 with about three fine, rounded granules; strial punctures minute, very obscurely indicated; surface subreticulate. Vestiture confined to declivity, of very sparse, rather short, stout, interstrial hair.

MALE.— Similar to female except sexual differences as in *aguacatensis*.

DISTRIBUTION.— Nayarit to Morelos.

MEXICO: **Michoacán**: Putuan, I-XI-80, *Spondia mombin*, T. H. Atkinson. **Morelos**: Xochitlán, VIII-37, M. F. 6130A, en troncos de aguacate. **Nayarit**: 6 km W Tepic, 13-VII-65, 1000 m, No. 240, tree branches, S. L. Wood.

BIOLOGY.— My specimens were taken from branches 1–2 cm in diameter. The record from the bole of avocado quoted by Schedl in the original description is an obvious error unless very small seedlings were involved.

NOTES.— The original description mentions only the male but appears to apply to the female. The Schedl collection contains a male "holotype" and a female "holotype," although the original description indicates the type series was syntypic. Both of Schedl's "holotypes" were compared directly to my male and female on which the above treatment was based. Ten specimens were examined.

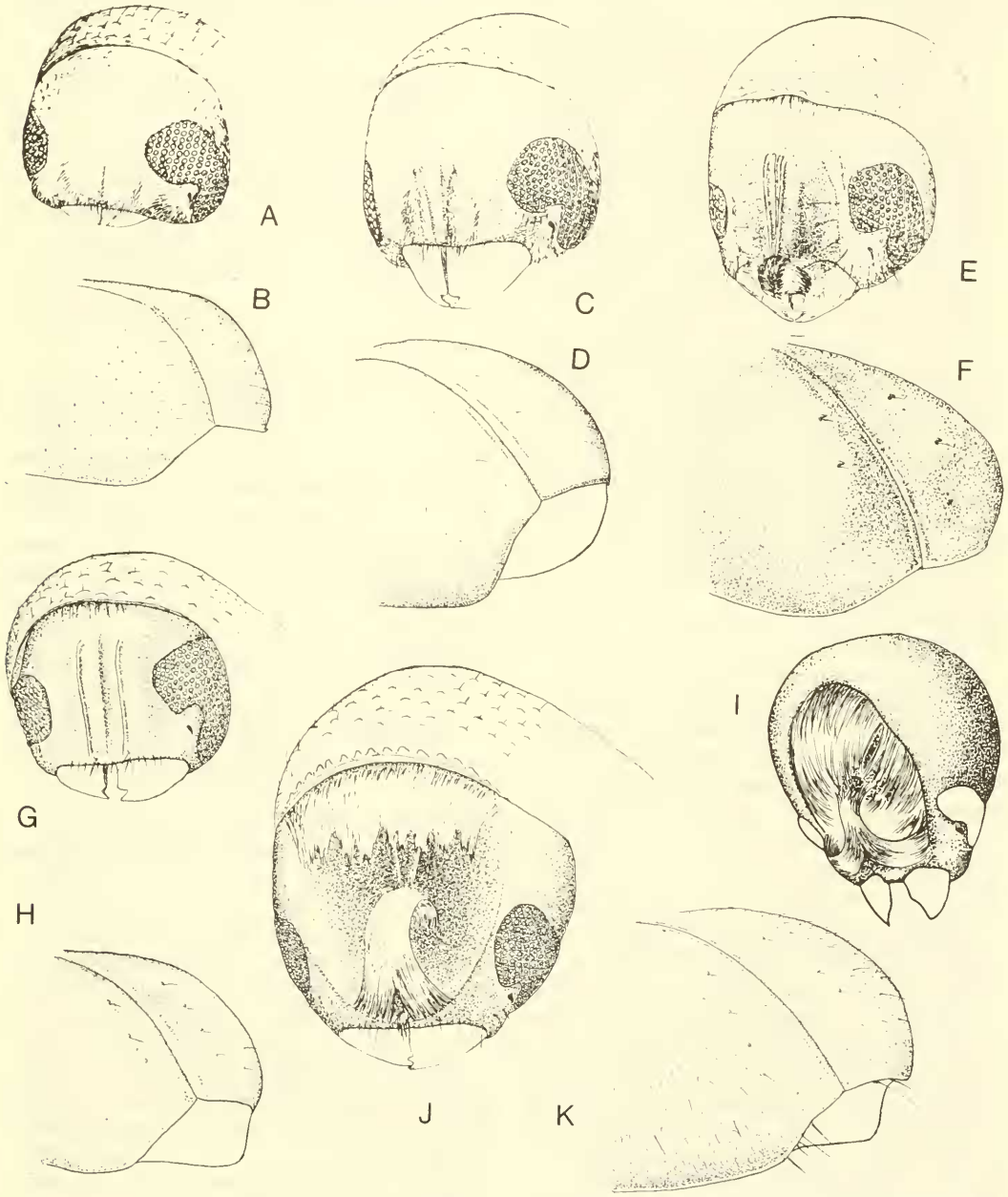



Fig. 220. *Corthylocurus* spp., female heads and declivities: A, B, *debilis*; C, D, *aguatatensis*; E, F, *costaricensis*; G, H, *mexicanus*; I, *cincinnatus*; J, K, *barbatus*.

### 3. *Corthylocurus mexicanus* (Schedl)
Fig. 220

*Brachyspartus mexicanus* Schedl, 1950, Dusenia 1:163 (Holotype, male; Comitán, Chiapas, Mexico; Schedl Coll.)

*Corthylus cylindricus* Schedl, 1963, Ent. Arb. Mus. Frey 14:164 (Holotype, female; Jalapa, Veracruz, Mexico; Schedl Coll.); Wood, 1974, Great Basin Nat. 34:279. *Synonymy*

*Corthylus anomalus* Bright, 1972, Canadian Ent. 104:1378 (Holotype, female; 5.6 km or 3.5 miles S Suchixtepec, Oaxaca, Mexico; Canadian Nat. Coll.); Wood, 1973, Great Basin Nat. 33:175. *Synonymy*

DIAGNOSIS.— This species is distinguished from *aguacatensis* (Schedl) by the characters of the female frons and elytral declivity mentioned below, and by the more confused punctures on the basal half of the elytral disc.

FEMALE.— Length 1.9–2.0 mm, 2.5 times as long as wide; color yellowish brown.

Frons from epistoma to slightly above upper level of eyes rather deeply, equally divided into three longitudinal sulci by a pair of rather strongly elevated, parallel, subacute, longitudinal carinae; lateral sulci smooth, shining, glabrous; median sulcus obtusely angulate at its deepest point; carinae each with a row of moderately long hair on both lateral and mesal margins; head above eyes reticulate. Antennal club moderately asymmetrical; but essentially as in *debilis* Wood.

Pronotum and elytra as in *aguacatensis* except punctures on basal half of elytral disc confused and elytral declivity moderately, rather narrowly sulcate, interstriae 2 narrowly, rather deeply impressed, lateral convexities higher than suture and armed by granules as in *aguacatensis*.

MALE.— Similar to female except sexual differences as in *debilis*.

DISTRIBUTION.— Veracruz to Panama.

MEXICO: Chiapas: Comitán. Oaxaca: 5.6 km S Suchixtepec, 2-VI-71, 2600 m, *Arbutus*, D. E. Bright. Puebla: 9 km NE Teziutlán, 2-VII-67, 1600 m, woody vine, No. 137 in *Miconia*, No. 142 in *Rubus*, S. L. Wood. Veracruz: 25 km NW Jalapa, 29-VI-53, 2100 m, S. L. Wood; Jalapa. GUATEMALA: Palín, Esquintla, 19-V-64, 300 m, No. 538, anonillo, S. L. Wood; Volcán de Agua, Esquintla, 19-V-64, 1000 m, No. 615 in *Acacia*, No. 592 in tree branch, S. L. Wood; Volcán Pacaya, 1-VI-64, 1300 m, No. 660, tree branch, S. L. Wood. COSTA RICA: 7 km SE Cartago, Cartago, 3-VII-63, 1500 m, No. 14, *Rhus*, S. L. Wood; San Ignacio de Acosta, San José, 5-VII-63, 1500 m, No. 28, tree branch, S. L. Wood; Santa Ana, San José, 9-X-63, 1300 m, No. 229, tree branch, S. L. Wood. PANAMA: Volcán de Chiriquí, Chiriquí, 11-I-63, 1600 m, No. 315 in *Inga*, No. 376 in tree branch, No. 385 in woody vine, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 1–2 cm in diameter.

NOTES.— The above treatment was based on the holotypes of *mexicanus*, *cylindricus*, and *anomalus* and on 49 other specimens.

### 4. *Corthylocurus costaricensis* (Schedl)
Fig. 220

*Microcorthylus costaricensis* Schedl, 1936, Arch. Inst. Biol. Veg., Río de Janeiro 3:108 (Holotype, female; Turrialba, Cartago, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from other representatives of the genus by the stout body form, by the unique female frons, and by the strongly impressed elytral declivity.

FEMALE.— Length 1.5–1.8 mm, 2.1 times as long as wide; color brown.

Frons with lateral thirds very strongly sulcate from epistoma to vertex, glabrous; median fourth strongly elevated, its summit deeply, abruptly sulcate, sulcus with a very narrow, acute carina, its height not attaining level of lateral margins of sulcus, sulcus dilates and disappears on vertex; carina terminates before sulcus ends; lower end of median elevation ornamented by a dense brush of rather short, subplumose setae; each mandible with a similar tuft of setae. Antennal club subtriangular, wider than long.

Pronotum 1.1 times as long as wide; similar to *aguacatensis* except more finely sculptured and anterior margins more narrowly rounded.

Elytra 1.1 times as long as wide, 1.05 times as long as pronotum; sides almost straight and parallel on basal two-thirds, very broadly rounded behind, disc strongly reticulate, obscure punctures confused. Declivity very steep, strongly, subtriangularly sulcate somewhat as in *Microcorthylus*; surface reticulate, obscure punctures confused; lateral convexities on upper half much higher than suture, rounded, armed by two pairs of small, pointed denticles, 1 near base, 2 at middle of declivity and more widely spaced than 1. Subglabrous.

MALE.— Simliar to female except sexual differences as in *debilis*.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Turrialba, Cartago, 800 m, Schild; Puerto Viejo, Heredia, 12-III-64, 70 m, No. 477, woody vine, S. L. Wood; Finca Gromaco on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 64, woody vine, S. L. Wood; Río Tempisque, Guanacaste, 25-III-64, 15 m, No. 503, woody vine, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 1–3 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 42 other specimens.

### 5. *Corthylocurus cincinnatus* Bright
Fig. 220

*Corthylocurus cincinnatus* Bright, 1972, Canadian Ent. 104:1379 (Holotype, female; 21 km or 13 miles N Ocozoautla, Chiapas, Mexico; Canadian Nat. Coll.)

DIAGNOSIS.— This species is distinguished from *barbatus* (Blandford) by characters on the female head and on the elytral declivity as described below.

FEMALE.— Length 2.0–2.2 mm, 2.3 times as long as wide; color yellowish brown.

Frons as in *barbatus* except less deeply concave, lateral margins on lower half straight and moderately converging orad, median carinae on upper two-thirds of concave area parallel, abruptly, strongly elevated, not diverging from one another near vertex, subglandular area on margins of lower half forming a narrow band (one-eighth as wide as greatest width of concave area) along mesal side of lateral margin from just above upper level of eye to base of epistomal curl of hair, their appearance shiny, not spongy; epistoma with a pair of thick curls of very long reddish hair; upper margin of concave area ornamented by a brush of long, plumose, yellow hair.

Pronotum and elytra as in *barbatus* except elytral declivity slightly more narrowly, less strongly sulcate, and lateral denticles smaller.

MALE.— Similar to female except sexual differences as in *barbatus*.

DISTRIBUTION.— Chiapas to Costa Rica.

MEXICO: **Chiapas**: 21 km N Ocozoautla, 2-VII-69, D. E. Bright. COSTA RICA: Tapantí, Cartago, 17-VIII-63, 1300 m, No. 106, woody vine, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 1–2 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 12 other specimens.

### 6. *Corthylocurus barbatus* (Blandford)
Fig. 220

*Brachyspartus barbatus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):265 (Holotype, female; Volcán de Chiqiruí, Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *cincinnatus* Bright by the characters on the female frons and on the elytral declivity mentioned below.

FEMALE.— Length 2.1–2.5 mm, 2.4 times as long as wide; color yellowish brown.

Frons very deeply, subcircularly concave from eye to eye from epistoma to vertex, lateral margins arcuate, one feebly elevated median carina on middle third; it then divides into two distinct diverging carinae to vertex (height and point of divergence variable within series); subglandular area appearing spongy and occupying lateral fifth of concave area from well above eye to base of epistomal curl, extending to median line near base of curl in some specimens; epistomal curl about half as thick as in *cincinnatus* and conspicuously shorter, of yellow hair; brush of plumose hair on vertex slightly longer than in *cincinnatus* and more extensive. Antennal club 1.5 times as long as wide, asymmetrically oval; tuft of hair on posterior face poorly developed.

Pronotum 1.1 times as long as wide; essentially as in *debilis* Wood.

Elytra 1.3 times as long as wide, 1.2 times as long as pronotum; sides almost straight and parallel on basal two-thirds, broadly rounded behind; disc rather weakly reticulate, punctures small, shallow, poorly formed, confused. Declivity steep, rather strongly sulcate; sulcus deeper and wider than in *cincinnatus*; sutural interstriae feebly elevated, 2 narrowly impressed above, very broadly impressed below, lateral convexities rounded, much higher than suture, crest armed by two to six tubercles (two usually dominant), tubercles slightly larger than in *cincinnatus*.

MALE.— Similar to female except sexual differences as in *debilis*; in addition, posterolateral margin of declivity weakly, acutely elevated from sutural apex toward interstriae 8; declivital sulcus less strongly impressed, lateral denticles usually slightly smaller.

DISTRIBUTION.— Puebla to Panama.

MEXICO: Oaxaca: 9 km S Valle Nacional, 8-V-71, D. E. Bright. Puebla: 9 km NE Teziutlán, 2-VII-67, 1600 m, No. 137, *Miconia*, No. 149, tree branch, S. L. Wood. COSTA RICA: Escasú, San José, 2-X-63, 1300 m, No. 216, *Spondias purpurea*, No. 218, tree seedling, S. L. Wood; Tapantí, Cartago, 2-VII-63, 1300 m, No. 10, *Conostegia oerstediana*, No. 106, woody vine, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 2–4 cm in diameter. The "parasitic" habit described above for the genus applies to this species.

NOTES.— The above treatment was based on the holotype and on 82 other specimens.

My Tapantí, Costa Rica (No. 1963-106), collection contained a mixture of *barbatus* and *cincinnatus*. The very subtle differences between these species was interpreted as individual variation within one species until the two patterns of "glandular" microtorichia on the female frons were seen. This character then indicated that several other less conspicuous features had taxonomic significance and that *cincinnatus* is a valid species, contrary to an earlier opinion (Wood 1973:175).

## GENUS *CORTHYLUS* ERICHSON

*Corthylus* Erichson, 1836, Archiv Naturgesch. 2(1):64 (Type-species: *Bostrichus compressicornis* Fabricius, subsequent designation through monotypy by Ferrari, 1867)

*Morizus* Ferrari, 1867, Die Forst- und Baumzuchtschädlichen Borkenkäfer, p. 69 (Type-species: *Morizus excisus* Ferrari, monobasic); Eichhoff, 1870, Berliner Ent. Zeitschr. 13:300. *Synonymy*

*Pseudocorthylus* Ferrari, 1867, Die Forst- und Baumzuchtschädlichen Borkenkäfer, p. 59 (Type species: *Pseudocorthylus letzneri* Ferrari, subsequent designation by Hopkins, 1914, Proc. U.S. Nat. Mus. 48:128); Wood, 1977, Great Basin Nat. 37:511. *Synonymy*

DIAGNOSIS.— This difficult genus is distinguished from other members of the tribe by the 1-segmented antennal funicle, by the distinctive, asymmetrical antennal club, by the entire elytra, by the simple, transverse, prothoracic precoxal piece, by the subquadrate (or triangular) antennal scape, and by the distinctive combination of characters on the protibia and elytral declivity.

DESCRIPTION.— Length 1.2–4.3 mm, 2.0–2.5 times as long as wide; color yellowish brown to black, several species bicolored.

Frons sexually dimorphic, males convex and subglabrous, females flat to strongly concave and subglabrous to elaborately ornamented by setae. Eye emarginae; finely to very coarsely faceted. Antennal club sexually dimorphic, males moderately large, slightly asymmetrical, and without specialized tufts of hair, female club moderately to very large, strongly to very strongly asymmetrical, lateral margin of posterior face usually ornamented by a pennicellate tuft of hair; one to three sutures usually present, 1 often partly or entirely septate. Pronotum as long or longer than wide, lateral margins usually marked by a fine raised line (several exceptions); anterior margin usually with several serrations in female, male usually with one pair of median serrations. Scutellum large, flat. Elytral disc finely sculptured, punctures almost always confused; declivity convex, sulcate, or truncate, small denticles present in a few species. Vestiture usually confined to head and elytral declivity. Female protibia with posterior face flat and smooth or inflated and variously tuberculate.

DISTRIBUTION.— SE Canada to Argentina; about 90 species are known, 56 of them occurring in North and Central America.

BIOLOGY.— Recently cut or broken limbs are usually selected for attack, although *columbianus* Hopkins may breed in the bole of living trees without killing them. The male forms the entrance tunnel and at least part of one or both egg galleries. The female then joins him and completes the two transverse egg galleries that extend in opposite directions along growth rings about 5–10 mm below the wood surface. In many species these tunnels may meet on the opposite side of the branch, thus forming a continuous circular ring. In smaller stems the egg galleries follow opposite spiral courses upward and downward from the inner end of the entrance tunnel. Both types of galleries may occur in the same species. In all tropical species observed by me the female formed the complete larval cradle. The cradle was then inoculated with the ambrosial fungus on which an egg was deposited near the open end. The mycelial growth then sealed the opening, apparently with the aid of mycelial material or frass placed at the opening by the parent beetle. After hatching, the larva assumed a U-shape and fed largely near the cradle opening and passed excrement into the parental gallery. The larva apparently was free to feed

throughout the larval cradle. Pupae always formed with the head at the open end of the cradle. Emergence was through the parental entrance hole.

## Key to the Species of *Corthylus*

1. Posterolateral margin of elytral declivity broadly rounded, occasionally feebly elevated near costal margin; if elevated, then crest of this carina more weakly raised than costal margin and with median side of crest flat or convex; a weak declivital sulcus, if present, not extending laterally beyond interstriae 3 ..... 2
— Posterolateral margin of declivity moderately to rather strongly elevated, crest higher than elevation on costal margin, its mesal slope concavely impressed; declivity more broadly impressed, often dentate; cirrus on female antennal club commonly very long (absent in a few species); anterior tibiae with posterior face usually inflated and/or dentate (except *unicceptis*, *trucis*, *luridus*) ..... 31

2(1). Posterolateral margin of elytral declivity broadly rounded, without any indication of an abrupt elevation; mostly smaller species ..... 3
— Posterolateral margin of elytral declivity with an abrupt, weakly elevated ridge extending dorsad from costal margin a short distance; mostly larger species ..... 19

3(2). Antennal club entirely aseptate or with a short, partial septum on mesal or lateral third of suture 1, suture 2 rarely indicated by a groove, never septate ..... 4
— Antennal club with sutures 1 and 2 indicated by parallel grooves, 1 septate throughout, 2 sometimes septate (except 2 neither grooved nor septate in *comosus*) ..... 13

4(3). Antennal club completely aseptate (males of *retusus* sometimes very finely septate) ..... 5
— Antennal club with a partial septum on mesal end (or in some males also lateral third) of suture 1 ..... 9

5(4). Fine raised line on basal margin of pronotum continued to lateral and anterior margins without interruption; anterior slope and anterior margin on female pronotum unarmed; elytral declivity simple, without elevations, impressions, or conspicuous punctures; Costa Rica and Venezuela; *Cecropia* leaf petioles; 2.0–2.5 mm ..... 1. ***cecropii*** **Wood**
— Raised basal line not reaching anterior margin of pronotum; anterior slope and anterior margin of female pronotum armed by asperities; elytral declivity with interstriae 1 strongly convex, 2 impressed, punctures and granules conspicuous ..... 6

6(5). Declivital interstriae 2 as wide as 3 and bearing a row of punctures or tubercles ..... 7
— Declivital interstriae 2 impressed, narrow, without punctures or granules ..... 8

7(6). Declivital interstriae 2 not impressed, with a row of minutely granulate setiferous punctures; strial punctures on declivity small; interstriae punctured; Costa Rica; 2.0 mm ..... 2. ***granulifer*** **Wood**
— Declivital interstriae 2 impressed, 2 and lateral interstriae each bearing a row of small tubercles; strial punctures on declivity distinctly larger; declivity steeper; Costa Rica; 2.2–2.4 mm ..... 3. ***retusus*** **Wood**

8(6). Declivital interstriae 2 very narrow, essentially obsolete; female frons with excavated area 1.8 times as long as wide, punctures in excavated area much smaller, spaced by more than twice diameter of a puncture, vestiture in excavated area minute, sparse; Costa Rica; 1.7–2.0 mm ..... 4. ***retusifer*** **Wood**

– Declivital interstriae 2 moderately narrow, less deeply impressed; female frons with excavated area 1.5 times as long as wide, punctures in concave area coarse, deep, close, spaced by diameter of a puncture; Puebla to Costa Rica; 1.7–2.2 mm ..... 5. ***villus*** **Bright**

9(4). Female frons rather shallowly concave from epistoma to upper level of eyes; antennal club moderately asymmetrical, without external grooves; declivity with abundant pubescence; very small species ..... 10

– Female frons strongly, broadly concave to well above eyes; antennal club strongly asymmetrical, with conspicuous grooves in positions of sutures 1 and 2; larger species ..... 11

10(9). Entire declivital area finely, densely punctured, and covered by abundant, short, hairlike setae, interstriae 1 not elevated; female frons coarsely, deeply punctured; elytral disc shining, not reticulate; Costa Rica to Panama; 1.4–1.7 mm ..... 6. ***villifer*** **Wood**

– Declivital area less densely, less deeply punctured, interstriae 1 strongly elevated; female frons finely, sparsely punctured; eyes very coarsely faceted; elytral disc dull, strongly reticulate; declivital interstriae 3 with a row of bristles; Costa Rica; 1.0–1.2 mm ..... 7. ***oculatus*** **Wood**

11(9). Declivity evenly convex, strial punctures obsolete, interstriae indicated by sparse rows of minute granules on 1–3; color uniformly brown; Costa Rica; 2.4 mm ..... 8. ***bifurcus*** **Schedl**

– Declivital interstriae 2 distinctly impressed and entirely devoid of granules, punctures on striae 1 and 2 reduced but visible, bicolored ..... 12

12(11). Strial punctures on posterior half of disc and declivity small, distinct, in rows; interstriae on declivity with rows of granules; female frontal excavation more coarsely punctured; Costa Rica; Bamboo; 2.5–2.9 mm ..... 9. ***calamarius*** **Wood**

– Strial punctures on disc and declivity obsolete, decivital granules not evident or exceedingly minute; female frons more finely punctured; Costa Rica; Bamboo; 2.5–2.8 mm ..... 10. ***cannularius*** **Wood**

13(3). Elytral declivity with interstriae 1–3 unarmed, 3 occasionally with minute granules, 2 moderately impressed ..... 14

– Declivital interstriae 1–3 each armed by a row of granules, 2 only slightly impressed; female frons with a large median callus at vertex ..... 18

14(13). Punctures on elytral disc only slightly larger than those on pronotal disc; elytra brown; smaller species ..... 15

– Punctures on elytral disc several times larger than those on pronotal disc; elytra black; larger species ..... 16

15(14). Antennal club with suture 2 obsolete; female frons more extensively excavated, at least a third of its area above eyes; posterior third of elytra densely pubescent; Costa Rica; *Piper*; 2.5–2.8 mm ..... 11. ***comosus*** **Wood**

– Antennal club with sutures 1 and 2 clearly marked; female frons less extensively excavated, extending only slightly above eyes; posterior third of elytra very sparsely pubescent; Guatemala to Panama; 1.8–2.1 mm ..... 12. ***collaris*** **Blandford**

16(14). Pronotum black; strial punctures on declivity minute, interstriae at least six times as wide as striae; female frons more shallowly concave, a feeble median carina near and on epistoma, a median callus near vertex; Costa Rica; 2.7–3.0 mm ..... 13. ***simplex*** **Wood**

— Pronotum reddish brown, strial punctures on declivity larger, interstriae about three times as wide as striae; female frons more deeply concave, without any indication of a carina near epistoma or on vertex ..... 17

17(16). Declivital sulcus less deeply impressed, punctures slightly smaller; female frons with punctures much less abundant, interspaces irregular but averaging more than twice diameter of a puncture, vestiture very fine, less abundant, shorter; apex of female antennal club more broadly rounded, minutely sinuate, cirrus short, ending remote from apex of club; Costa Rica to Panama; 2.5–3.0 mm ..... 14. ***rubricollis*** **Blandford**

— Declivital sulcus more deeply impressed, punctures larger; female frons more densely punctured, interspaces averaging less than diameter of a puncture, vestiture coarser, longer, much more abundant; apex of female club more narrowly rounded, with about three to five serrations, cirrus attaining apex of club; Costa Rica; 2.8–3.0 mm ..... 15. ***sanguineus*** **Schedl**

18(13). Elytra stouter, 1.1 times as long as wide; strial punctures on declivity very fine, interstrial tubercles smaller; Costa Rica to Panama; 2.8–3.0 mm ..... 16. ***panamensis*** **Blandford**

— Elytra more slender, 1.3 times as long as wide; strial punctures on declivity larger, interstrial tubercles larger; Puebla to Guatemala; 2.5–2.8 mm ..... 17. ***consimilis*** **Wood**

19(2). Elytral declivity convex, strial and interstrial punctures confused or at least with interstriae 2 punctured, interstriae 3 rarely granulate; larger than 3 mm ..... 20

— Declivital interstriae 2 impressed and impunctate, punctures of striae 1 and 2 in rows, interstriae 3 sometimes granulate (doubtful species smaller than 3 mm) .... 25

20(19). Female antennal club moderately asymmetrical, sutures 1 and 2 almost straight, 1 and sometimes 2 finely septate; unicolorous; in various hosts ..... 21

— Female antennal club strongly asymmetrical, suture 1 moderately, 2 rather strongly procurved, both aseptate; bicolored brown and dark brown; in bamboo ..... 24

21(20). Elytral punctures on disc and declivity very small, only slightly larger than those on pronotal disc; Michoacán and Distrito Federal to Chiapas; 4.0–4.3 mm ..... 18. ***nudus*** **Schedl**

— Elytral punctures rather coarse, much larger than on pronotal disc; smaller species ..... 22

22(21). Body stouter, 2.06 times as long as wide; female frons with margin of concave area narrowly separated from inner margin of eye, its lateral margin devoid of a tuberculate callus just above level of antennal insertion; Costa Rica; 3.1 mm ..... 19. ***granulatus*** **Schedl**

— Body more slender, at least 2.2 times as long as wide; female frons with lateral margin of concavity at inner margin of eye, with a conspicuous tuberculate callus at margin slightly above level of antennal insertion ..... 23

23(22). Elytral declivity less strongly convex; declivital punctures smaller, not as deep, interstriae 2 at least six times as wide as a puncture; Distrito Federal and Mexico (state) to El Salvador; 3.3–3.6 mm ..... 20. ***fuscus*** **Blandford**

— Elytral declivity more strongly convex; declivital punctures much larger, deeper, interstriae 2 about three times as wide as a puncture; Colorado and Ontario to Arkansas and North Carolina; 3.0–3.3 mm ..... 21. ***punctatissimus*** **(Zimmermann)**

24(20). Anterior margin of pronotum coarsely serrate, median pair larger in male; setae on interstriae 8 and 9 sparse and shorter on basal half of elytra; Costa Rica; Bamboo; 3.0–3.3 mm ..... 22. ***brunnescens*** **Wood**

— Anterior margin of pronotum weakly serrate except median pair coarse in male; basal half of elytra with rather abundant, long hair on interstriae 8–10; Costa Rica; Bamboo; 3.7–4.0 mm ..... 23. ***calamicolens*** **Wood**

25(19). Female antenna with cirrus extending to or very slightly beyond apex of club; declivital sulcus very weakly impressed; Puebla to Panama; 2.3–3.4 mm ..... 24. ***comatus*** **Blandford**

— Female antenna either without cirrus or cirrus poorly developed, ending well before apex of club; declivital sulcus more strongly impressed ..... 26

26(25). Declivital interstriae 1 entirely devoid of granules; female antenna with a small, distinct cirrus on posterior face of club; smaller species ..... 27

— Declivital interstriae 1 with a row of fine granules; female antennal club without a cirrus; larger species ..... 29

27(26). Declivital interstriae 1 more strongly convex, as high as lateral convexities; female frons narrower, distance from upper level of eyes to epistoma equal to distance between eyes, lateral margin from eye to level of antennal insertion subacutely elevated, surface of concavity much more coarsely, more sparsely punctured, vestiture in concave area less abundant, very fine; Costa Rica to Panama; 2.7–3.1 mm ..... 25. ***strigilis*** **Wood**

— Lateral convexities of declivity much higher than sutural interstriae; female frons wider, distance from upper margin of eye to epistoma distinctly less than distance between eyes, lateral margins rounded, concave area densely, finely punctured, vestiture much more abundant ..... 28

28(27). Declivital sulcus more strongly impressed, wider, including entire width of interstriae 2; sutures of antennal club straight in male, feebly, equally arcuate in female; Guatemala; 2.5–2.6 mm ..... 26. ***diligens*** **Wood**

— Declivital sulcus shallow, narrow, ascending laterally from striae 1; sutures of antennal club weakly arcuate in male, in female 1 weakly, 2 much more strongly arcuate; Costa Rica; 3.4–3.5 mm ..... 27. ***zelus*** **Wood**

29(26). Body stout, 2.0 times as long as wide; declivital striae 1 and 2 with punctures larger, deeper, interstriae 2 more strongly impressed; female frons with a median subcarinate, impunctate callus from epistoma to vertex; female antennal club with apical margin straight, median apical angle more abruptly rounded; Panama; 3.9–4.2 mm ..... 28. ***ptyocerus*** **Blandford**

— Body more slender, at least 2.2 times as long as wide; declivital punctures on striae 1 and 2 smaller, not as deep, interstriae 2 less strongly impressed; female frons without a median elevation; apical margin of female antennal club arcuate ..... 30

30(29). Elytral declivity more strongly convex, strial punctures larger, deeper; declivital interstriae 2 less strongly impressed, much narrower than 1 or 3; punctures on pronotal disc larger, distinct; apical margin of female antennal club entire, almost smooth; Kansas and Massachusetts to Tennessee and Georgia; 3.6–3.8 mm ..... 29. ***columbianus*** **Hopkins**

— Elytral declivity more broadly convex, strial punctures very small, shallow; declivital interstriae 2 more strongly impressed, as wide as 1 or 3; punctures on pronotal disc minute to obsolete; apical margin of female antennal club subserrate, its posterior side armed by several small tubercles; Puebla to Oaxaca; 3.4–3.9 mm ..... 30. ***concavus*** **Bright**

31(1). Small species less than 1.8 mm in length; posterior face of anterior tibia moderately inflated and armed by a few minute, confused tubercles; declivital structure rather simple except truncate in *trunculus*; suture 1 on antennal club septate (if doubtful, *trunculus*, female frons convex) ..... 32

— Species larger than 2.3 mm (except *pygmaeus*); either size much larger than 2.3 mm or else all tubercles on posterior face of protibia in a longitudinal row ..... 36

32(31). Elytral declivity abruptly truncate, a small tooth on its basal margin in position of interstriae 3; sutures on female antennal club very strongly procurved; female frons broadly convex, ornamented by abundant, uniformly distributed, fine, long hair; Costa Rica to Panama; 1.3–1.4 mm ..... 31. ***trunculus*** **Wood**

— Elytral declivity convex, its margin rounded on upper three-fourths; sutures on female antennal club weakly procurved; female frons concave ..... 33

33(32). Body more slender, 2.4 times as long as wide; elytral declivity very steep, broadly concave, interstriae 1 very strongly elevated; Veracruz; 1.4 mm ..... 32. ***suturifer*** **Schedl**

— Body stouter, 2.2–2.3 times as long as wide (except 2.5 in *nanus*); declivity more gradual, more strongly convex, interstriae 1 less strongly elevated, wider than high ..... 34

34(33). Declivity bisulcate, interstriae 1 narrowly, abruptly elevated, 2 conspicuously impressed, 3 broadly rounded, as high as 1; female frons narrower than width of an eye, very shallowly impressed below upper level of eyes; Honduras; 1.3–1.4 mm ..... 33. ***minimus*** **Wood**

— Declivity evenly convex, interstriae 1 weakly elevated, 2 not impressed; female frons at least twice as wide as width of an eye, strongly concave from epistoma to vertex ..... 35

35(34). Declivity with interstriae 2 entirely unarmed; female frons with margins rounded, concavity with abundant, moderately long hair; Panama; 1.5–1.8 mm (see also 35. ***nevermanni*** **Schedl** and 36. ***nanus*** **Wood**) ..... 34. ***pumilus*** **Wood**

— Declivital interstriae 2 armed by a row of minute granules similar to those on 1 and 3; female frons with lateral margin below eye subacute, concavity with sparse, minute hair; Oaxaca to Honduras; 1.2–1.4 mm ..... 37. ***minutissimus*** **Schedl**

36(31). Posterior face of protibia flat, unarmed; female antennal club with three strongly procurved sutures, anterior face entirely pubescent; posterolateral margin of declivity finely, acutely elevated on lower fourth, margins rounded above, declivity broadly convex, interstriae 1–3 equally, rather finely, not closely granulate (2 unarmed in *uniseptis*; only one tubercle in *luridus*); female frons broadly concave from epistoma to vertex, concave area densely, finely punctured, finely pubescent, hair of uniform length except median line impunctate and glabrous ..... 37

— Posterior face of protibia inflated and/or tuberculate; declivital interstriae 2 never with a row of tubercles ..... 39

37(36). Smaller; declivital interstriae 2 unarmed, 1 and 3 each with about two widely spaced granules; Veracruz to Chiapas; 1.8–2.1 mm ..... 39. ***parvulus*** **Blandford** and 38. ***uniseptis*** **Schedl**

— Larger; elytral declivity armed by very sparse granules on interstriae 2; declivital interstriae 1 and 3 each armed by six or more granules ..... 38

38(37). Declivital tubercles rather fine; transverse spongy area on posterior face of female antennal club occupying middle third of club length almost from mesal to lateral margin; Costa Rica; 2.9–3.1 mm ..... 40. ***trucis*** **Wood**

— Declivital tubercles rather coarse; transverse spongy area on female antennal club a slender band occupying only a small part of a much larger impressed area; Guatemala to Panama; 2.3 mm ..... 41. ***luridus*** **Blandford**

39(36). Elytral declivity essentially convex, posterolateral margin restricted to lower fourth of declivity or less, rather weakly elevated ..... 40

— Elytral declivity truncate, posterolateral margin subacutely elevated on more than lower half of declivity, if doubtful then interstriae 1 very strongly elevated ..... 49

40(39). Elytral declivity with interstriae 1 armed by a series of granules ..... 41

— Declivital interstriae 1 entirely unarmed by granules ..... 44

41(40). Declivity more strongly, evenly convex, interstriae 1–3 each armed by a row of very small granules, 2 equal in height, width, and convexity to 3; yellowish spongy area on female frons large, in lateral areas almost attaining upper level of eyes, attaining level of lower inner margin of eye at median line; Durango to Guerrero; 2.5–2.7 mm ..... 42. ***detrimentosus*** **Schedl**

— Declivity variously impressed, not evenly convex, interstriae 2 unarmed, weakly impressed (occasional specimens of *nolenae* with a few granules at base); yellowish spongy area on female frons smaller, not extending above lower inner margin of eye (female of *spinosus* unknown) ..... 42

42(41). Elytral declivity with posterolateral margin subacutely elevated from sutural apex to slightly above middle of declivity, declivital face rather weakly convex; longitudinally oval, yellowish, spongy area on female frons occupying median third, upper margin of concave area ornamented by a brush of long hair; Puebla to Honduras; 2.3–2.5 mm ..... 43. ***mexicanus*** **Schedl**

— Posterolateral margin of declivity subacutely elevated on less than lower fourth; yellowish, spongy area on female frons wider (*spinosus* unknown) ..... 43

43(42). Declivital interstriae 2 feebly or not at all impressed, granules on 1 and 3 very small, strial punctures coarse, deep; male frons coarsely, sparsely punctured, smooth on lower half; female frons with median carina on upper two-thirds of concave area, spongy area reniform; elytra black, pronotum reddish brown; Oaxaca; *Nolena*; 2.0–2.3 mm ..... 44. ***nolenae*** **Wood**

— Declivital interstriae 2 distinctly impressed, tubercles on 1 and 3 rather coarse, sharply pointed, strial punctures small, shallow; male frons more finely punctured, reticulate from epistoma to vertex; Veracruz; 2.0 mm ..... 45. ***spinosus*** **Wood**

44(40). Declivital interstriae 2 largely obsolete, 3 with a series of about two to five rather coarse, pointed denticles; declivital sulcus rather deep; female frons with a pair of large, spongy areas on lower area, upper margin bearing a brush of long hair, concave area almost glabrous ..... 45

— Declivital interstriae 2 of normal width, 3 with minute granules or unarmed, 1 and 3 rather weakly elevated; female frons without yellowish, spongy area, concave area with abundant pubescence ..... 46

45(44). Smaller; spongy areas on each half of female frons subcircular, extending slightly more than half distance from epistoma to upper level of eyes, margins of spongy areas marked by a row of fine, long hair; Chiapas; 1.6 mm ..... 46. ***minutus*** **Bright**

— Larger; spongy areas elongate, almost attaining upper level of eyes, their margins usually devoid of long setae; Guatemala to Costa Rica; 2.0–2.4 mm ..... 47. ***sentus*** **Wood**

46(44). Smaller; declivital impression on interstriae 2 rather weak, less extensive, 1 as high as 3, lower area subconcave only near costal margin; female frons slightly less strongly concave ..... 47

— Larger; declivital impression deeper, much more extensive, interstriae 3 conspicuously higher than 1, lower fifth of declivity subconcave; female frons more strongly concave ..... 48

47(46). Punctures on elytral disc slightly smaller, surface partly or entirely reticulate; female frons very shallowly concave; Costa Rica; 1.5–1.8 mm ..... 48. ***pygmaeus*** **Wood**

— Punctures on elytral disc slightly larger, surface shining; female frons more strongly concave, particularly on lower half; Florida and Nayarit to Brazil; 2.0–2.4 mm ..... 49. ***spinifer*** **Schwarz**

48(46). Female frons above eyes almost flat, setae at upper margin of concave area longer, equal to half distance from their bases to epistomal margin; male frons more finely, sparsely punctured; Nayarit and Veracruz to Guatemala; 2.5–3.0 mm ..... 50. ***flagellifer*** **Blandford**

— Female frons above eyes conspicuously concave, setae at upper margin shorter, equal to less than one-third distance from their bases to epistomal margin; male frons rather coarsely, closely punctured; Costa Rica; 3.0–3.4 mm ..... 51. ***sobrinus*** **Wood**

49(39). Posterolateral margin of declivity subacutely elevated on lower one-half to three-fourths, interstriae 1 strongly elevated, its summit strongly serrate, interstriae 3 with several small granules ..... 50

— Posterolateral margin forming a complete circumdeclivital ring, interstriae 1 uniformly elevated, its surface not serrate ..... 51

50(49). Posterolateral margin of declivity subacutely elevated on lower half of declivity; declivital surface reticulate; female frons with a large, yellowish, spongy area occupying lower third of concave area; Costa Rica; 2.3–2.5 mm ..... 52. ***subserratus*** **Wood**

— Posterolateral margin of declivity subacutely elevated on lower three-fourths of declivity; declivital surface smooth; female frons with central half on upper two-thirds abruptly, much more strongly impressed; Costa Rica to Panama; 2.0–2.3 mm ..... 53. ***serratus*** **Wood**

51(49). Body slender, 2.4 times as long as wide; female frons with large, yellow, spongy area on lower fourth; subacute margin of declivity discontinued at base, not crossing interstriae 1; female antennal club with cirrus absent or much shorter than length of club ..... 52

— Body stouter, 2.0–2.2 times as long as wide; female frons without spongy area (except *eichhoffi*); subacute margin of declivity continued to suture at base; female antennal club with cirrus much longer than club (about as long as club in *procerus*) ..... 53

52(51). Declivity flat to feebly convex, reticulate, punctures rather small, interstriae 1 finely serrate throughout its length; female antennal club with a cirrus about half as long as club; Guatemala; 1.8 mm ..... 54. ***praeustus*** **Schedl**

— Declivity slightly concave, brightly shining, rather coarsely punctured, interstriae 1 a continuous costa throughout its length; female antennal club without a cirrus; Arizona to Durango; *Quercus*; 2.0–2.1 mm ..... 55. ***petilus*** **Wood**

53(51). Declivital surface slightly convex, interstriae 3 armed by about two to four small, pointed tubercles; female frons almost flat, large central area smooth, impunctate, punctured only on lateral pubescent areas; Chiapas to Panama; 2.0–2.3 mm ..... 56. ***concisus*** **Wood**

— Declivital surface flat, interstriae 3 unarmed; female frons broadly, rather strongly concave, finely, uniformly punctured ..... 54

54(53). Female epistoma normal, brush of hair on vertex yellow, slightly shorter, ending slightly above upper level of eye (sparse hair continues to epistomal area); apex of female antennal club rounded; declivital interstriae 1 rather strongly elevated; Oaxaca to Panama; 1.7–1.9 mm ..... 57. ***procerus*** **Bright**

— Female epistoma broadly, very strongly elevated, apical half of its dorsal surface yellow and spongy, brush of hair on vertex reddish, slightly longer, dense area extending slightly below upper level of eye; apex of female club acutely pointed; declivital interstriae 1 rather weakly elevated; Costa Rica; 2.3 mm ..... 58. ***eichhoffi*** **Schedl**

### 1. *Corthylus cecropii* Wood

*Corthylus cecropii* Wood, 1975, Great Basin Nat. 35:31 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This aberrant species is distinguished from all other species in the genus by the small, aseptate antennal club, by the absence of female pronotal asperities, and by the minute to obsolete punctures of the pronotum and elytra.

FEMALE.— Length 2.0–2.5 mm, 2.3 times as long as wide; color black.

Frons uniformly, deeply concave from eye to eye, from epistoma to vertex; surface densely, uniformly, very finely punctured over entire surface; vestiture very fine, rather abundant, uniformly rather short over concave area, margin above eyes with a dense row of very long hair, a small tuft of longer hair at level of antennal insertion on lateral half. Antennal club 1.6 times as long as wide; asymmetrically obovate, aspetate, entire surface minutely pubescent; posterior face with a small tuft of hair extending about half of club length beyond apex.

Pronotum 1.1 times as long as wide; sides weakly arcuate on posterior half, broadly rounded in front, a distinct, submarginal, transverse constriction; anterior margin unarmed; summit indefinite, near middle; asperities absent; surface reticulate, anterior half with sparse, minute granules, posterior half with sparse, minute punctures. Acute lateral margins more strongly developed than in other species. Glabrous.

Elytra 1.3 times as long as wide, 1.2 times as long as pronotum; sides almost straight and parallel on basal two-thirds, obtusely subangulate behind; disc reticulate, a few obscure, irregular lines indicated, punctures minute, mostly obsolete, apparently confused. Declivity occupying slightly more than posterior third, rather steep, convex; sculpture as on disc, except a few irregularly placed fine granules usually present. Vestiture confined to declivity, consisting of sparse, short, fine bristles apparently on odd-numbered interstriae.

MALE.— Similar to female except frons convex, a distinct, transverse impression above epistoma, surface smooth, shining, impunctate; anterior margin of pronotum distinctly produced toward median line and armed by two slender teeth; anterior slope of pronotum much steeper, asperate.

DISTRIBUTION.— Costa Rica and Venezuela.

COSTA RICA: San Vito, Puntarenas, 13-III-68, H. Hespenheide; Tapantí, Cartago, 5-V, 24-X-63, and 9-III-64, 1300 m, nos. 19, 243, 467, *Cecropia* leaf petioles, S. L. Wood. OTHER COUNTRIES: Venezuela.

HOST.— *Cecropia peltata.*

BIOLOGY.— Recently fallen leaf petioles are selected for attack. The spiral-shaped tunnels are formed where the pith meets the harder outer tissues on the basal half of the petiole. Usually fewer than three larvae develop in each system. In a majority of the gallery systems examined one or more branches contained a pair of *Tricolus cecropii* Wood (Costa Rica) or *T. intrusus* Wood (Venezuela). It

appeared as though the *Tricolus* species had entered the newly formed tunnel of this species and assumed ownership. In most instances the *Corthylus* was either missing or else dead in a remote part of the tunnel; in a few instances the *Corthylus* formed a new branch tunnel beginning near the entrance hole and continued normal activities.

NOTES.— The above treatment was based on the type series of 26 specimens and on 4 other specimens.

### 2. *Corthylus granulifer* Wood

*Corthylus granulifer* Wood, 1974, Great Basin Nat. 34:181 (Holotype, male; 15 km SE Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *retusus* Wood by the smaller size, by much smaller tubercles on the elytral declivity, by the uniformly convex declivity laterad from striae 1, and by the more slender body form.

MALE.— Length 2.0 mm, 2.5 times as long as wide; color dark brown.

Frons broadly convex, ascending slightly toward epistomal margin; surface shining at epistoma, reticulate above, reticulate area with sparse, rather fine punctures; vestiture sparse, inconspicuous. Antennal club as in *retusus*.

Pronotum 1.0 times as long as wide; anterior margin with median pair of serrations much larger, otherwise as in *retusus* female.

Elytra 1.5 times as long as wide, 1.5 times as long as pronotum; similar to *retusus* except elytral surface smoother, strial punctures near declivity almost in rows, declivital interstriae 2 not impressed, 3 not elevated, tubercles much smaller, declivital vestiture apparently longer and slightly more abundant.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 15 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 200, *Myrica pubescens*, S. L. Wood; Volcán Poás, Heredia, 9-XI-63, 2500 m, No. 261, tree branch, S. L. Wood.

NOTES.— The above treatment was based on the type series of two male specimens.

### 3. *Corthylus retusus* Wood
Fig. 221

*Corthylus retusus* Wood, 1974, Great Basin Nat. 34:181 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *granulifer* Wood by characters summarized in the diagnosis of that species.

FEMALE.— Length 2.2–2.4 mm, 2.3 times as long as wide; color very dark brown.

Frons deeply concave from eye to eye, from epistoma to vertex, lateral margin carinate from eye to lateral part of vertex; surface of lower half reticulate, upper half shining, slightly irregular, minutely, rather closely punctured, glabrous; a pair of widely spaced slender, hornlike denticles near upper margin of concave area. Antennal club asymmetrically subquadrate, 1.4 times as long as wide; anterior surface minutely pubescent; suture 1 obscurely indicated by an obscure septum, 2 marked by an obscure groove; posterior face with a small tuft of hair extending slightly beyond apex of club.

Pronotum 0.93 times as long as wide; sides almost straight and parallel on basal half, abruptly converging to rather broadly rounded anterior margin; anterior margin with about 10 low serrations (viewed from cephalic aspect); summit indefinite, slightly anterior to middle; anterior slope coarsely asperate; posterior areas subshining, weakly reticulate, punctures minute, moderately abundant. Glabrous.

Elytra 1.3 times as long as wide, 1.5 times as long as pronotum; sides very feebly arcuate and subparallel on basal two-thirds, rather broadly rounded behind; disc smooth, shining, with obscure, irregular lines indicated, punctures small, confused, moderately abundant. Declivity convex, steep; interstriae 1 uniformly, abruptly elevated from near base to near apex, about as high as wide on middle half, its summit smooth, shining, with sparse punctures; interstriae 2 moderately, broadly impressed, 3 convex, slightly elevated, 2–5 each bearing a row of conspicuous, closely spaced, pointed tubercles. Vestiture confined to declivity, of fine, long, interstrial hair.

Protibia with posterior face subrugose, unarmed.

MALE.— Similar to female except frons and anterior margin of pronotum as in male *granulifer*; antennal club smaller, less strongly asymmetrical, tuft of hair absent.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 15 km SE Cartago, Cartago, 24-IX-63, 1800 m, Nos. 198 from *Solanum torvum*, 195 from tree seedling, S. L. Wood; Tapantí, Cartago, 2-VII-63, 1300 m, No. 9, *Miconia*, 26-XI-63, No. 265, *Phoebe mexicana*, S. L. Wood.

HOSTS.— *Miconia* sp., *Phoebe mexicana*.

BIOLOGY.— Specimens were taken from branches 3–4 cm in diameter.

NOTES.— The above treatment was based on the type series of 113 specimens.

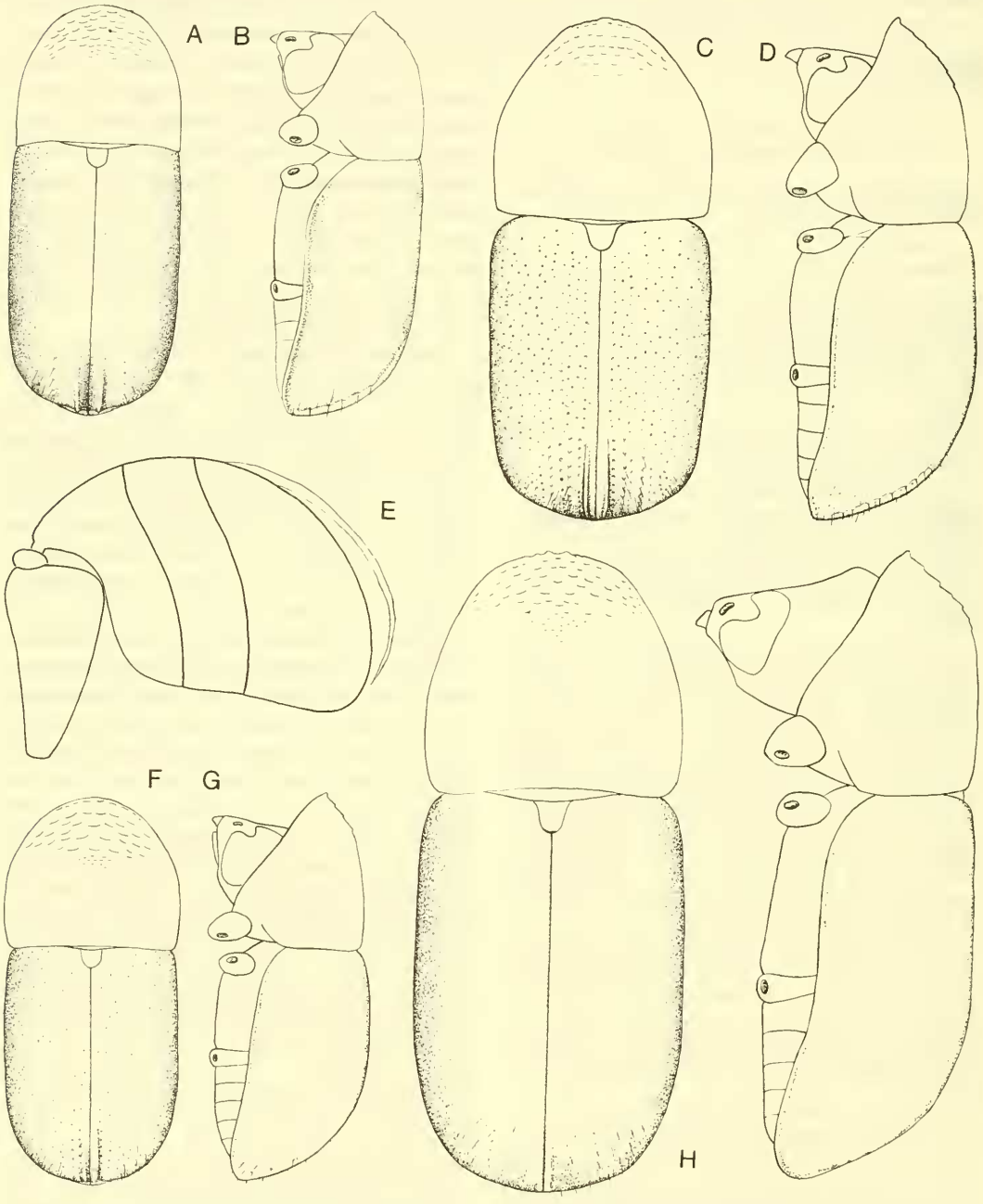



Fig. 221. *Corthylus* spp., female outlines from dorsal and lateral aspects: A, B, *retusifer*; C, D, E, *retusus*; F, G, *villus*; H, I, *calamarius*.

### 4. *Corthylus retusifer* Wood
Fig. 221

*Corthylus retusifer* Wood, 1974, Great Basin Nat. 34:183 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *retusus* Wood by the characters of the antennal club and elytral declivity cited below.

FEMALE.— Length 1.7–2.0 mm, 2.3 times as long as wide; very dark brown (holotype not fully darkened.)

Frons as in *retusus*; antennal club more nearly subcircular, sutures 1 and 2 entirely obsolete except for a very small piece of septum of 1 on lateral margin. Pronotum and elytra as in *retusus* except declivital interstriae 2 impressed, very strongly narrowed, almost obsolete, unarmed, 3 weakly convex, 3–5 armed by small granules about as in *granulifer* Wood.

MALE.— Similar to female except frons, antenna, and anterior margin of pronotum as in male *granulifer*.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 1300 m, 2-VII-63, No. 7, woody vine, 17-IX-63, No. 176, tree branch, 26-XI-63, No. 265 in *Phoebe mexicana*, No. 266 in tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 3–5 cm in diameter.

NOTES.— The above treatment was based on the type series of nine specimens.

### 5. *Corthylus villus* Bright
Fig. 221

*Corthylus villus* Bright, 1972, Canadian Ent. 104:1371 (Holotype, female; Yerba Buena 32 km or 20 miles N Bochil, Chiapas, Mexico; Canadian Nat. Coll., 12640)

DIAGNOSIS.— This species is distinguished from *retusifer* Wood by characters of the frons and elytral declivity as indicated below.

FEMALE.— Length 1.7–2.2 mm, 2.3 times as long as wide; color dark brown.

Frons as in *retusifer* except surface of concave area very closely, deeply, coarsely punctured, with moderately short, rather abundant, fine hair of uniform length. Pronotum and elytra as in *retusifer* except declivital interstriae 2 more strongly, more broadly impressed, its surface smooth, shining, with impressed points, granules on interstriae 3–5 slightly smaller.

MALE.— Similar to female except antennal club smaller; frons and anterior margin of pronotum as in male *granulifer* Wood.

DISTRIBUTION.— Puebla to Costa Rica.

MEXICO: **Chiapas**: Yerba Buena, 32 km or 20 mi N Bochil, 21-V-69, 2300 m, D. E. Bright. **Puebla**: 9 km NE Teziutlán, 27-VI-53 and 2-VII-67, 1500 m, *Alnus*, S. L. Wood. GUATEMALA: Guatemala City, 30-V-64, 1300 m, No. 648, tree branch, S. L. Wood; Volcán Pacaya, Esquintla, 1-VI-64, 1300 m, No.651, *Celtis iguanae*, S. L. Wood; Volcán Zunil, Quezaltenango, 27-V-64, 1000 m, No. 627, tree seedling, S. L. Wood. COSTA RICA: San José, San José, 12-IX-63, 1300 m, No. 163, *Spondias purpurea*, S. L. Wood; Tapantí, Cartago, 17-VIII-63, 1300 m, No. 107, tree branch, S. L. Wood; Río Damitas in Dota Mts., San José, 18-II-64, 250 m, flight, S. L. Wood; Santa Ana, San José, 1-VIII-63, 1300 m, No. 96, shrub, S. L. Wood; Turrialba, Cartago, 1970, R. I. Gara.

BIOLOGY.— Specimens were taken from branches 3–5 cm in diameter.

NOTES.— The above treatment was based on 2 paratypes and on 106 other specimens.

### 6. *Corthylus villifer* Wood

*Corthylus villifer* Wood, 1974, Great Basin Nat. 34:183 (Holotype, female; 15 km SE Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This unique species is distinguished from all others in the genus by the small, slender form, by the abundant, minute setae on the posterior half of the elytra, by the female antennal club and frons, and by other characters.

FEMALE.— Length 1.4–1.7 mm, 2.5 times as long as wide; color brown.

Frons rather shallowly concave from eye to eye from epistoma to upper level of eyes, a median, shining callus on epistoma; surface shining, punctures coarse, close, deep; vestiture of fine, long, uniformly distributed hair. Antennal scape rather strongly flattened; club large, asymmetrical, 1.3 times as long as wide, sutures obsolete except 1 at mesal margin, uniformly, finely pubescent.

Pronotum 1.05 times as long as wide; sides almost straight and parallel on basal half, rather broadly rounded in front; anterior margin unarmed; summit indefinite, slightly in front of middle; rather finely asperate on anterior slope; posterior areas reticulate, punctures small, obscure, moderately abundant; lateral margins rounded, not marked by a raised line. Subglabrous.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; sides straight and

parallel on more than basal two-thirds, broadly rounded behind; disc smooth and shining at base, becoming strongly reticulate toward declivity, punctures sparse, small, confused. Declivity steep, shallowly, subconcavely impressed on median half, lateral and basal margins broadly rounded; surface minutely, closely punctured; impressed area extending from suture to position of interstriae 3. Vestiture largely confined to posterior fourth, of dense, minute hair, a few longer setae on marginal areas.

Protibiae subinflated on posterior face, a few very minute granules indicated.

MALE.— Similar to female except frons convex, reticulate, punctures sparse, obscure, subglabrous; anterior margin armed by one median pair of large, slender teeth.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: 15 km SE Cartago, Cartago, 24-IX-63, 1800 m, Nos. 187, 199, and 248 in *Siparuna nicaraguensis*, No. 201 in a woody vine, S. L. Wood; Tapantí, Cartago, 2-VII-63, 1300 m, No. 177, woody vine, S. L. Wood. PANAMA: Cerro Punta, Chiriquí, 11-I-64, 1800 m, No. 385, woody vine, S. L. Wood.

BIOLOGY.— Specimens were found in stems 2–4 cm in diameter.

NOTES.— The above treatment was based on the type series of 82 specimens.

### 7. *Corthylus oculatus* Wood

*Corthylus oculatus* Wood, 1974, Great Basin Nat. 34:184 (Holotype, female; Pandora, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *villifer* Wood by the smaller size, by the very large eyes, by the narrower, less strongly impressed female frons, and by the strongly elevated declivital interstriae 1.

FEMALE.— Length 1.0–1.2 mm, 2.3 times as long as wide; color brown.

Frons narrow, shallowly concave from eye to eye from epistoma to slightly below upper level of eyes; surface smooth and shining on upper half, reticulate below, punctures sparse, fine; vestiture rather sparse, moderately long. Eye very large, coarsely faceted. Antennal club similar to *villifer* but slightly smaller.

Pronotum and elytra about as in *villifer*, except elytral disc strongly reticulate to base, declivity more nearly convex, declivital interstriae 1 strongly, acutely elevated from base to near apex, punctures not evident, a few minute granules on interstriae 3; vestiture confined to declivity, consisting of very short, moderately abundant hair, a few long, slender bristles on declivital interstriae 1, 3, and lateral areas.

MALE.— Similar to female except frons convex, reticulate, punctures obscure; anterior margin of pronotum armed by a median pair of slender teeth.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Pandora, Limón, 23-VIII-63, 50 m, No. 142 in tree branch, No. 144 in woody vine, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 1–2 cm in diameter.

NOTES.— The above treatment was based on the type series of 10 specimens.

### 8. *Corthylus bifurcus* Schedl

*Corthylus bifurcus* Schedl, 1935, Rev. de Ent. 5:345 (Holotype, male; Laguna Volcán Poás, Heredia, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *cannularius* Wood by the slightly smaller size, by the uniformly brown color, and by characters on the elytra as described below. It resembles *Corthycyclon* much more closely than *Corthylus* species.

MALE.— Length 2.4 mm, 2.4 times as long as wide; color brown, elytra slightly lighter.

As in male *cannularius* except elytral disc less uniformly reticulate, punctures smaller but more clearly indicated; declivity evenly convex, strial punctures obsolete, interstriae 1–3 indicated by minute granules. (In *cannularius* interstriae 2 is weakly impressed and devoid of granules and punctures evident on striae 1 and 2.)

DISTRIBUTION.— Costa Rica.

COSTA RICA: Laguna Volcán Poás, 2600 m, T. Assmann.

HOST.— Probably a native bamboo.

NOTES.— The above treatment was based on the holotype.

### 9. *Corthylus calamarius* Wood

Fig. 221

*Corthylus calamarius* Wood, 1974, Great Basin Nat. 34:185 (Holotype, female; Volcán Poás, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *cannularius* Wood by the distinct strial punctures that are in rows, by the larger, regularly placed interstrial granules on the

declivity, and by the more coarsely punctured female frons.

FEMALE.— Length 2.5–2.9 mm, 2.6 times as long as wide; color yellowish brown, with anterior third of pronotum and elytral declivity dark brown to black.

Frons deeply concave from eye to eye, from epistoma to vertex; surface reticulate, punctures rather close, moderately coarse; vestiture of moderately abundant, fine, rather long hair, uniformly distributed except absent on a small median area at epistoma. Antennal club subreniform, 1.2 times as long as wide; suture 1 represented by septum on lateral third, 2 and 3 represented by arcuate grooves (secondary strengthening features, not true sutures); a small tuft of hair on posterior face not reaching apex.

Pronotum 1.02 times as long as wide; widest near base, sides weakly arcuate and converging very slightly on basal half, rather narrowly rounded in front; anterior margin serrate; summit indefinite, slightly in front of middle; anterior slope moderately steep, coarsely asperate; posterior areas finely reticulate, punctures very small, rather sparse; lateral margin rounded. Glabrous.

Elytra 1.6 times as long as wide, 1.6 times as long as pronotum; sides straight and parallel on basal two-thirds, rather broadly rounded behind; disc reticulate, punctures near base minute, obscure, confused, those on posterior third distinct and in definite strial rows. Declivity convex, steep; striae 1 and 2 with punctures minute; interstriae 2 broadly, very weakly impressed, 1–4 each with a row of small, regularly spaced granules. Vestiture confined to declivity, consisting of interstrial rows of moderately long, slender bristles.

MALE.— Similar to female except frons convex, reticulate, sparsely punctured, subglabrous; antennal club smaller, less irregular in shape; median pair of serrations on anterior margin of pronotum much larger than others.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Poás, Heredia, 19-XI-63, near 2000 m, No. 258, native bamboo, S. L. Wood.

BIOLOGY.— Specimens were taken in the nodes of recently cut bamboo stems 5–8 cm in diameter.

NOTES.— The above treatment was based on the type series of 11 specimens.

### 10. *Corthylus cannularius* Wood

Fig. 222

*Corthylus cannularius* Wood, 1974, Great Basin Nat. 34:186 (Holotype, female; Cerro de la Muerte, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *calamarius* Wood by the confused, obscure to obsolete punctures near the elytral declivity, by the very minute to obsolete, irregularly placed interstrial granules on the declivity, and by the more finely punctured female frons.

FEMALE.— Length 2.5–2.8 mm, 2.5 times as long as wide; color yellowish brown, anterior third of pronotum and elytral declivity darker.

Frons as in *calamarius* except surface almost smooth, punctures minute. Pronotum as in *calamarius* except anterior margin more coarsely serrate (somewhat variable). Elytra as in *calamarius* except punctures near declivity confused or obsolete, strial punctures on declivity obsolete, interstrial granules on declivity much smaller and more widely, less regularly spaced, declivital vestiture finer and less abundant.

MALE.— Similar to female except frons convex, reticulate, sparsely punctured, subglabrous; antennal club smaller, less irregular in shape; anterior margin of pronotum armed by only two coarse teeth.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Summit of Panamerican Highway on Cerro de la Muerte, San José, 6-VIII-63, 3200 m, No. 46, native bamboo, S. L. Wood.

BIOLOGY.— Specimens were taken from the nodes of stems 1–3 cm in diameter of a dwarf bamboo about 2–3 mm in height.

NOTES.— The above treatment was based on the type series of 40 specimens.

### 11. *Corthylus comosus* Wood

Fig. 222

*Corthylus comosus* Wood, 1974, Great Basin Nat. 34:186 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from the very closely related *villosus* Eggers by the smaller pale area on the lower fifth of the female frons, by the smaller punctures on the elytral disc, by the more closely punctured elytral declivity, by the much more abundant declivital vestiture, and by the larger size (*villosus* 2.0–2.5 mm).

FEMALE.— Length 2.5–2.8 mm, 2.1 times as long as wide; color dark brown.

Frons deeply, uniformly concave from eye to eye, from epistoma to vertex; almost half of concave area above eyes; surface reticulate, finely, closely, uniformly punctured, lower one-sixth yellow and with punctures finer and much closer; vestiture of rather abundant, uniformly distributed, short, fine hair, slightly longer on upper margin. Antennal club large, reniform; tuft of hair on posterior face ending before apex of club.

Pronotum 0.90 times as long as wide; widest near base, sides weakly arcuate and subparallel on basal third, broadly rounded in front; anterior margin armed by about 14 low serrations; summit indefinite, anterior slope moderately steep; asperities commence

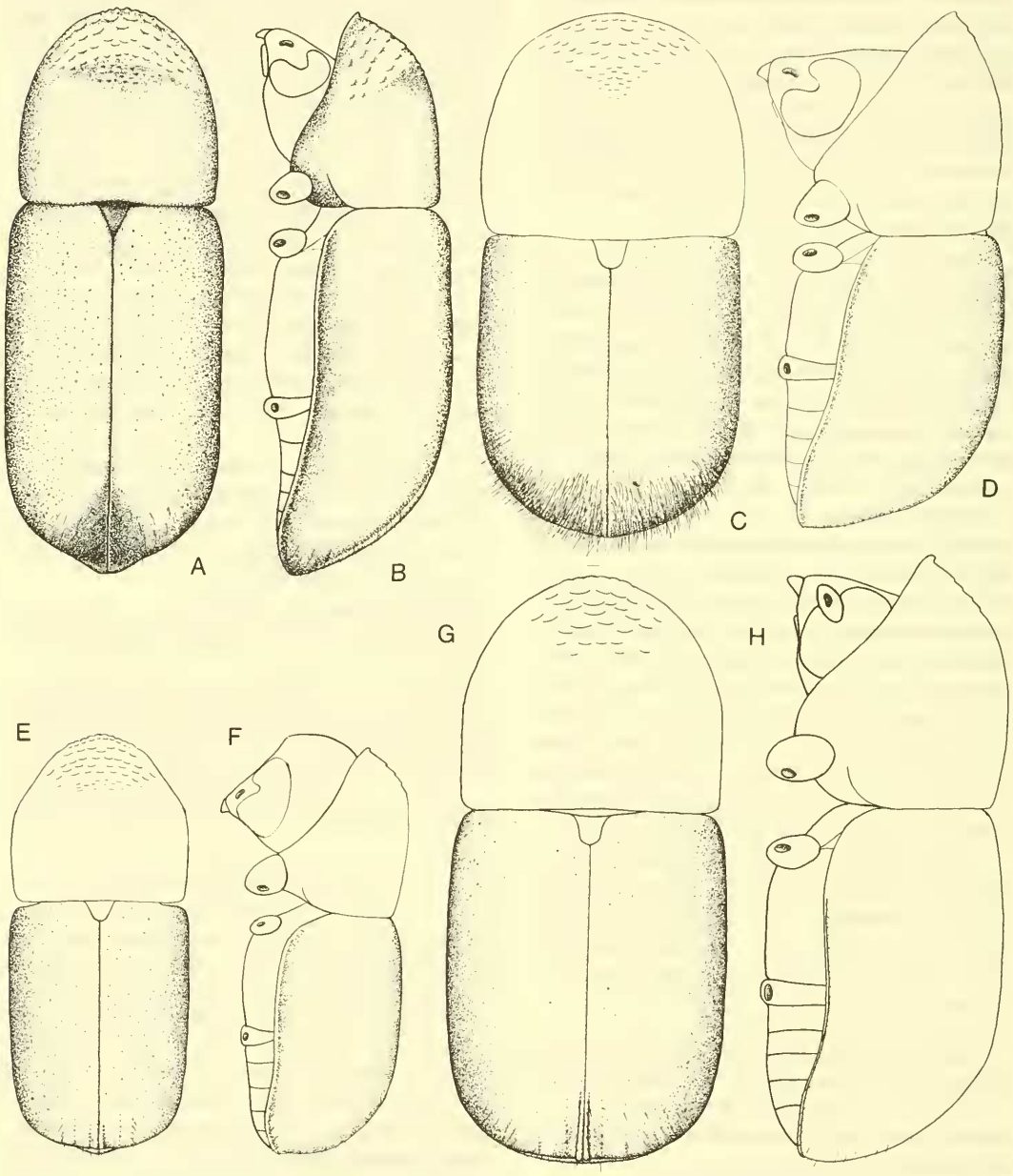



Fig. 222. *Corthylus* spp., female outlines from dorsal and lateral aspects (frontal setae omitted): A, B, *cannularius*; C, D, *comosus*; E, F, *collaris*; G, H, *rubricollis*.

slightly behind middle and continue to anterior margin; posterior area reticulate, punctures minute. Minute, hairlike pubescence moderately abundant, but usually abraded.

Elytra 1.2 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal half, broadly rounded behind; disc smooth, a few very obscure irregular lines evident, punctures very fine, moderately abundant, confused. Declivity occupying posterior third, steep, evenly, broadly convex; surface smooth, shining, punctures very fine, close, confused, much closer than in *villosus*. Vestiture sparse on disc, abundant on entire declivity, of fine, moderately long hair, more abundant than in *villosus*.

MALE.— Similar to female except frons convex, reticulate, rather finely punctured, vestiture sparse; anterior margin of pronotum armed by two median teeth.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Tapantí, Cartago, 26-XI-63, 1300 m, No. 264, *Piper*, S. L. Wood.

BIOLOGY.— Specimens were taken from recently cut stems 5–8 cm in diameter.

NOTES.— The above treatment was based on the type series of 32 specimens. This species and *villosus* are restricted to *Piper* spp.; their habits are virtually identical. Because *villosus* is somewhat variable in several characters, it would not be surprising to find that *comosus* is only a well-marked geographical race.

### 12. *Corthylus collaris* Blandford

Fig. 222

*Corthylus collaris* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):261 (Holotype, male; Cerro Zunil, Guatemala; British Mus. Nat. Hist.)

*Corthylus splendens* Wood, 1967, Great Basin Nat. 27:138 (Holotype, female; 16 km SE Cartago, Cartago, Costa Rica; Wood Coll.); Wood, 1974, Great Basin Nat. 34:279. *Synonymy*

DIAGNOSIS.— This species is distinguished from all the preceding members of this genus by the presence of sutures 1 and 2 on the antennal club, 2 finely septate, by the presence of a fine, raised line on the lateral margin of the pronotum, by the simple elytral declivity that is entirely unarmed, and by other characters.

FEMALE.— Length 1.8–2.1 mm, 2.5 times as long as wide; color dark reddish brown, pronotum frequently of lighter color.

Frons moderately concave from eye to eye, from epistoma to very slightly above upper level of eyes; surface smooth, shining, punctures very fine, rather dense, uniformly distributed; vestiture of rather abundant, fine, moderately long hair of about equal length, slightly longer at margins. Eye very coarsely faceted. Antennal club 1.6 times as long as wide; larger, subreniform; sutures 1 and 2 parallel, complete, almost straight, 1 finely septate; tuft of hair on posterior face attaining apex of club.

Pronotum 1.05 times as long as wide; sides almost straight and parallel on basal half, rather narrowly rounded in front; anterior margin serrate, median pair often larger; basic sculpture as in *retusus* Wood. Glabrous.

Elytra 1.3 times as long as wide, 1.4 times as long as pronotum; disc smooth, shining, irregular lines usually evident, punctures fine, shallow, moderately abundant, about four times larger than those on pronotal disc. Declivity convex, rather steep; striae 1 and 2 finely punctured, 1 somewhat impressed, interstriae 1 weakly elevated, 2 weakly impressed; 3 on a broadly rounded summit, with two or three fine punctures (rarely minutely granulate); surface brightly shining. Vestiture confined to declivity, of very sparse, moderately long hair in interstrial rows.

MALE.— Similar to female except frons convex, sparsely, coarsely punctured, subglabrous; antennal club smaller, less irregular; anterior margin of pronotum armed by two large, median teeth.

DISTRIBUTION.— Guatemala to Panama.

GUATEMALA: Cerro Zunil, G. C. Champion; Palín, Esquintla, 19-V-64, 300 m, No. 588, Anonillo, S. L. Wood; Volcán de Agua, 19-V-64, 1000 m, No. 615, *Acacia*, S. L. Wood. COSTA RICA: 16 km SE Cartago, Cartago, 24-IX-64, 1800 m, No. 244, *Miconia globuliflora*, S. L. Wood; Peralta, Cartago, 10-III-64, 500 m, No. 462, woody vine, S. L. Wood; Tapantí, Cartago, 2-VII-63, 24-X-63, 1300 m, No. 7, woody vine, No. 241, *Phoebe mexicana*, S. L. Wood; Turrialba, 5-VII-63, 700 m, No. 23, *Crotolaria*, S. L. Wood; Pandora, Limón, 23-VII-63, 50 m, Nos. 144, 150, woody vine and tree branch, S. L. Wood; Finca La Lola, Limón, VII-63, *Theobroma cacao*, J. L. Saunders. PANAMA: 13 km S El Hato del Volcán, Chiriquí, 7-I-64, 1000 m, No. 371, tree sapling, S. L. Wood.

HOSTS.— *Acacia* sp., *Crotolaria* sp., *Miconia globuliflora, Phoebe mexicana, Theobroma cacao,* etc.

BIOLOGY.— Specimens were taken in recently cut stems about 3–5 cm in diameter.

NOTES.— The above treatment was based on the holotype of *collaris* and 43 other specimens from Guatemala, and on the type series of 109 specimens of *splendens* from Costa Rica and Panama. The northern and southern material is distinguishable and may represent geographical races; however, because the differences are slight and because specimens from intermediate localities are not at hand, the two forms were placed in synonymy. It is possible that *punctatus* Eggers, from Bolivia, is also a synonym.

### 13. *Corthylus simplex* Wood

*Corthylus simplex* Wood, 1974, Great Basin Nat. 34:187 (Holotype, female; Cerro de la Muerte, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *rubricollis* Blandford by the characters of the elytral declivity and of the female frons as indicated below.

FEMALE.— Length 2.7–3.0 mm, 2.4 times as long as wide; color black.

Frons as in *rubricollis* except punctures larger, vestiture coarser, slightly less abundant, slightly longer, broad median line on upper third impunctate and glabrous. Antennal club 1.3 times as long as wide; sutures 1 and 2 slightly procurved, parallel, clearly marked; tuft of hair on posterior face extending about half club length beyond apex.

Pronotum and elytra as in *rubricollis* except upper two-thirds of declivity more gradual, declivital interstriae 2 less strongly impressed, strial punctures much smaller, declivital bristles (when present) about twice as long.

MALE.— Simiar to female except frons convex, reticulate, punctures fine, sparse, subglabrous.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Cerro de la Muerte, San José, 6-VIII-63, 3100 m, No. 111, tree seedling, S. L. Wood; Volcán Poás, Heredia, 2500 m, 14-VII-63, No. 46, *Podocarpus oleifolius,* 19-XI-63, No. 262, tree branch, S. L. Wood.

NOTES.— The above treatment was based on the type series of nine specimens.

### 14. *Corthylus rubricollis* Blandford

Fig. 222

*Corthylus rubricollis* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):260 (Lectotype, female; Volcán de Chiruquí, Chiriquí, Panama; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *simplex* Wood by characters of the elytral declivity and female frons as indicated below.

FEMALE.— Length 2.5–3.0 mm, 2.4 times as long as wide; color black, pronotum reddish brown.

Frons reddish brown, shallowly concave from eye to eye, from epistoma to vertex; surface smooth, shining, punctures fine, rather sparse, less numerous on narrow median line; vestiture moderately abundant, of very fine, rather short hair of uniform length, indistinctly interrupted on median line. Antennal club 1.6 times as long as wide; subreniform, sutures 1 and 2 weakly procurved, partly septate; apex of club broadly rounded, indistinctly, minutely sinuate; tip of cirrus remote from apex.

Pronotum 1.0 times as long as wide; about as in *collaris.*

Elytra 1.4 times as long as wide, 1.4 times as long as pronotum; outline as in *retusus* Wood; disc smooth, shining, marked by many irregular lines, punctures moderately coarse for this genus, rather close, confused. Declivity rather steep, convex except shallowly sulcate between third interstriae; surface smooth, shining; interstriae 2 moderately, broadly impressed, 1 and 3 moderately, equally elevated; striae 1 and 2 indicated by moderately coarse, shallow punctures; interstriae with a few fine punctures in rows, some of those on 3 feebly granulate. Vestiture confined to declivity, sparse, in obscure interstrial rows, rather short, often abraded.

MALE.— Similar to female except differing as indicated for male *simplex.*

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: 16 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 200, *Myrica pubescens,* S. L. Wood; Tapantí, Cartago, 1300 m, 17-IX-63, No. 184, *Miconia caudata,* 24-X-63, No. 245, woody vine, 26-XI-63, No. 270, *Werklia insignis,* S. L. Wood. PANAMA: Volcán Chiriquí.

HOSTS.— *Miconia caudata, Myrica pubescens, Werklia insignis,* etc.

BIOLOGY.— Specimens were taken from material 4–6 cm in diameter.

NOTES.— The above treatment was based on four of Blandford's 5 syntypes and on 13 other specimens.

### 15. *Corthylus sanguineus* Schedl

*Corthylus sanguineus* Schedl, 1935, Rev. de Ent. 5:346 (Holotype, female; San Isidro de Coronado, San José, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *rubricollis* Blandford by the slightly stouter body form, by the more strongly impressed declivital sulcus, and by the female frons and antennal club as described below.

FEMALE.— Length 2.8–3.0 mm, 2.3 times as long as wide; color reddish brown, elytra very dark brown.

Frons with contours as in *rubricollis*, concave area rather densely punctured, fine punctures spaced by about half diameter of a puncture; vestiture rather fine, moderately long, much more abundant than in *rubricollis*. Apex of antennal club much more narrowly rounded than in *rubricollis* and with about three to five serrations; tip of cirrus attaining apex of club.

Pronotum and elytra as in *rubricollis* except declivital sulcus more strongly impressed, with punctures slightly larger.

MALE.— Similar to female except sexual differences as in *simplex*.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Santo Domingo, Heredia, 27-VI-38, *Persea americana*, F. Nevermann; (San Isidro de) Coronado (San José), 17-I-29, 1400–1500 m, im trocknem holz, F. Nevermann.

NOTES.— The above treatment was based on the holotype and on two other specimens.

### 16. *Corthylus panamensis* Blandford

Fig. 223

*Corthylus panamensis* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):259 (Lectotype, female; Volcán de Chiriquí, Chiriquí, Panama; British Mus. Nat. Hist., present designation.

DIAGNOSIS.— This species is distinguished from *consimilis* Wood by the finer elytral punctures and tubercles, by the absence of an impression on declivital interstriae 2, and by the much smaller elevated callus on the female vertex.

FEMALE.— Length 2.8–3.0 mm, 2.0 times as long as wide; color very dark brown.

Frons rather deeply concave from eye to eye, from epistoma to vertex, a glabrous, conspicuously elevated callus on median third extending from upper margin of concavity two-thirds of distance toward upper level of eyes; surface smooth, shining, punctures fine, close, more widely spaced near center; vestiture of fine, moderately short hair of uniform length, except glabrous on median line. Antennal club large, subreniform, 1.4 times as long as wide; sutures 1 and 2 clearly indicated, subparallel, 1 septate; tuft of hair on posterior face poorly developed, ending remote from apex.

Pronotum 0.90 times as long as wide; widest near base, sides arcuately converging toward rather broadly rounded, subserrate, anterior margin; summit indefinite, slightly behind summit; asperities on anterior slope reduced in number, very broad; posterior areas almost shining, minutely, obscurely reticulate, punctures very sparse, minute. Glabrous.

Elytra 1.1 times as long as wide, 1.4 times as long as pronotum; sides subparallel, feebly arcuate on slightly more than basal two-thirds, broadly rounded behind; disc smooth, shining, punctures very small, shallow, confused. Declivity convex, steep; striae 1–3 indicated by fine, shallow punctures, 1 slightly impressed; interstriae narrowly convex, distinctly, not strongly elevated, 2 and 3 equally flat, not impressed, 2 and 3 each bearing a row of sharply pointed granules mostly on upper half, lateral interstriae with an occasional tubercle. Vestiture confined to declivity, of sparse interstrial rows of fine, long hair.

MALE.— Similar to female except frons convex, reticulate, sparsely punctured, subglabrous; antennal club much smaller, less strongly asymmetrical; anterior margin of pronotum armed by two median teeth.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Tapantí, Cartago, 24-XI-63, 1300 m, No. 245 in woody vine, No. 265 in *Phoebe mexicana*, S. L. Wood. PANAMA: Volcán de Chiriquí, G. C. Champion.

BIOLOGY.— Specimens were taken from recently cut branches 4–8 cm in diameter.

NOTES.— The above treatment was based on the six syntypes in the British Museum (Natural History) and on seven other specimens. The first syntype from Volcán de Chiriquí is here designated as the lectotype of *panamensis* Blandford.

### 17. *Corthylus consimilis* Wood

Fig. 224

*Corthylus consimilis* Wood, 1974, Great Basin Nat. 34:188 (Holotype, female; 9 km NE Teziutlán, Puebla, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *panamensis* Blandford by the larger elytral punctures, by the feebly impressed declivital interstriae 2, and by the larger elevated callus on the female vertex.

FEMALE.— Length 2.5–2.8 mm, 2.2 times as long as wide; color very dark brown.

As in *panamensis* except frontal callus larger, extending from vertex to slightly below upper level of eyes; elytral punctures distinctly larger, particularly on declivity, declivital interstriae 2 feebly impressed, declivital tubercles slightly larger and more widely distributed.

MALE.— Similar to female except differing as in *panamensis*.

DISTRIBUTION.— Puebla to Guatemala.

MEXICO: Puebla: 9 km NE Teziutlán, 27-VI-53, 1600 m, No. 50, 2-VII-67, Nos. 136, 140, tree branches, S. L. Wood. GUATEMALA: Volcán Pacaya, Esquintla, 1-VI-64, 1300 m, No. 668, tree branch, S. L. Wood; Volcán de Agua, 19-V-64, 1000 m, No. 615, *Acacia*, S. L. Wood.

BIOLOGY.— Specimens were taken from branches 6 cm in diameter.

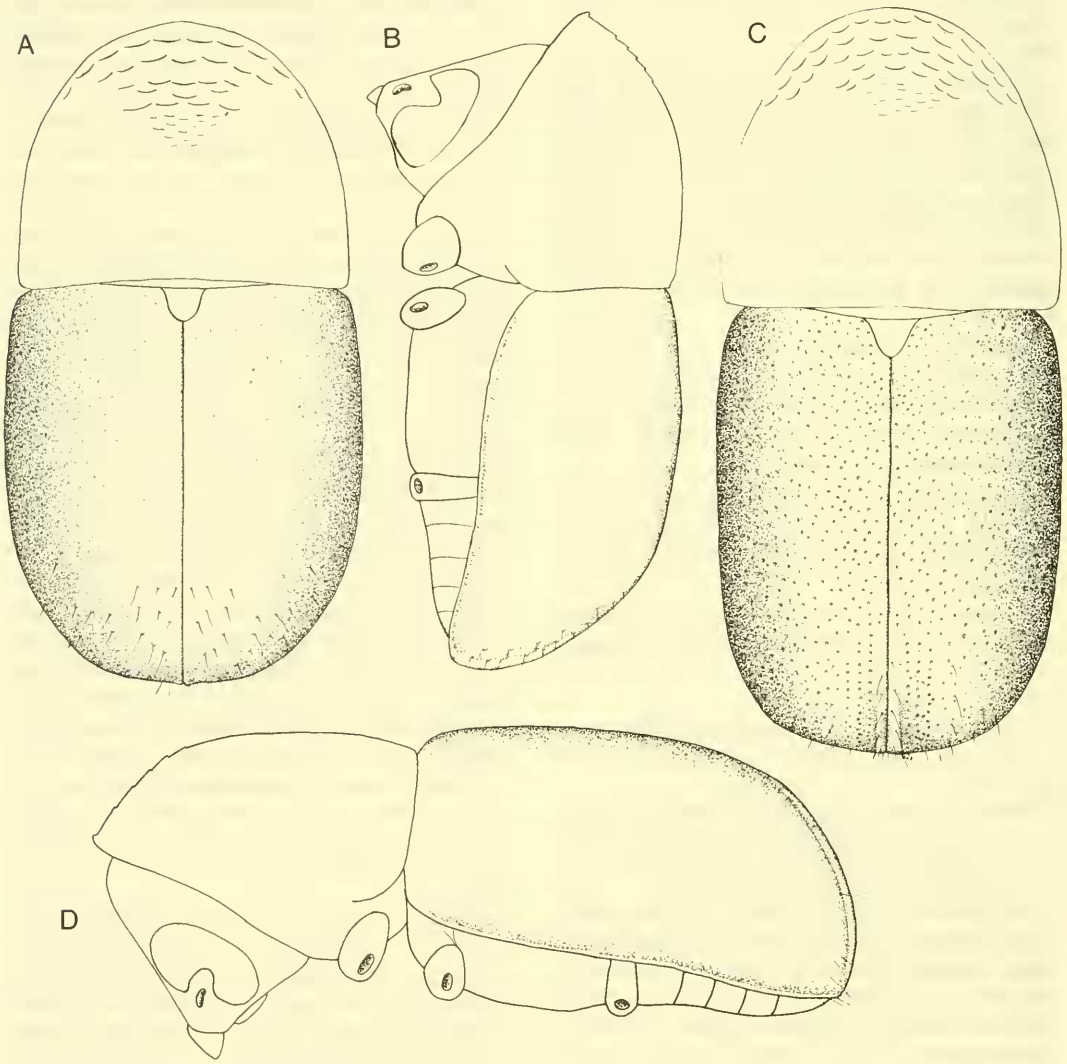



Fig. 223. *Corthylus* spp., female outlines from dorsal and lateral aspects (frontal setae omitted): A, B, *panamensis*; C, D, *punctatissimus*.

NOTES.— The above treatment was based on the type series of 34 specimens.

Although no indications of integration between this species and *panamensis* are evident in the material at hand, the differences between them are not great. Future collecting might make it necessary to reduce this form to the rank of subspecies.

### 18. *Corthylus nudus* Schedl

*Corthylus nudus* Schedl, 1940, An. Esc. Nac. Cienc. Biol., Mexico 1:354 (Syntypes, females; San Antonio Nexapa in Chiapas, San Jacinto in Distrito Federal, and Uruapan in Michoacán, Mexico; Schedl and Dampf colls.)

DIAGNOSIS.— This species is distinguished from *fuscus* Blandford by the larger size and by the more finely punctured elytra.

FEMALE.— Length 4.0–4.3 mm, 2.4 times as long as wide; color very dark brown to black.

Frons moderately concave from eye to eye, from epistoma to vertex; surface almost smooth, shining, punctures fine, dense, uniformly distributed; lateral margin armed by an elongate, blunt tubercle at level of lower margin of eye; vestiture of rather dense, short, yellow hair of uniform length and distribution, except very slightly longer at margins. Antennal club large, moderately asymmetrical, 1.5 times as long as wide; sutures 1 and 2 almost straight, parallel; tuft of hair on posterior face entirely absent.

Pronotum 0.95 times as long as wide; essentially as in *panamensis* Blandford.

Elytra 1.4 times as long as wide, 1.6 times as long as pronotum; outline as in *panamensis*; discal surface smooth, shining, shallow, obscure, irregular lines moderately abundant, punctures fine, shallow, confused. Declivity steep, convex; interstriae 1 feebly elevated, lateral areas broadly convex, punctures minute, confused, interstriae 3 with about four minute granules. Vestiture confined to declivity, of very sparse, fine, short setae, apparently only on odd-numbered interstriae.

MALE.— Similar to female except frons convex, smooth, punctured, subglabrous; antennal club smaller; anterior margin of pronotum armed by two coarse, median teeth.

DISTRIBUTION.— Michoacán and Distrito Federal to Chiapas.

MEXICO: **Chiapas**: San Antonio Nexapa, Dampf. **Distrito Federal**: Mexico City, 19-III-53, flight. **Mexico**: Chapingo, 5-I-57, R. Coronado. **Michoacán**: Uruapan, Dampf.

NOTES.— The above treatment was based on my female homotype and on two males.

### 19. *Corthylus granulatus* Schedl

*Corthylus granulatus* Schedl, 1935, Rev. de Ent. 5:345 (Holotype, female; Turrialba, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *fuscus* Blandford by the stouter body form, by the more nearly confused interstriae at the base of the disc, and, in the female, by the slightly different frons as described below.

FEMALE.— Length 3.1 mm, 2.06 times as long as wide; color dark brown.

Frons as in *fuscus* except lateral margin of concave area very narrowly separated from inner margin of eye (in *fuscus* lateral margin touches eye, without a subtuberculate callus on lateral margin just above level of antennal insertion; surface with punctures slightly larger, slightly less abundant; vestiture much finer, less abundant, slightly shorter. Antenna as in *fuscus*.

Pronotum and elytra as in *fuscus* except as noted in diagnosis.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Turrialba, 800 m, Schild.

NOTES.— The above treatment was based on the holotype.

### 20. *Corthylus fuscus* Blandford

*Corthylus fuscus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):262 (Syntypes, female; Brazilian tobacco intercepted at Paris; British Mus. Nat. Hist.)

DIAGNOSIS.— This species is distinguished from *punctatissimus* (Zimmermann) by the less strongly convex elytral declivity and by the much smaller punctures on the elytral declivity.

FEMALE.— Length 3.3–3.6 mm, 2.3 times as long as wide; color very dark brown.

As in *nudus* Schedl except punctures on elytral disc slightly larger; punctures on elytral declivity small, in strial rows, with a few interstrial punctures, granules essentially obsolete on interstriae 3.

MALE.— Similar to female except sexes differing as in *nudus*.

DISTRIBUTION.— Distrito Federal in Mexico to El Salvador.

MEXICO: **Distrito Federal**: Mexico City, 28-IX-24, *Pyrus*. **Mexico**: Amecameca, XI-52, *Malus*, R. Coronado. GUATEMALA: Palín, Esquintla, 19-V-64, 300 m, No. 588, Anonillo, S. L. Wood. EL SALVADOR: Volcán San Salvador, 7-IX-35, *Coffea*, F. Choussay.

BIOLOGY.— Specimens were taken from a recently cut branch 7 cm in diameter.

NOTES.— The above treatment was based on two syntypes in the British Museum (Natural History) and on nine other specimens.

### 21. *Corthylus punctatissimus* (Zimmermann)
Fig. 223

*Crypturgus punctatissimus* Zimmermann, 1868, Trans. Amer. Ent. Soc. 2:144 (Syntypes?: South Carolina, not located)

DIAGNOSIS.— This species is distinguished from *fuscus* Blandford by the more strongly convex elytral declivity and by the coarser punctures on the elytral declivity.

FEMALE.— Length 3.0–3.3 mm, 2.2 times as long as wide; color very dark brown.

As in *fuscus* except punctures on elytral disc larger and deeper; elytral declivity with punctures as large or larger than on disc, much larger than in *fuscus*, punctures almost always in discernible rows.

MALE.— Similar to female except sexes differing as in *nudus* Schedl.

DISTRIBUTION.— Colorado and Ontario to Arkansas and North Carolina.

CANADA: **Ontario**: Sebringville in Perth Co. USA: **Arkansas**: Bradley Co. **Colorado**: Ft. Collins; 2 miles W Bellvue in Larimer Co. **Connecticut**: Winnipauk. **District of Columbia**: Washington. **Illinois**: Hancock Co. **Kentucky**: Noble. **Michigan**: Midland Co. **Minnesota**: Minnetonka Lake. **New Hampshire**: Exeter. **New Jersey**: Locust Grove, Summerset. **New York**: Attica, New York. **North Carolina**: Gray Beard Mt., Lake Junaluska, Mt. Pisgah, Pink Beds, Pisgah Forest. **Ohio**: Clinton, Delaware Co., Tuscarawas Co., Maumee. **Pennsylvania**: Frasier. **Rhode Island**: Watch Hill. **Tennessee**: McMinnville, Nashville. **Virginia**: Cape Hew, Falls Church, Nelson Co., Mt. Solon. **West Virginia**: Monongalia Co., Morgantown.

HOSTS.— *Acer sacharinum, Berberis* sp., *Cercocarpus* sp., *Gaylussacia* sp., *Rhododendron* sp., *Sassafras* sp., *Viburnum betuloides*.

BIOLOGY.— Small trees or shrubs are attacked on or near the ground level. In larger stems the gallery system is transverse; in smaller stems it tends to spiral upward or downward into the root.

NOTES.— The type was not located. My identification of this species was based on the material in the U.S. National Museum of Natural History studied by Schwarz and Hopkins.

### 22. *Corthylus brunnescens* Wood
Fig. 224

*Corthylus brunneus* Wood, 1974, Great Basin Nat. 34:188 (Holotype, female; Volcán Barba, Heredia, Costa Rica; Wood Coll.). *Preoccupied*

*Corthylus brunnescens* Wood, 1981, Great Basin Nat. 41:122. *Replacement name*

DIAGNOSIS.— This species is distinguished from *calamicolens* Wood by the smaller size, by the more slender body form, by the much more coarsely serrate anterior margin of the pronotum, and by the setal characters indicated below.

FEMALE.— Length 3.0–3.3 mm, 2.4 times as long as wide; color dark brown, discal area of elytra lighter.

Frons as in *punctatissimus* (Zimmermann) except vestiture more abundant and slightly longer on margins of lower half. Antennal club very large, strongly subreniform, suture 1 weakly, 2 moderately procurved; tuft of hair on posterior face large, its tip reaching apex.

Pronotum as in *punctatissimus* except anterior margin very coarsely serrate, median serrations larger.

Elytra as in *punctatissimus* except discal punctures slightly smaller, declivity not as steep, more broadly convex, punctures much less numerous, very fine, confused except on striae 1, about four minute granules on interstriae 1; ventrolateral margin of declivity with a low, short, subacute carina extending from costal margin toward interstriae 8. Vestiture fine, hairlike, sparse, not confined to declivity, mostly restricted to odd-numbered interstriae except on sides, rather sparse on interstriae 8 and 9 and not longer than elsewhere.

MALE.— Similar to female except frons convex, subshining, sparsely, coarsely punctured; median pair of serrations on anterior margin of pronotum larger.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Volcán Poás, 19-XI-63, 2500 m, No. 258, native bamboo, S. L. Wood.

BIOLOGY.— Specimens were taken from the nodes of recently cut bamboo about 7 cm in diameter.

NOTES.— The above treatment was based on the type series of 15 specimens.

### 23. *Corthylus calamicolens* Wood

*Corthylus calamicolens* Wood, 1974, Great Basin Nat. 34:189 (Holotype, female; Volcán Poás, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *brunnescens* Wood by the larger size, by the stouter body form, by the much more finely serrate anterior margin of the pronotum, and by the setal characters indicated below.

FEMALE.— Length 3.7–4.0 mm, 2.3 times as long as wide; as in *brunnescens* except anterior margin of pronotum finely serrate, elytral declivity more broadly convex, and vestiture along sides of elytra much more abundant and longer.

MALE.— Similar to female except differing as in male *brunnescens*.

DISTRIBUTION.— Costa Rica.

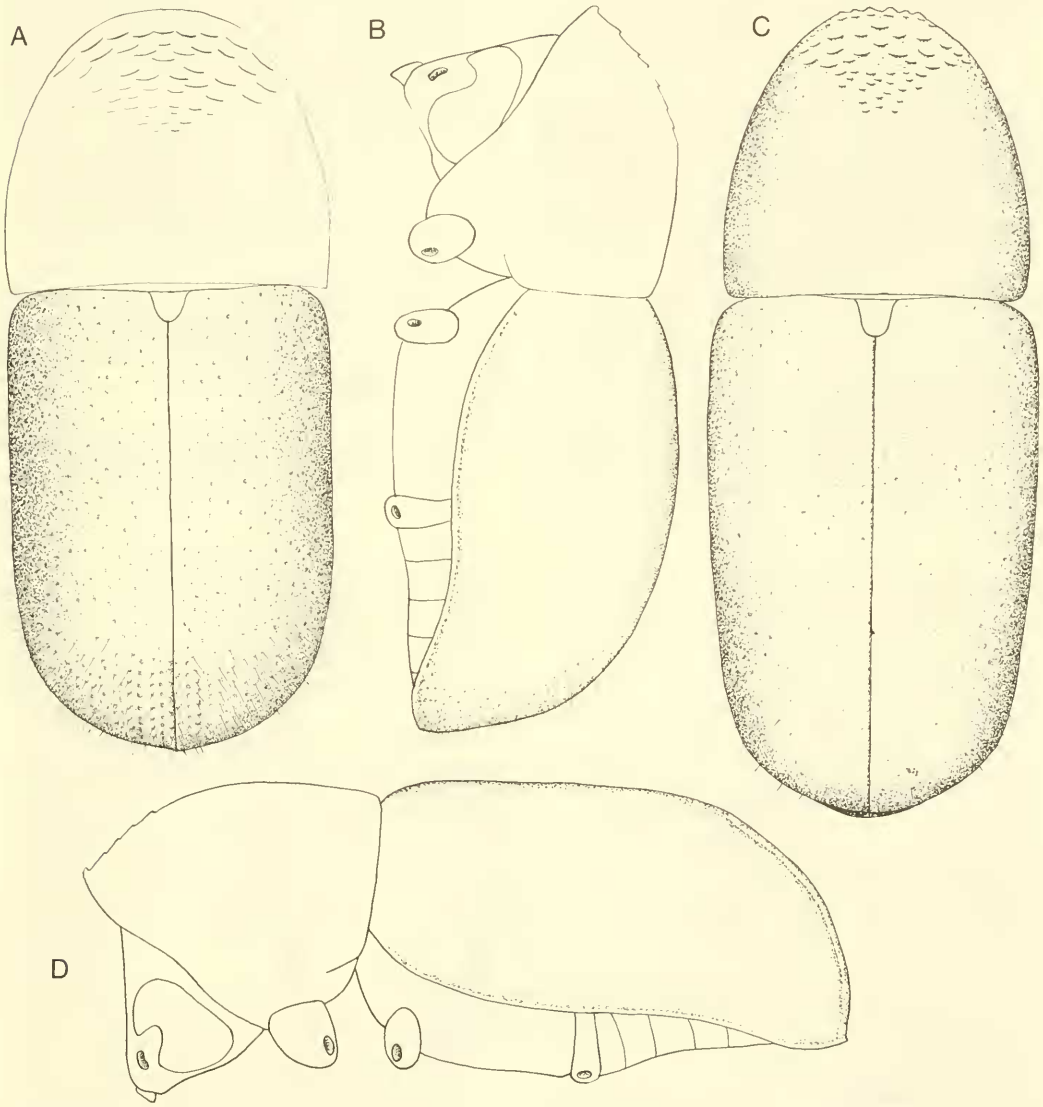



Fig. 224. *Corthylus* spp., female outlines from dorsal and lateral aspects (frontal setae omitted): A, B, *consimilis*; C, D, *brunnescens*.

COSTA RICA: Finca Vota Steinworth on south slope Volcán Barba, Heredia, 8-II-65, native bamboo, J. B. Karren; Volcán Poás, Heredia, 19-XI-63, 2500 m, No. 258, native bamboo, S. L. Wood.

BIOLOGY.— As in *brunnescens*.

NOTES.— The above treatment was based on the type series of 14 specimens.

### 24. *Corthylus comatus* Blandford
Fig. 225

*Corthylus comatus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):258 (Holotype, female; Cerro Zunil, Guatemala; British Mus. Nat. Hist.)

*Corthylus splendidus* Bright, 1972, Canadian Ent. 104:1371 (Holotype, female; 5.6 km or 3.5 miles S Suchixtepec, Oaxaca, Mexico; Canadian Nat. Coll., 12641); Wood, 1974, Great Basin Nat. 34:279. *Synonymy*

DIAGNOSIS.— This species is distinguished from *brunnescens* Wood by the uniformly darker color, by the more finely serrate anterior margin of the pronotum, by the slightly larger elytral punctures, and by the weakly impressed declivital interstriae 2.

FEMALE.— Length 2.3–3.3 mm, 2.3 times as long as wide; color uniformly dark brown to black.

As in *brunnescens* except elytral punctures slightly larger, declivity more broadly convex, declivital interstriae 2 feebly to weakly impressed, punctures of striae 1 and 2 usually clearly impressed, in rows, interstriae 2 usually without punctures, interstriae 3 with about four minute granules. Vestiture largely confined to declivity, of sparse, rather short hair on odd-numbered interstriae.

MALE.— Similar to female except frons convex, mostly shining; antennal club smaller, only slightly asymmetrical, without tuft of hair on posterior face; median pair of serrations on anterior margin of pronotum much larger.

DISTRIBUTION.— Puebla to Panama.

MEXICO: **Puebla**: 9 km NE Teziutlán, 27-VI-53, 2-VII-67, tree branches, S. L. Wood. **Oaxaca**: 5.6 km S Suchixtepec, 2-VII-71, 2600 m, *Alnus*, D. E. Bright. GUATEMALA: Volcán Pacaya, Esquintla, 1-VI-64, 1300 m, Nos. 683, 695, tree branches, S. L. Wood; Volcán Zunil, Quezaltenango, 27-V-64, 1000 m, No. 627, tree seedling, S. L. Wood. COSTA RICA: Tapantí, Cartago, 24-X-63, 1300 m, No. 241, *Phoebe mexicana*, S. L. Wood; 16 km SE Cartago, Cartago, 24-IX-63, 1600 m, No. 198 in *Solanum torvum*, No. 196 in a woody vine, S. L. Wood; Volcán Poás, Heredia, 19-IX-63, 2500 m, No. 259 in *Miconia*, No. 260 in a tree branch, S. L. Wood. PANAMA: Cerro Punta at Volcán de Chiriquí, Chiriquí, 11-I-64, 1600 m, No. 426 in *Ochroma*, Nos. 396, 425, tree branches, S. L. Wood.

HOSTS.— *Alnus* sp., *Miconia* sp., *Ochroma* sp., *Phoebe mexicana*, *Solanum torvum*, etc.

BIOLOGY.— This species breeds in recently cut or broken branches about 4–8 cm in diameter.

NOTES.— The above treatment was based on the holotypes of *comatus* and *splendidus*

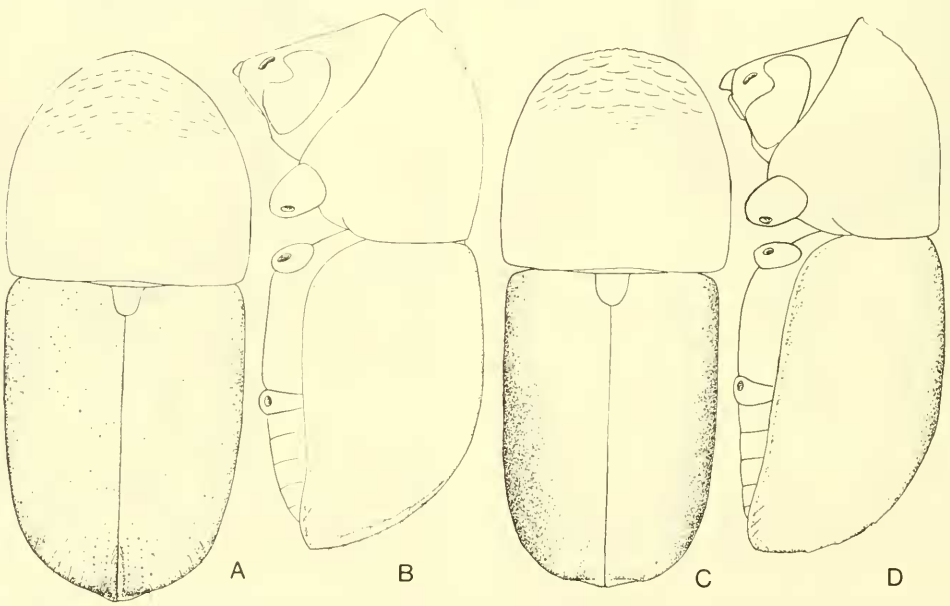



Fig. 225. *Corthylus* spp., female outlines from dorsal and lateral aspects (frontal setae omitted): A, B, *comatus*; C, D, *diligens*.

and on 121 other specimens. Specimens from Mexico and Costa Rica taken at elevations of 1300 m tend to be smaller than those from Guatemala, Costa Rica, and Panama taken at 1600–2500 m.

### 25. *Corthylus strigilis* Wood

*Corthylus strigilis* Wood, 1974, Great Basin Nat. 34:189 (Holotype, female; 16 km SE Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *comatus* Blandford by the more deeply impressed declivital interstriae 2, by the much less closely, more coarsely punctured female frons, by the very small tuft of hair on the posterior face of the female antennal club, and by the finely serrate apical margin of the female antennal club.

FEMALE.— Length 2.7–3.1 mm, 2.3 times as long as wide; color dark brown.

Frons as in *comatus* except less deeply concave, sparsely, less uniformly punctured, an indistinct median callus on upper third, vestiture much more sparse, very fine, absent on callus. Antennal club 2.8 times as long as wide, large, rather strongly asymmetrical; sutures 1 and 2 indicated by grooves, weakly procurved; tuft of hair on posterior face very small, ending remote from apex.

Pronotum and elytral disc as in *comatus*. Elytral declivity as in *comatus* except interstriae 2 more strongly impressed, 1 more strongly elevated, half as high as wide, lateral convexities more narrowly rounded.

MALE.— Similar to female except differing as in *comatus*.

DISTRIBUTION.— Costa Rica and Panama.

COSTA RICA: 16 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 204 in *Miconia globuliflora*, No. 205 in *Myrica pubescens*, S. L. Wood; Tapantí, Cartago, 1300 m, 2-VII-63, No. 5, *Miconia*, 17-IX-63, No. 176, tree limb, 24-X-63, Nos. 241, 265, *Phoebe mexicana*, No. 26-XI-63, No. 271, *Werklia insignis*, S. L. Wood. PANAMA: Cerro Punta at Volcán de Chiriquí, Chiriquí, 11-I-64, No. 393 in a tree branch, No. 407 in a tree seedling, No. 426 in *Ochroma*, S. L. Wood.

HOSTS.— *Cercropia* sp., *Miconia globuliflora*, *Myrica pubescens*, *Ochroma* sp., *Phoebe mexicana*, *Werklia insignis*.

BIOLOGY.— Specimens were taken from material 3–6 cm in diameter.

NOTES.— The above treatment was based on the type series of 68 specimens.

### 26. *Corthylus diligens* Wood

Fig. 225

*Corthylus diligens* Wood, 1974, Great Basin Nat. 34:190 (Holotype, female; Volcán de Agua, Esquintla, Guatemala; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *comatus* Blandford by the much more deeply impressed declivital interstriae 2 and by characters of the female frons and antennal club as indicated below.

FEMALE.— Length 2.5–2.6 mm, 2.4 times as long as wide; color brown.

Frons as in *comatus* except concave area more broadly oval, 1.2 times as long as wide (1.4 times in *comatus*); tuft of hair on posterior face of antennal club with tip ending remote from apex. Pronotum as in *comatus* except anterior margin more coarsely serrate; punctures on disc minutely, obscurely granulate. Elytra as in *comatus* except declivity more strongly impressed on interstriae 2, suture not as high, lateral convexities higher and more narrowly rounded.

MALE.— Similar to female except sexual differences as in *comatus*.

DISTRIBUTION.— Guatemala.

GUATEMALA: Volcán de Agua, Esquintla, 19-V-64, 1000 m, No. 593, in *Clusia*, No. 600 in *Alnus*; Lago Amatitlan, 10-VI-64, 700 m, No. 705, tree branch; Palín, Esquintla, 19-V-64, 300 m, No. 687, *Ficus*; all by me.

HOSTS.— *Alnus* sp., *Clusia* sp., *Ficus* sp., etc.

BIOLOGY.— Specimens were taken from branches 3–5 cm in diameter.

NOTES.— The above treatment was based on the type series of 10 specimens.

### 27. *Corthylus zelus* Wood

Fig. 226

*Corthylus zelus* Wood, 1974, Great Basin Nat. 34:190 (Holotype, female; Cerro de la Muerte, San José, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *diligens* Wood by the larger size and by characters of the female frons and antennal club as indicated below.

FEMALE.— Length 3.4–3.5 mm, 2.5 times as long as wide; color very dark brown.

Frons similar to *diligens* except concave area less strongly impressed, upper margin not clearly delimited; frontal vestiture longer. Tuft of hair on antennal club with its tip almost attaining apex. Anterior margin of

pronotum less coarsely serrate. Elytral declivity with punctures on striae 1 in a row, shallow, of moderate size; lateral punctures much smaller.

MALE.— Similar to female except sexual differences as in *comatus*.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Cerro de la Muerte, San José, 6-VIII-63, 2500 m, No. 114, *Brunellia costricensis*, S. L. Wood.

BIOLOGY.— Specimens were taken from a limb 10 cm in diameter.

NOTES.— The above treatment was based on the type series of three specimens. One male from 16 km SE Cartago, Cartago, at 1800 m, and another from Tapantí, Cartago, at 1300 m, have the declivital sulcus narrower and deeper, and the lateral punctures almost obsolete; they possibly could also

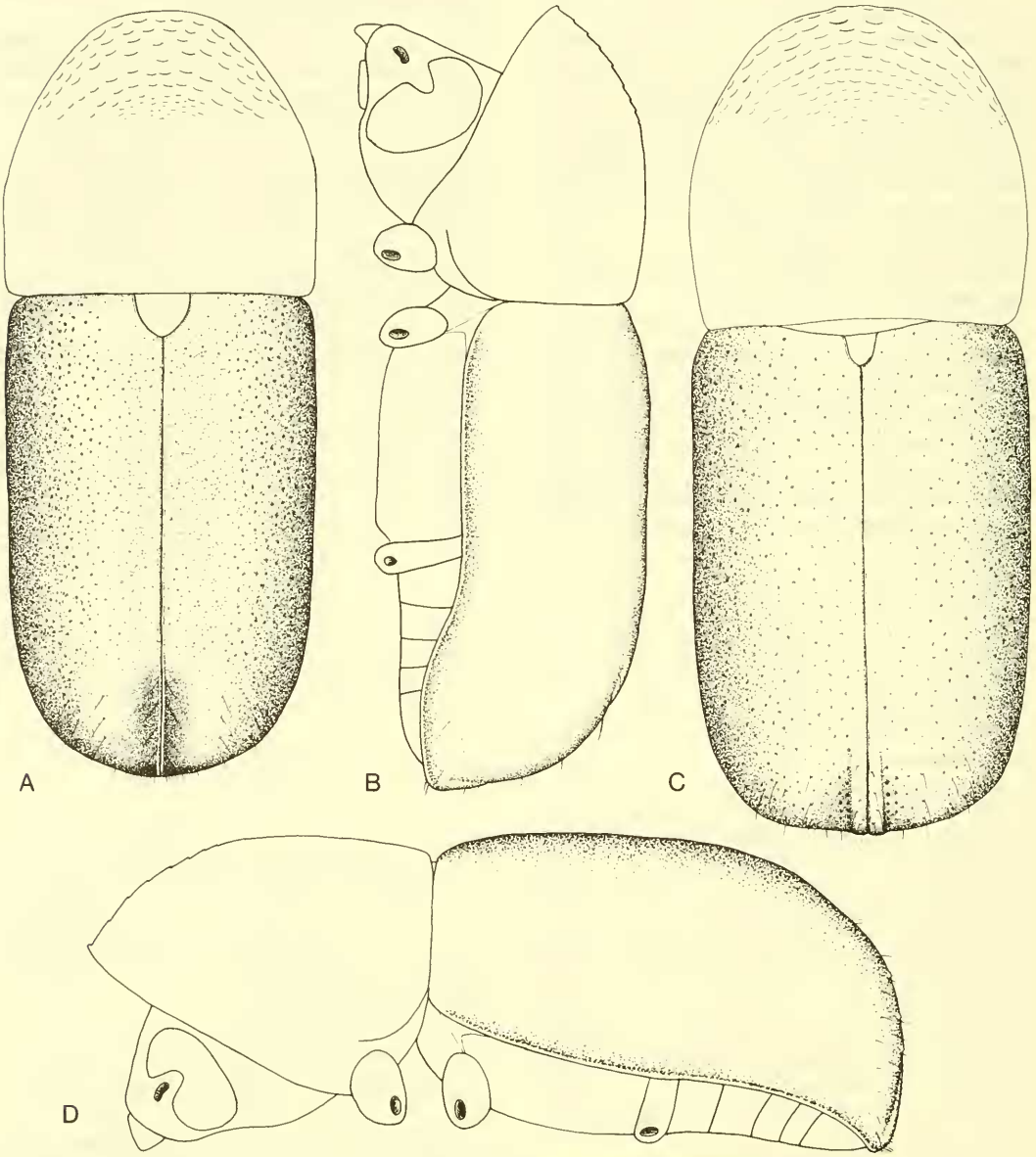



Fig. 226. *Corthylus* spp., female outlines from dorsal and lateral aspects (frontal and antennal setae omitted): A, B, *zelus*; C, D, *columbianus*.

represent this species or a very closely related one not yet known from the female.

### 28. *Corthylus ptyocerus* Blandford

*Corthylus ptyocerus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):257 (Lectotype, female; Volcán de Chiriquí, Chiriquí, Panama; British Mus. Nat. Hist., present designation)

DIAGNOSIS.— This species is distinguished from the remotely related *concavus* Bright by characters summarized in the above key.

FEMALE.— Length 3.9–4.2 mm, 2.0 times as long as wide; color black.

Frons deeply concave and punctured as in *concavus* Bright, with a conspicuous subcarinate, impunctate median callus from epistoma to vertex; lateral margins at level of antennal insertions, and median line at epistoma and again slightly above epistoma subtuberculate; vestiture of abundant, fine, short hair of uniform length. Antennal club large, subtriangular, apical margin almost straight; cirrus not attaining subacute mesal apical angle.

Pronotum 0.94 times as long as wide; essentially as in *concavus*.

Elytra 1.2 times as long as wide; 1.3 times as long as pronotum; sides weakly arcuate and subparallel on basal half, arcuately converging, then broadly rounded behind; about as in *concavus* except striae 1 and 2 more coarsely punctured, interstriae 2 slightly narrower and more deeply impressed, interstrial tubercles at base of declivity distinctly larger, including one or two tubercles on interstriae 2.

MALE.— Similar to female except sexual differences as in *concavus*.

DISTRIBUTION.— Panama.

PANAMA: Volcán de Chiriquí, Chiriquí, 25–4000 ft, G. C. Champion.

NOTES.— The above treatment was based on four syntypes. The first syntype, a female, has been regarded as the type; it is here designated as the lectotype of *ptyocerus* Blandford.

### 29. *Corthylus columbianus* Hopkins

Fig. 226

*Corthylus columbianus* Hopkins, 1894, Proc. Ent. Soc. Washington 3:104 (Syntypes; Raleigh Co., West Virginia; U.S. Nat. Mus.)

DIAGNOSIS.— This species is distinguished from *zelus* Wood by the larger size, by the absent of a tuft of hair on the posterior face of the female antennal club, by characters of the female frons, and by other features.

FEMALE.— Length 3.6–3.8 mm, 2.4 times as long as wide; color very dark brown to almost black.

Frons shallowly, broadly concave from elevated epistoma to vertex; lateral margin with a rounded tubercle at inner margin of eye; surface smooth, densely, finely, uniformly punctured; vestiture of rather short, fine, dense, erect hair uniformly distributed. Antennal club moderately asymmetrical, 1.4 times as long as wide, sutures 1 and 2 almost straight; posterior face without a specialized tuft of hair.

Pronotum and elytral disc essentially as in *punctatissimus* except elytral punctures less abundant and less sharply impressed. Elytral declivity with punctures on striae 1 and 2 essentially in rows; interstriae 2 moderately impressed, rather strongly narrowed, 3 with about six distinct tubercles, 1 usually with smaller tubercles. Vestiture sparse, confined to declivity.

MALE.— Similar to female except frons convex, punctured, sparsely pubescent; antennal club smaller, less strongly asymmetrical.

DISTRIBUTION.— Kansas and Massachusetts to Tennessee and Georgia.

USA: **District of Columbia**: Washington. **Georgia**: Green Co. **Kansas**: Shawnee Co. **Maryland**: Berwyn, Piscataway, Riderwood. **Missouri**: Dent Co. **New Jersey**: Cranford, Ocean Country, Riverton. **New York**: New Rochelle. **North Carolina**: Washington. **Tennessee**: Elkmont. **Virginia**: Elkins, Falls Church, Ft. Monroe. **West Virginia**: Rickene, Randolph Co.

HOSTS.— *Acer rubrum*, *A. saccharinum*, *Castanea dentata*, *Liriodendron tulipifera*, *Platanus occidentalis*, *Quercus alba*, *Ulmus* sp.

BIOLOGY.— The bole of living trees is selected for attack and the tree usually survives after the brood has emerged. The life cycle and habits are discussed by Kabir and Giese (1966).

NOTES.— The above treatment was based on 47 specimens, including Hopkins's syntypes.

### 30. *Corthylus concavus* Bright

*Corthylus concavus* Bright, 1972, Canadian Ent. 104:1376 (Holotype, female; 24 km or 15 miles S Valle Nacional, Oaxaca, Mexico; Canadian Nat. Coll., 12647)

DIAGNOSIS.— This space is distinguished from *columbianus* Hopkins by characters of the female frons and elytral declivity as indicated below.

FEMALE.— Length 3.4–3.9 mm, 2.2 times as long as wide; color black.

Frons as in *columbianus* except much more strongly concave, vestiture on margin much longer; sutures of antennal club feebly procurved. Pronotum and elytral disc as in *columbianus* except punctures smaller, not as deep. Elytral declivity as in *columbianus* except interstriae 2 more strongly, more broadly impressed, punctures much smaller.

MALE.— Similar to female except sexual differences as in *columbianus*.

DISTRIBUTION.— Puebla to Oaxaca.

MEXICO: **Oaxaca**: 24 km or 15 miles S Valle Nacional, 20-V-71, 1300 m, D. E. Bright. **Puebla**: 9 km NE Teziutlán, 2-VII-67, 1600 m, No. 135 in *Alnus*, No. 140 in tree limb, S. L. Wood.

BIOLOGY.— Specimens were taken from limbs and a seeding 5–12 cm in diameter.

NOTES.— The above treatment was based on the holotype and on 12 other specimens.

### 31. *Corthylus trunculus* Wood

*Corthylus trunculus* Wood, 1974, Great Basin Nat. 34:191 (Holotype, female; 13 km or 8 miles S El Hato del Volcán, Chiriquí, Panama; Wood Coll.)

DIAGNOSIS.— This unique species is distinguished from all other representatives of the genus by the small size, by the truncate elytral declivity that is armed at its base by a pair of denticles on interstriae 3, by the convex female frons, and by the strongly procurved sutures on the female antennal club.

FEMALE.— Length 1.3–1.4 mm, 2.2 times as long as wide; color brown.

Frons weakly convex except somewhat flattened on lower fifth; surface subreticulate, punctures small, obscure, moderately abundant; vestiture of uniformly distributed moderately long hair from epistoma almost to vertex. Antennal club subtriangular, more nearly symmetrical than normal for this genus, 1.1 times as long as wide; sutures 1 and 2 strongly procurved, 1 apparently partly septate but not showing on posterior face; posterior face with tip of small tuft of hair reaching apex.

Pronotum 1.1 times as long as wide; basically as in *comatus* Blandford except sculpture much finer, posterior areas strongly reticulate.

Elytra 1.2 times as long as wide; 1.1 times as long as pronotum; sides almost straight on basal five-sixths, very slightly narrower toward declivity, abruptly, very broadly rounded behind; disc almost smooth, subshining, points, lines, and punctures small, confused, somewhat obscure. Declivity truncate, very steep, margin from base to apex abruptly rounded, slightly elevated (not acutely margined); basal margin armed by a pair of small pointed spines at interstriae 3; sutural interstriae uniformly, subacutely, rather weakly elevated; surface strongly reticulate, punctures abundant, confused, shallow, very obscure. Vestiture sparse, short, confined to sides and margins of declivity.

Posterior face of protibia subinflated and armed by four to six confused, minute denticles.

MALE.— Similar to female except frons more strongly convex, subglabrous; antennal club normal, sutures weakly procurved, tuft of hair absent; anterior margin of pronotum armed by two or more coarse teeth.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: Beverley, Limón, 26-VIII-63, 7 m, No. 154, woody vine, S. L. Wood. PANAMA: 13 km S El Hato del Volcán, Chiriquí, 7-I-64, 100 m, No. 371, tree seedling, S. L. Wood.

BIOLOGY.— Specimens were taken from stems 2–3 cm in diameter.

NOTES.— The above treatment was based on the type series of nine specimens.

### 32. *Corthylus suturifer* Schedl

*Corthylus suturifer* Schedl, 1963, Ent. Arb. Mus. Frey 14:165 (Holotype, female; Cordoba, Veracruz, Mexico; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *pumilus* Wood by the more slender body form, by the much steeper, more broadly rounded elytral declivity, with interstriae 1 very strongly elevated, and by the different female frons.

FEMALE.— Length 1.4 mm, 2.4 times as long as wide; color yellowish brown.

Frons rather shallowly concave from eye to eye, from epistoma to vertex; median third smooth, shining, impunctate, lateral thirds apparently very finely granulate-punctate; lateral margins ornamented from epistoma to vertex by a row of moderately long hair (vertex concealed by pronotum, row of hair sometimes interrupted in median area). Both antennae missing from type; left antenna immersed in adjacent glue, large, without a cirrus.

Pronotum 1.05 times as long as wide; about as in *pumilus* except more slender.

Elytra 1.4 times as long as wide, 1.4 times as long as pronotum; sides almost straight and parallel on basal three-fourths, rather abruptly, very broadly rounded behind, with sutural interstriae interrupting outline; disc reticulate, punctures obscure, confused. Declivity confined to posterior fifth, very steep, very broadly convex; interstriae 1 very strongly, uniformly elevated, higher than wide at middle of declivity, its crest reticulate-granulate; lateral areas reticulate, weakly convex; interstriae 3 with about three small denticles; posterolateral margin subacutely, rather weakly elevated on lower third, upper two-thirds of margin rounded. Vestiture confined to declivital interstriae 2, 3, and 4, consisting of rows of rather short, very stout setae.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: Cordoba.

NOTES.— The above treatment was based on the holotype.

### 33. *Corthylus minimus* Wood

*Corthylus minimus* Wood, 1974, Great Basin Nat. 34:192 (Holotype, female; La Ceiba, Honduras; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *minutissimus* Schedl by the characters of the head and elytral declivity as indicated below.

FEMALE.— Length 1.3–1.4 mm, 2.3 times as long as wide; color brown.

Frons very narrow, very shallowly concave, on central half, impressed areas not attaining upper level of eyes; surface shining, obscurely reticulate, a few punctures in marginal areas; subglabrous. Eyes very large, coarsely faceted. Antennal club 1.5 times as long as wide, moderately asymmetrical; sutures almost straight, 1 partly septate, 2 very obscure; posterior face without a tuft of hair.

Pronotum and elytra essentially as in *minutissimus* except elytral declivity with interstriae 2 narrowed, moderately impressed, 1 carinate, more strongly elevated, 3 distinctly elevated and armed by about four minute tubercles, 2 without setae.

MALE.— Similar to female except frons convex, rugose-reticulate, punctures more uniformly distributed; eyes of normal size; antennal club smaller, less elongate; anterior margin of pronotum armed by a pair of coarse, median teeth.

DISTRIBUTION.— Honduras.

HONDURAS: La Ceiba, Atlántida, 20-V to 26-VIII-49, at light, E. C. Becker.

NOTES.— The above treatment was based on the type series of 17 specimens.

### 34. *Corthylus pumilus* Wood

*Corthylus pumilus* Wood, 1974, Great Basin Nat. 34:192 (Holotype, female; Madden Forest, Canal Zone, Panama; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *minutissimus* Schedl by characters of the frons and elytral declivity as indicated below.

FEMALE.— Length 1.5–1.8 mm, 2.2 times as long as wide; color brown.

Frons broadly, deeply concave from epistoma to vertex; surface evidently minutely, densely punctured and finely, densely, uniformly pubescent except smooth and glabrous on narrow median area on upper fourth; vestiture rather short, of uniform length. Antennal club 1.4 times as long as wide; strongly reniform, with grooved sutures, and with a small tuft of hair on posterior face as in *minutissimus*.

Pronotum and elytra as in *minutissimus* except elytral declivity with interstriae 1 more strongly elevated, 2 weakly impressed, entirely unarmed, and devoid of setae, 4 feebly elevated and armed by about four minute tubercles. Vestiture as in *minutissimus* except more slender, slightly longer, absent on interstriae 2.

MALE.— Similar to female except frons convex, reticulate, subglabrous; antennal club normal, anterior margin of pronotum armed by a pair of coarse, median teeth.

DISTRIBUTION.— Panama.

PANAMA: Ft. Clayton, Canal Zone, 22-XII-63, 30 m, No. 363, tree branch, S. L. Wood; Madden Forest, Canal Zone, 2-I-64, 70 m, No. 366, tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from branches 2.3 cm in diameter.

NOTES.— The above treatment was based on the type series of 18 specimens.

### 35. *Corthylus nevermanni* (Schedl)

*Thylurcos nevermanni* Schedl, 1939, Mitt. Münchner Ent. Ges. 29:568 (Holotype, male; Hamburgfarm on Río Reventazón, Limón, Costa Rica; Schedl Coll.)

DIAGNOSIS.— The male is distinguished from the male of *pumilus* Wood by the more slender body form and by the more gradual elytral declivity that has interstriae 1 less distinctly elevated, interstriae 2 wider and not impressed, and the punctures more distinctly impressed.

MALE.— Length 1.7 mm, 2.4 times as long as wide; color brown.

Frons convex above eyes, rather strongly, transversely impressed below eyes, epistoma distinctly elevated; surface reticulate, punctures fine, rather sparse; vestiture of fine, long, rather sparse, uniformly distributed hair.

Pronotum 1.1 times as long as wide; sides almost straight and parallel on more than basal half, then abruptly rounded, rather narrowly rounded in front; anterior margin armed by about six serrations, median pair slightly larger; anterior third strongly declivous, moderately asperate, asperities near median line continued to middle of pronotum but of reduced size; posterior areas finely reticulate, punctures sparse, minute.

Elytra 1.3 times as long as wide, 1.2 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather narrowly rounded behind; surface smooth, shining, with a few very obscure, fine lines, punctures minute, confused. Declivity convex, moderately steep; suture weakly elevated on middle half, interstriae 2 not impressed; punctures fine, larger than on disc, distinctly impressed, granules on 1 and 3 very fine, rounded at base of setae. Vestiture consisting of sparse interstrial rows of moderately long, coarse hair on odd-numbered declivital interstriae and on basal half of 2.

Posterior face of protibiae with a few very minute tubercles.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Hamburgfarm, Río Reventazón, Limón, 1-V-34, F. Nevermann.

NOTES.— The holotype apparently was taken at light. The elytra of the type are spread very slightly. This condition was interpreted and illustrated by Schedl as a sutural emargination. Actually, the elytra are entire, with no hint of an emargination.

### 36. *Corthylus nanus* Wood

*Corthylus nanus* Wood, 1979, Great Basin Nat. 39:138 (Holotype, male; 1 km S Rincón de Osa, Puntarenas, Costa Rica; Wood Coll.)

DIAGNOSIS.— The unique male is unrelated to known species, but it is distinguished from *pumilus* Wood by the smaller, more slender form, by the shining, weakly reticulate frons, and by the very different elytra.

MALE.— Length 1.2 mm, 2.5 times as long as wide; color reddish brown.

Frons broadly convex, a feeble median granule at epistoma; surface shining, reticulate, very weakly so above upper level of eyes; vestiture fine, inconspicuous.

Pronotum 1.1 times as long as wide; basically as in *minutissimus* Schedl except anterior margin armed only by two slender, contiguous, median serrations; surface reticulate.

Elytra 1.4 times as long as wide, 1.3 times as long as pronotum; sides almost straight and parallel on basal two-thirds, rather broadly rounded behind; surface smooth, brightly shining, punctures minute, almost obsolete, perhaps in obscure strial rows. Declivity steep, convex; striae obscurely evident, punctures more distinct than on disc; interstriae 1 weakly, distinctly elevated, 2 strongly, rather narrowly elevated from just below base to just below middle, its narrowly convex crest uniformly elevated, with a row of small punctures, 3 neither elevated nor impressed, with a row of punctures, punctures on 1–3 possibly very feebly granulate. Vestiture restricted to declivity, of interstrial rows of subspatulate bristles on all interstriae, about 5–6 on each interstriae, each bristle about one and one-half times as long as distance between rows.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 1 km SW Rincón de Osa, Puntarenas, 12-VIII-68, from a *Cecropia* leaf petiole, H. Hespenheide.

NOTES.— The above treatment was based on the holotype.

### 37. *Corthylus minutissimus* Schedl

*Corthylus minutissimus* Schedl, 1940, An. Esc. Nac. Cienc. Biol., Mexico 1:353 (Syntypes, females; Chiltepec, Oaxaca, Mexico; Schedl and Dampf colls.)

DIAGNOSIS.— This species is distinguished from *pumilus* Wood by the characters of the frons and declivity as indicated below.

FEMALE.— Length 1.2–1.4 mm, 2.2 times as long as wide; color brown.

Frons broadly, rather deeply concave from epistoma to vertex, with a transverse callus near upper limits of impressed area; margin from level of antennal insertion to inner margin of eye subacute; surface of impressed area finely reticulate, minute punctures very obscure; vestiture of very fine, sparse hair or entirely abraded. Antennal club 1.5 times as long as wide, as in *pumilus*.

Pronotum 0.98 times as long as wide; about as in *trunculus* Wood.

Elytra 1.25 times as long as wide, 1.25 times as long as pronotum; sides straight and parallel on basal half, broadly rounded behind; disc shining, points, punctures, and lines minute, obscure, confused. Declivity broadly convex, steep; posterolateral margin subacutely, rather weakly elevated from costa (in line with striae 3) to about interstriae 8; interstriae 1 distinctly, weakly costate, a few granules feebly, indistinctly indicated, 2 and 3 each with a row of about four to six tubercles of about equal size; striae 1 and 2 not impressed, their punctures small, weakly impressed, apparently in rows. Vestiture of interstrial rows of bristles mostly on declivity; each bristle erect, short, stout, flattened, about four to six times as long as wide.

Protibia as in *trunculus*.

DISTRIBUTION.— Oaxaca to Honduras.

MEXICO: Oaxaca: Chiltepec, 3-III-32, at light, A. Dampf. HONDURAS: La Lima, Cortéz, 5-V-64, 200 m, No. 574, *Swietenia*, S. L. Wood.

BIOLOGY.— Specimens were taken from branches 2–3 cm in diameter.

NOTES.— The above treatment was based on 12 specimens, of which one was compared by me to Schedl's syntype.

### 38. *Corthylus uniseptis* Schedl

*Corthylus uniseptis* Schedl, 1961, Pan Pacific Ent. 34:229 (Holotype, male; Cordoba, Veracruz, Mexico; California Acad. Sci.)

*Corthylus reburrus* Bright, 1972, Canadian Ent. 104:1375 (Holotype, female; Palenque Ruins, Chiapas, Mexico; Canadian Nat. Coll.); Wood, 1974, Great Basin Nat. 34:280. *Synonymy*

DIAGNOSIS.— This species is distinguished from *trucis* Wood by the smaller size, by the unarmed declivital interstriae 2, and by other characters.

FEMALE.— Length 1.8–2.1 mm, 2.3 times as long as wide; color very dark brown.

As in *trucis* except median line on frons much wider, lateral areas without longer setae; antennal club apparently more elongate; declivital interstriae 2 unarmed.

MALE.— As in male *trucis* except elytral declivity with tubercles absent on interstriae 2, half as numerous as on 1 and 3; declivital setae half as numerous, much shorter.

DISTRIBUTION.— Veracruz to Chiapas.

MEXICO: Chiapas: Palenque Ruins, 22-VI-69, D. E. Bright. Veracruz: Cordova, A. Fenyes.

NOTES.— The above treatment was based on the holotype of *uniseptis* and on a male paratype of *reburrus*. The holotype of *reburrus* was also examined.

### 39. *Corthylus parvulus* Blandford

*Corthylus parvulus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):261 (Holotype, male; Las Mercedes, Guatemala; British Mus. Nat. Hist.)

This species is virtually identical with *uniseptis* Schedl except that the pronotum and elytra are smoother and without evident punctures on the elytral disc, and the declivital setae are stouter. The holotype is 1.6 mm in length. Based on the limited material at hand, I hesitate to recognize more than one species. The type, which was examined, was taken at an elevation of 3000 ft.

### 40. *Corthylus trucis* Wood

Fig. 227

*Corthylus trucis* Wood, 1974, Great Basin Nat. 34:193 (Holotype, female; 16 km SE Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *uniseptis* Schedl by the larger size, by the armed declivital interstriae 2, and apparently by other characters.

FEMALE.— Length 2.9–3.1 mm, 2.3 times as long as wide; color dark brown, almost black.

Frons deeply concave from eye to eye, from epistoma to vertex; surface smooth, shining, finely, closely punctured except narrowly impunctate on entire median line; vestiture of fine, erect, moderately long hair of uniform length, except a few longer setae on lateral margins. Antennal club large, strongly asymmetrical, 1.25 times as long as wide, with three rather strongly procurved sutures, median half of 1 septate, cirrus extending slightly beyond apex.

Pronotum and elytral disc essentially as in *comatus* Blandford. Elytral declivity broadly convex, steep; posterolateral margin subacutely elevated form costal margin to interstriae 8; surface shining, impressed points rather numerous, strial punctures only slightly larger than points, mostly in rows; interstriae 1 distinctly elevated, subcostate, 2 distinctly, rather shallowly impressed, 1–3 each armed by about four to six moderately large tubercles, usually less numerous on 2. Vestiture mostly confined to declivity, of fine, long, interstrial half of moderate abundance.

MALE.— Similar to female except frons convex, reticulate, sparsely punctured, subglabrous; antennal club much smaller, more nearly symmetrical, with only two sutures; anterior margin of pronotum more strongly serrate, median pair larger.

DISTRIBUTION.— Costa Rica.

COSTA RICA: 16 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 204, *Miconia globuliflora*, S. L. Wood.

NOTES.— The above treatment was based on the type series of five specimens.

### 41. *Corthylus luridus* Blandford

*Corthylus luridus* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):256 (Holotype, female; Volcán de Chiriquí, Chiriquí, Panama; British Mus. Nat. Hist.)

*Corthylus biseriatus* Eggers, 1943, Arb. Morph. Taxon. Ent. 10:247 (Holotype, female; Guatemala; Institut für Pflanzenschrutzforschung Kleinmachnow)

DIAGNOSIS.— This species is distinguished from *trucis* Wood by the posterior face of the female antennal club as described below and by the steeper elytral declivity with very slightly larger declivital tubercles.

FEMALE.— Length 2.3 mm, 2.1 times as long as wide; color brown (not fully mature).

As in *trucis* except posterior face of antennal club with a large, oval, impressed area occupying at least two-thirds of surface area on distal half, middle third of this impressed area occupied by a slender, transverse, spongy area extending to margins of impressed area (transverse, spongy area in *trucis* occupying middle third of club almost from mesal to lateral margins). Elytral declivity slightly steeper than in *trucis* and with interstrial tubercles slightly larger.

DISTRIBUTION.— Guatemala and Panama.

GUATEMALA: Guatemala, Conradt. PANAMA: Volcán de Chiriquí, 25–4000 ft, G. C. Champion.

NOTES.— The above treatment was based on the holotypes of *luridus* and *biseriatus*.

### 42. *Corthylus detrimentosus* Schedl

*Corthylus detrimentosus* Schedl, 1940, An. Esc. Nac. Cienc. Biol., Mexico 1:355 (Syntypes; Sierra de Durango, Mexico; Schedl Coll.)

DIAGNOSIS.— This species is rather similar to *trucis* Wood, but it is distinguished by characters of the frons, elytral declivity, and color as described below.

FEMALE.— Length 2.5–2.7 mm, 2.4 times as long as wide; color yellowish brown, anterior half of pronotum and posterior third of elytra dark brown.

Frons deeply, broadly concave from eye to eye, from epistoma to vertex; surface on upper two-thirds smooth, with rather coarse, very close punctures, evidently with a small median tubercle at upper margin, lower third covered almost from eye to eye by a subreniform, yellow, spongy area from epistoma almost to upper level of eyes; punctured area with fine, rather abundant, moderately long hair. Antennal club 1.3 times as long as wide, sutures 1 and 2 feebly procurved; cirrus extending slightly beyond apex of club.

Pronotum and elytral disc approximately as in *comatus* Blandford except minute punctures on posterior half of elytral disc mostly in strial rows. Elytral declivity about as in *trucis* except more strongly convex; small strial punctures in rows, interstriae 2 not impressed, 1–3 each with a row of very fine granules. Vestiture confined to declivity, of fine, rather short interstrial hair.

MALE.— Similar to female except frons convex, subglabrous, subreticulate, with sparse, coarse punctures; antennal club smaller, more symmetrical, without cirrus; declivital striae 1 somewhat sulcate.

DISTRIBUTION.— Durango to Guerrero.

MEXICO: **Durango**: Sierra de Durango; 16 km W El Salto, VII-64, J. B. Thomas; 29 km W El Salto, 7-VI-65, 2500 m, No. 35, *Arbutus*, S. L. Wood. **Guerrero**: Ciudad Altamiran, X-1979, at light.

BIOLOGY.— Two males were taken from an *Arbutus* stump 10 cm in diameter.

NOTES.— The above treatment was based on a female that was compared by me to the holotype, and on three males.

### 43. *Corthylus mexicanus* Schedl

Fig. 227

*Corthylus mexicanus* Schedl, 1950, Dusenia 1:159 (Holotype, male; Comitán, Chiapas, Mexico; Schedl Coll.)

*Corthylus glabinus* Bright, 1972, Canadian Ent. 104:1372 (Holotype, female; 14 km or 9 miles SW Teopisca, Chiapas, Mexico; Canadian Nat. Coll., 12642); Wood, 1974, Great Basin Nat. 34:175. *Synonymy*

DIAGNOSIS.— This species is distinguished from *detrimentosus* Schedl by conspicuous differences on the female frons and on the elytral declivity.

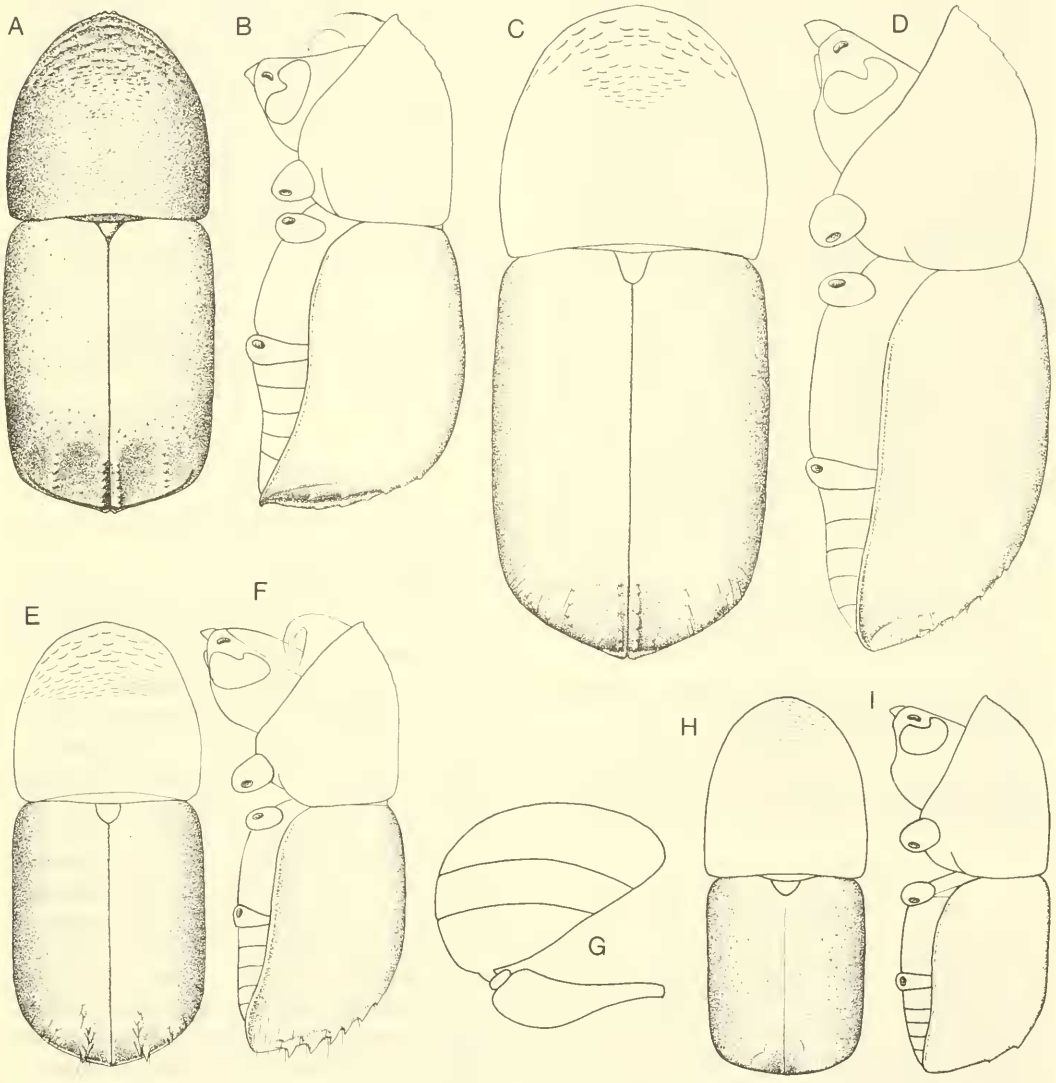



Fig. 227. *Corthylus* spp., female outlines from dorsal and lateral aspects (frontal setae omitted): A, B, *mexicanus*; C, D, *trucis*; E, F, *sentus*; G, H, I, *pygmaeus*, G, *anterior face of antenna.*

FEMALE.— Length 2.3–2.5 mm, 2.3 times as long as wide; color dark brown, basal two-thirds of elytra yellowish brown.

Frons with basic contours as in *detrimentosus*; spongy area an oval area on median fourth from epistoma to about two-thirds distance to upper level of eyes; vestiture in impressed area sparse, upper margin ornamented by a row of long, yellow hair, their tips extending beyond epistoma. Antennal club as in *detrimentosus* except cirrus longer.

Pronotum and elytral disc as in *detrimentosus*. Elytral declivity very steep, subtruncate, slightly convex; posterolateral margin subacutely elevated from apex to slightly above middle, margin rounded on upper third; strial punctures rather small, clearly impressed; interstriae 1 moderately elevated, armed by two to six rather small tubercles; 2 strongly, broadly impressed, unarmed, mostly impunctate; 3 slightly elevated on upper half and armed by about three small denticles; lateral areas occasionally with two or three small tubercles. Usually glabrous, occasional specimens with a few fine setae at base of declivity.

MALE.— Similar to female except frons convex, subreticulate, sparsely, finely punctured, subglabrous; antennal club smaller, more nearly symmetrical, without a cirrus.

DISTRIBUTION.— Puebla to Honduras.

MEXICO: Puebla: Huahuchinango, IV-61, *Malus*; 25 km W Texmelucan, 13-VI-67, 2800 m, *Salix*, S. L. Wood; 11 km W Villa Juarez, 25-VI-53, S. L. Wood. Veracruz: 25 km NW Jacala, 29-VI-53, 2100 m, S. L. Wood. HONDURAS: Zamorano, Morazán, 18-IV-64, *Clethra hondurensis, Lippia substrigosa, Oreopanax, Parathesis serrulata, Pinus pseudostrobus, Rapanea guyanensis*, S. L. Wood.

BIOLOGY.— This species breeds in material 3–5 cm in diameter.

NOTES.— The above treatment was based on the type series of *glabinus* and on 113 other specimens, one of which was compared by me to the holotype of *mexicanus*.

### 44. *Corthylus nolenae* Wood

*Corthylus nolenae* Wood, 1974, Great Basin Nat. 34:194 (Holotype, female; Huajuapan, 21 km or 13 miles SE Oaxaca, Oaxaca, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *detrimentosus* Schedl by the smaller size, by the female frons, and by the elytral declivity as noted below.

FEMALE.— Length 2.0–2.3 mm, 2.3 times as long as wide; color reddish brown, elytra black.

Frons as in *detrimentosus* except spongy area smaller, ending well below upper level of eyes, dorsal half of excavated area with a strongly elevated median carina, marginal setae slightly longer, cirrus on antennal club smaller, shorter.

Pronotum much as in *detrimentosus* except pronotal disc with several broad subasperate crenulations, and elytral disc with strial punctures much larger and mostly in definite rows. Elytral declivity similar to *detrimentosus* but not as steep and more narrowly convex; strial punctures rather coarse, deep; interstriae 1 distinctly elevated, 3 feebly elevated on basal half, 1 and 3 each with about four to six small tubercles; ventrolateral margin as in *detrimentosus*.

MALE.— Similar to female except sexual differences as in *detrimentosus*.

DISTRIBUTION.— Oaxaca.

MEXICO: Oaxaca: Huajuapan, 4-VII-53, *Nolena*, S. L. Wood.

HABITS.— Specimens were taken from a fruiting stalk about 5 cm in diameter.

NOTES.— The above treatment was based on the type series of 51 specimens.

### 45. *Corthylus spinosus* Wood

*Corthylus spinosus* Wood, 1974, Great Basin Nat. 34:194 (Holotype, male; Fortín de las Flores, Veracruz, Mexico; Wood Coll.)

DIAGNOSIS.— This species is distinguished in the male by the stouter body and by the very different elytral declivity.

MALE.— Length 2.0 mm, about 2.0 times as long as wide; color very dark brown.

Frons, antenna, pronotum, and elytral disc as in *uniseptis* Schedl except pronotum with summit nearer base, its disc with rather numerous low, rather broad, transverse crenulations. Elytral declivity much as in *uniseptis* except wider, strial punctures slightly larger, interstriae 2 narrower and slightly deeper, 1 and 3 each bearing about four very coarse, sharply pointed tubercles, each higher than wide (unusually large for this genus), several smaller tubercles in lateral areas. Vestiture slightly longer and more abundant than in *uniseptis*.

DISTRIBUTION.— Veracruz.

MEXICO: Veracruz: Fortín de las Flores-Sumidero, 27-IV-65, 900 m, blacklight, H. M. Weems, Jr.

NOTES.— The above treatment was based on the unique holotype.

### 46. *Corthylus minutus* Bright

*Corthylus minutus* Bright, 1972, Canadian Ent. 104:1373 (Holotypes, female; Lagos de las Colores, Chiapas, Mexico; Canadian Nat. Coll., 123643).

DIAGNOSIS.— This species is distinguished from *sentus* Wood by the much smaller size and by details in sculpture of the female frons.

FEMALE.— Length 1.6 mm, about 2.5 times as long as wide (elytra slightly spread on type; color very dark brown).

Frons as in *sentus* except yellow, spongy areas each subcircular, extending from epistoma slightly less than 60 percent of the distance to upper level of eyes, each very slightly longer than wide; margins of yellow, spongy area with a row of fine, rather long hair, hair about equal in length to half diameter of a spongy area. Pronotum and elytra as in *sentus*.

DISTRIBUTION.— Chiapas.

MEXICO: Chiapas: Lagos de las Colores, 17-V-69, *Quercus*, D. E. Bright.

NOTES.— The above treatment was based on the holotype.

### 47. *Corthylus sentus* Wood
Fig. 227

*Corthylus sentus* Wood, 1974, Great Basin Nat. 34:195 (Holotype, female, 2 km SE Cartago, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *minutus* Bright by the larger size and by characters of the female frons.

FEMALE.— Length 2.0–2.4 mm, 2.3 times as long as wide (Costa Rica; 2.4 times in Guatemala); color brown.

Frons strongly concave from eye to eye, from epistoma to vertex; surface of upper half almost smooth, evidently with a few minute punctures, lower half from epistoma to upper level of eyes entirely occupied by a pair of oval, yellow, spongy areas, separated by a fine, low, acute, median carina, margins of spongy areas without a row of hair in most specimens, an irregular row in others. Antennal club strongly asymmetrical, apex subacute, sutures 1 and 2 moderately procurved, both partly septate at median end, a feeble suture 3 suggested; cirrus absent.

Pronotum as in *uniseptis* Schedl except discal area with numerous weak, broad crenulations. Elytral disc as in *uniseptis* except punctures more obscure; declivity about as in *spinosus* except punctures obsolete, interstriae 1 weakly elevated, unarmed, 2 impressed, strongly narrowed, essentially obsolete, 3 and lateral areas convex, 3 armed by about three coarse spines (larger than in *spinosus*), usually with one or two smaller spines at base, lateral areas with about four to eight pointed tubercles. Vestiture confined to declivity, of sparse hair.

MALE.— Similar to female except frons convex, reticulate, sparse punctures obscure, antennal club smaller, less strongly asymmetrical; anterior margin of pronotum armed by one pair of median teeth.

DISTRIBUTION.— Guatemala to Costa Rica.

GUATEMALA: Cerro Peña Blanca, 23-IV-64, 2000 m, No. 529, *Miconia schlechtendalii*, S. L. Wood; Guatemala City, 30-V-64, 1300 m, No. 644, leguminous vine, No. 683, shrub, S. L. Wood; Quezaltenango, 26-V-64, 16 mm, No. 622, tree branch, S. L. Wood. COSTA RICA: 2 km SE Cartago, 2-VIII-63, 1300 m, No. 98, tree branch, S. L. Wood.

BIOLOGY.— This species made spiral galleries in branches 2–4 cm in diameter.

NOTES.— The above treatment was based on the type series of 57 specimens. The specimens from Guatemala were slightly more slender than were those in the Costa Rican series.

### 48. *Corthylus pygmaeus* Wood
Fig. 227

*Corthylus pygmaeus* Wood, 1974, Great Basin Nat. 34:195 (Holotype, female, Finca La Lola, Limón, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *spinifer* Schwarz by the smaller size and by the numerous minor features indicated below.

FEMALE.— Length 1.5–1.8 mm, 2.0 times as long as wide; color brown.

Frons as in *spinifer* except more shallowly impressed (transversely flat at upper level of eyes), punctures averaging smaller, longest setae on upper third less numerous. Cirrus on antennal club shorter, its length from insertion of last hair to its apex less than length of club.

Pronotum and elytra as in *spinifer* except declivital sulcus not quite as deep, punctures slightly finer, impressed points largely obsolete, posterolateral margin more abruptly, less strongly elevated.

MALE.— Similar to female except sexual differences as in *spinifer*.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Finca La Lola, Limón, 17-I-63, *Theobroma cacao*, J. L. Saunders; Pandora, Limón, 23-VIII-63, 50 m, No. 149, tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from branches 2–3 cm in diameter.

NOTES.— The above treatment was based on the type series of 14 specimens.

The name *pygmaeus* was employed as a manuscript name for this species by Schedl, but apparently it has not been validated by him.

### 49. *Corthylus spinifer* Schwarz
Fig. 228

*Corthylus spinifer* Schwarz, 1891, Proc. Ent. Soc. Washington 2:114 (Syntypes, females, Key West, Florida; U.S. Nat. Mus.)

*Metacorthylus affinis* Fonseca, 1925, Commisao de Estudio e Debellacao de Praga Cafeeira, Pub. 12:3 (Syntypes; Itatiba, São Paulo, Brazil; not located)

*Corthylus affinis* Fonseca, 1927, Rev. Mus. Paul. 15(1):585 (Syntypes; Itatiba, São Paulo, Brazil; not located; an obvious duplication of the 1925 description)

*Corthylus guayanensis* Eggers, 1933, Lab. d'Ent. Mus. Nat. d'Hist. Nat. Paris, Mem. 1:22 (Syntype, male; Camopi, Franz. Guayana; Paris Mus.); Wood, 1977, Great Basin Nat. 37:208. *Synonymy*

*Corthylus tomentosus* Schedl, 1940, An. Esc. Nac. Cienc. Biol., Mexico 1:350 (Syntypes, female; Tuxtepec in Oaxaca, and Ixtapa in Nayarit, Mexico; Schedl and Dampf colls.); Wood, 1976, Great Basin Nat. 36:347. *Synonymy*

DIAGNOSIS.— This species is distinguished with difficulty from *pygmaeus* Wood by the larger size, by the more strongly impressed female frons, and by other characters mentioned below.

FEMALE.— Length 2.0–2.4 mm, 2.2 times as long as wide; color dark brown.

Frons rather shallowly concave from eye to eye, from epistoma to well above eyes; surface densely, finely punctured (coarser than in *pygmaeus*); abundant hairlike vestiture moderately long, much longer on margins (long setae twice as numerous above as in *pygmaeus*). Antennal club about as in *sentus* except suture 3 not indicated; cirrus almost twice as long as club.

Pronotum and elytral disc about as in *comatus* Blandford. Elytral declivity steep, broadly convex, feebly sulcate; strial punctures in obscure rows, interstrial punctures indistinguishable from those of striae, confused, punctures rather coarse, moderately deep, rather close, impressed points

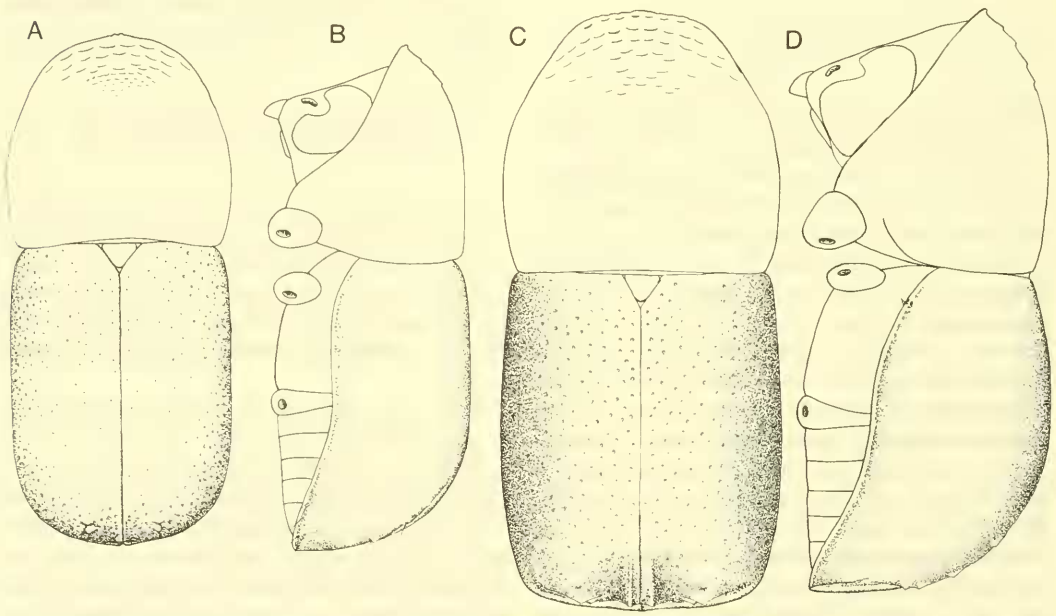



Fig. 228. *Corthylus* spp., female outlines from dorsal and lateral aspects (frontal setae omitted): A, B, *spinifer*; C, D, *flagellifer*.

conspicuous, rather numerous; interstriae 1 convex, rather weakly elevated, impunctate, 2 shallowly, broadly impressed, 3 slightly elevated, rather broadly convex, armed by two or three fine tubercles on middle half; posterolateral margin acutely elevated from apex to interstriae 1, its height equal to its thickness (higher than *pygmaeus*). Glabrous or with three or four short setae on interstriae 3.

MALE.— Similar to female except frons convex, reticulate, sparsely, coarsely punctured, glabrous; antennal club smaller, more symmetrical, without cirrus; anterior margin of pronotum armed by a median pair of coarse teeth.

DISTRIBUTION.— Florida and Nayarit to Brazil.

USA: **Florida**: Brookville, Hilliard, Miami, Paradise Key, Ramrod Key, Vero Beach. MEXICO: **Michoacán**: Patuan. **Nayarit**: Tepic. **Veracruz**: Fortín de las Flores. HONDURAS: Zamorano in Morazán, COSTA RICA: Escasú and Santa Ana in San José, PANAMA: Panama City and Taberville in the Canal Zone. VENEZUELA: States of Aragua, Barinas, Miranda.

HOSTS.— *Persea americana*, *Salix guatemalensis*, *Spondias mombin*, *S. purpurea*, *Theobroma cacao*, etc.

BIOLOGY.— Specimens were taken from branches 2–4 cm in diameter.

NOTES.— The above treatment was based on the syntypes of *spinifer*, on one syntype of *tomentosus*, on one specimen of *affinis* compared by Costa Lima to the type, and on 93 other specimens. Two "holotypes" and two "allotypes" of the apparent manuscript name *Corthylus pseudoflagellifer* Schedl are also of this species.

## 50. *Corthylus flagellifer* Blandford

Fig. 228

*Corthylus flagellifer* Blandford, 1904, Biol. Centr. Amer., Coleopt. 4(6):255 (Syntypes; Toxpan in Mexico, San Gerónimo and Pantaleon in Guatemala, and Boquete in Panama; British Mus. Nat. Hist.)

*Corthylus cirrus* Schedl, 1940, An. Esc. Nac. Cienc. Biol., Mexico 1:351 (Syntypes; Xochitlan, Morelos, Mexico; Schedl and Dampf colls.); Wood, 1966, Great Basin Nat. 26:22. *Synonymy*

*Corthylus nudiusculus* Schedl, 1950, Dusenia 1:156 (Holotype, female; Comitán, Chiapas, Mexico; Schedl Coll.); Wood, 1966, Great Basin Nat. 26:22. *Synonymy*

DIAGNOSIS.— This species is distinguished from *spinifer* Schwarz by the larger size and by characters mentioned in the above key and in the following description.

FEMALE.— Length 2.5–3.0 mm, 2.2 times as long as wide; color dark brown to almost black.

Frons as in *spinifer* except punctures larger, closer, vestiture longer, more abundant, impression on lower half apparently slightly deeper. Cirrus of antennal club shorter than club.

Pronotum and elytra as in *spinifer* except declivity with lateral convexities conspicuously higher than suture, area of interstriae 2 more strongly, more extensively impressed.

MALE.— Similar to female except sexual differences as in *spinifer*.

DISTRIBUTION.— Nayarit and Veracruz to Guatemala.

MEXICO: **Chiapas**: Comitán. **Morelos**: Xochitlan, VII-37, *Persea americana*. **Nayarit**: 6 km W Tepic, 13-VII-65, 700 m, No. 240, tree seedling, S. L. Wood. **Veracruz**: Fortín de las Flores, 22-V-65, Blacklight, H. V. Weems. GUATEMALA: Pantaleon and San Geronimo, G. C. Champion; Volcán de Agua, 19-V-64, 1000 m, No. 615, *Acacia*, S. L. Wood; Palin, Esquintla, 19-V-64, 1000 m, No. 588, anonillo, S. L. Wood.

BIOLOGY.— Specimens were taken from branches 5–8 cm in diameter.

NOTES.— The above treatment was based on the syntypes of *flagellifer*, on Schedl's female syntypes of *cirrus*, on the holotype of *nudiusculus*, and on 19 other specimens. I have seen no specimen smaller than 2.5 mm, although Blandford indicated males were as small as 2.2 mm and females 2.3 mm.

## 51. *Corthylus sobrinus* Wood

*Corthylus sobrinus* Wood, 1974, Great Basin Nat. 34:196 (Holotype, female; Turrialba, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *flagellifer* Blandford by the larger size and by characters of the frons and elytral declivity mentioned below.

FEMALE.— Length 3.0–3.4 mm, 2.1 times as long as wide; color very dark brown.

Frons as in *flagellifer* except much more strongly impressed, particularly on upper half; lower fifth with a pair of rather widely separated, oval, yellow spongy areas (vestiture not interrupted by their presence); vestiture similar to *flagellifer* except most setae strongly flattened, less abundant at upper

margin. Antennal cirrus much more poorly developed but only slightly shorter.

Pronotum and elytra as in *flagellifer* except punctures on elytral disc larger but very shallow, and elytral declivity somewhat more strongly, more broadly impressed.

MALE.— Similar to female except sexual differences as in *spinifer*.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Turrialba, 7-I-63, *Theobroma cacao*, J. L. Saunders, and 9-III-64, 700 m, No. 468B, fence post, S. L. Wood.

BIOLOGY.— Two specimens were taken from a new fence post 8 cm in diameter.

NOTES.— The above treatment was based on the type series of 18 specimens.

### 52. *Corthylus subserratus* Wood
Fig. 229

*Corthylus subserratus* Wood, 1974, Great Basin Nat. 34:197 (Holotype, female; Volcán Poás, Heredia, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *serrulatus* Eggers (from Bolivia and Peru) by the larger size and by conspicuous differences on the head and elytral declivity as indicated below.

FEMALE.— Length 2.3–2.5 mm, 2.4 times as long as wide; color black, with one-third to two-thirds of elytra yellowish brown (area and color intensity of pale portion variable).

Frons deeply concave from eye to eye, from epistoma to vertex, much deeper than in *serrulatus*; entire lower third occupied by a yellow, spongy area, upper areas dull, coarsely punctured, vestiture absent at center of concavity, increasing in size and density toward margins above eyes; margins above eyes ornamented by a dense brush of long, yellow, strongly plumose setae (as in *serrulatus*). Antennal club as in *serrulatus*, with suture 1 partly septate, 2 and 3 weakly impressed; cirrus entirely absent.

Pronotum as in *serrulatus* except posterior areas more strongly reticulate, weak transverse crenulations on disc much narrower. Elytra as in *serrulatus* except surface of disc less shining; declivity less convex, posterolateral margin ending slightly below middle of declivity, surface strongly reticulate, punctures mostly obscure, interstriae 1 slightly less strongly elevated, its summit conspicuously undulating, forming about six rounded serrations (summit an almost uniform costa in serrulatus). Vestiture confined to declivity, of rows of erect interstrial hair on interstriae 1 and 3 and base of 2, a few setae in lateral areas.

MALE.— Similar to female except frons convex, reticulate, sparsely punctured, vestiture sparse, inconspicuous; antennal club smaller, more nearly symmetrical; anterior margin of pronotum armed by one median pair of teeth.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Guápiles, Limón, 22-VIII-66, 100 m, S. L. Wood; Volcán Poás, Heredia, 2500 m, 14-VII-63, No. 44, tree branch, 6, 14, 19-XI-63, various tree branches, S. L. Wood.

BIOLOGY.— Specimens were taken in material 6–12 cm in diameter.

NOTES.— The above treatment was based on the type series of 118 specimens.

### 53. *Corthylus serratus* Wood
Fig. 229

*Corthylus serratus* Wood, 1974, Great Basin Nat. 34:197 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *serrulatus* Eggers and *subserratus* Wood by the smaller size and by conspicuous differences on the head and elytral declivity as noted below.

FEMALE.— Length 2.0–2.3 mm, 2.5 times as long as wide; color dark brown.

Frons basically shallowly concave as in *serrulatus*, and with oval area on median half from near epistoma to near vertex abruptly, much more strongly concave; central concavity smooth, with a few punctures and hairlike setae; lateral areas minutely, densely punctured, becoming spongy and yellowish above on median margins, this area very minutely, densely pubescent; plumose vestiture on upper margin as in *subserratus*. Antenna as in *serrulatus* except cirrus smaller, slightly shorter.

Pronotum and elytral disc as in *serrulatus* except punctures on elytral disc slightly larger. Elytral declivity with margins abruptly angled except rounded on basal fifth, face much more weakly convex than *serrulatus*, its surface shining and punctured about as in *serrulatus*, interstriae 1 more strongly elevated

than in *serrulatus*, its crest with about four to six coarse crenulations, some of them acutely pointed. Interstriae 1, 3, and 4 with very long hairlike setae.

MALE.— Similar to female except sexual differences as in *subserratus*.

DISTRIBUTION.— Costa Rica to Panama.

COSTA RICA: 16 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 204, *Miconia globuliflora*, S. L. Wood; Tapantí, Cartago, 2-VII-63, 1300 m, No. 9, *Miconia*, also 24-IX-63, No. 271, *Werklia insignis*, No. 197, *Siparuna nicaraguensis*, No. 241, *Phoebe mexicana*, S. L. Wood. PANAMA: Volcán Chiriquí, 11-I-64, 1800 m, No. 371, *Inga*, No. 399, tree branch, S. L. Wood.

BIOLOGY.— Specimens were taken from material 2–5 cm in diameter.

NOTES.— The above treatment was based on the type series of 23 specimens.

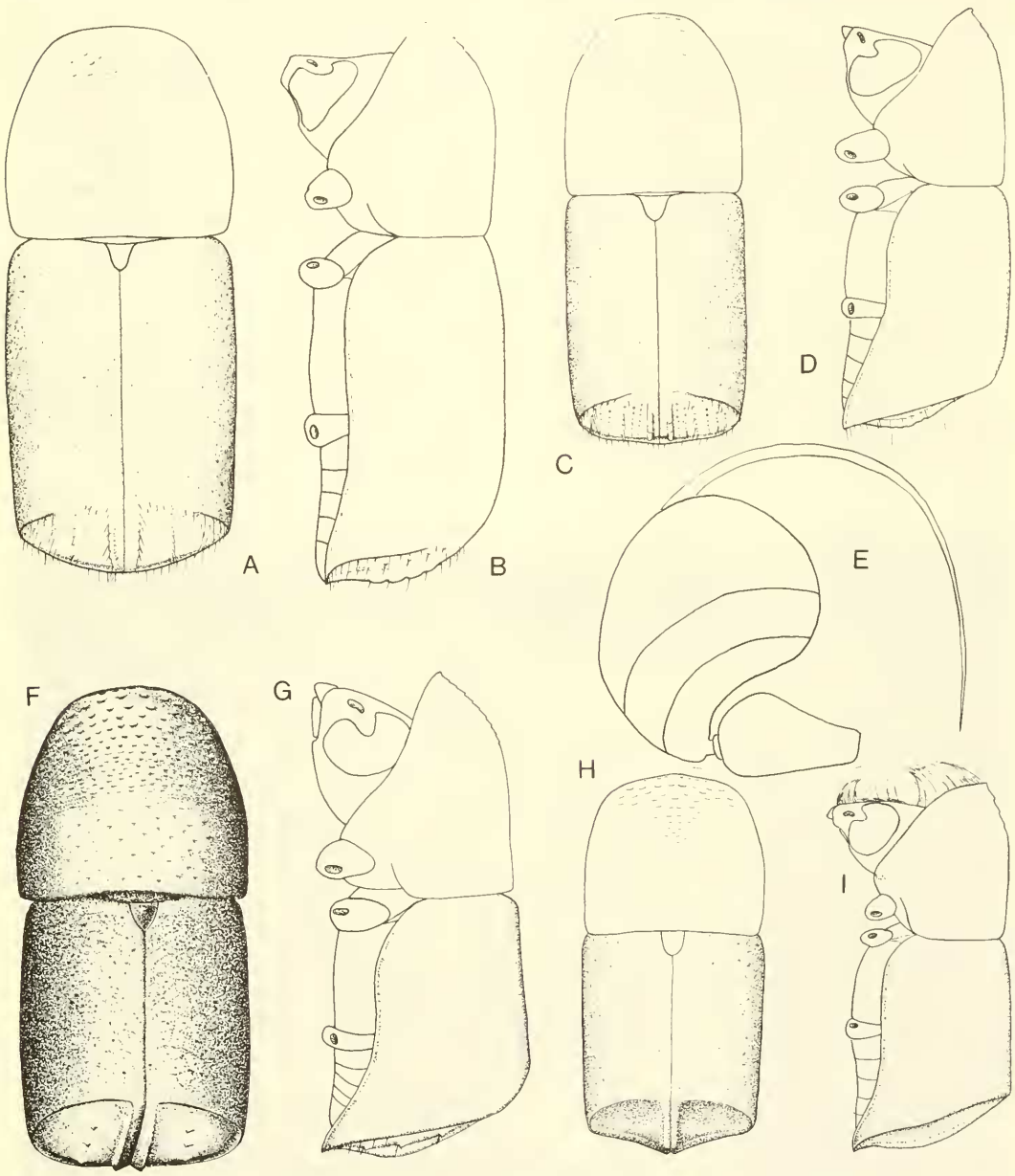



Fig. 229. *Corthylus* spp., female outlines from dorsal and lateral aspects (frontal setae omitted): A, B, *subserratus*; C, D, E, *serratus*; F, G, *concisus*; H, I, *procerus*.

### 54. *Corthylus praeustus* Schedl

*Corthylus praeustus* Schedl, 1950, Dusenia 1:153 (Lectotype, female; Guatemala; Schedl Coll., present designation)

DIAGNOSIS.— This species is distinguished from *petilus* Wood by characters mentioned below.

FEMALE.— Length 1.8 mm, 2.4 times as long as wide; color light brown (not fully mature).

Frons largely obscured, apparently similar to *petilus* except less strongly concave, tuft of hair on vertex much more abundant and longer, lower fifth occupied by a yellow spongy area along epistoma from eye to eye, its lower margin acutely elevated particularly in lateral portion; central half not visible on type. Antennal club similar to *petilus*, but slightly more slender; a small cirrus extending slightly beyond apex of club.

Pronotum 1.2 times as long as wide; similar to *petilus* except more strongly reticulate.

Elytra about 1.4 times as long as wide (slightly spread); similar to *petilus* except surface more nearly reticulate, puncture more obscure. Declivity subtruncate, steep, flat to feebly convex, margin abruptly angulate to striae 1 at base, weakly elevated on about lower two-thirds; surface rather weakly reticulate, moderately shining, punctures small, shallow; interstriae 1 moderately elevated as in *petilus*, its crest finely serrate. Vestiture confined to declivity, of several rather short, stout setae.

DISTRIBUTION.— Guatemala.

GUATEMALA: "Guatemala; Coll. Hagedorn, 1915."

NOTES.— The syntypic series on which this species was based contained two or more species. I here designate as the lectotype of *praeustus* Schedl the female from Guatemala that Schedl regards as the type. That specimen was examined and is the only representative of the species known to me. The South American syntypes have been referred to *insignis* Wood. Other Central American specimens identified by Schedl as this species are of *concisus* Wood.

### 55. *Corthylus petilus* Wood

Fig. 217

*Corthylus petilus* Wood, 1967, Great Basin Nat. 27:56 (Holotype, female; 5 km or 3 miles W El Salto, Durango, Mexico; Wood Coll.)

DIAGNOSIS.— Among those species having the elytral declivity truncate and margined by a complete, raised, circumdeclivital costa, this species is distinguished by the slender form and by characters on the female head as specified below.

FEMALE.— Length 2.0–2.1 mm, 2.5 times as long as wide; color dark brown.

Frons deeply concave from eye to eye from epistoma to vertex; lower fourth of concave area pale yellow, spongy, upper area smooth, shining, with moderately abundant fine punctures; concave area with sparse, fine, short hair, upper margin with a dense row of long plumose setae, longest setae equal in length to half distance between eyes. Antennal club strongly asymmetrical, three sutures indicated; cirrus entirely absent.

Pronotum 1.1 times as long as wide; sides on basal half almost straight and parallel, moderately converging on anterior half to very broadly rounded, unarmed anterior margin; summit indefinite, one-third pronotum length from anterior margin; anterior third asperate; posterior areas reticulate, punctures minute, rather sparse. Glabrous.

Elytra 1.7 times aslong as wide, 1.5 times as long as pronotum; sides straight and parallel on more than basal nine-tenths, very broadly rounded behind; surface shining, with obscure irregular lines, punctures small and obscure on basal fourth, larger and distinctly impressed on posterior fourth, mostly confused but strial rows indicated in some specimens. Declivity abrupt, subvertical, subacutely margined from apex to striae 1 at base; face smooth, shining, with rather coarse, confused punctures; interstriae 1 abruptly, strongly elevated, higher than wide on middle half. Glabrous.

MALE.— Similar to female except frons convex, obscurely subreticulate, sparsely, rather coarsely punctured, vestiture inconspicuous; antennal club smaller, less strongly asymmetrical; anterior margin of pronotum armed by one or two pairs of median serrations.

DISTRIBUTION.— Arizona to Durango.

USA: **Arizona**: Mt. Bigelow in Sta. Catalina Mts., 11-VI-69, 2500 m, No. 90, *Quercus hypoleucoides*, S. L. Wood. MEXICO: **Durango**: 5 km W El Salto, 7-VI-65, 2500 m, No. 41, *Quercus*, S. L. Wood.

HOST.— *Quercus hypoleucoides*, *Q.* sp.

BIOLOGY.— Specimens were taken from dying limbs 3–6 cm in diameter on living trees.

NOTES.— The above treatment was based on the type series of 5 specimens and on 41 other specimens.

### 56. *Corthylus concisus* Wood
Figs. 229–230

*Corthylus compressicornis*: Blandford, 1904 (nec. Fabricius), Biol. Centr. Amer., Coleopt. 4(6):255. *Misidentification*

*Corthylus concisus* Wood, 1974, Great Basin Nat. 34:201 (Holotype, female; Tapantí, Cartago, Costa Rica; Wood Coll.)

DIAGNOSIS.— This species is distinguished from *procerus* Bright by the larger size and by the characters on the head mentioned below.

FEMALE.— Length 2.0–2.3 mm, 2.1 times as long as wide; color dark brown to almost black.

Frons flat, a weak transverse callus at level of antennal insertion; large central area smooth, glabrous, impunctate, marginal areas with fine punctures; lateral, submarginal areas with a tuft of hair from level of antennal insertion to upper level of eyes, margin above upper level of eyes ornamented by a dense row of very long plumose setae. Antennal club very broad, 1.4 times wider than long, cirrus at least three times longer than club (club longer than wide and cirrus shorter than club in *procerus*).

Pronotum and elytral disc essentially as in *petilus* Wood except pronotal disc with minute, transverse crenulations, and punctures on elytral disc confused. Elytral declivity truncate, subvertical, margin abruptly, subacutely elevated on a complete circle from apex to base; face slightly convex, strongly reticulate, punctures small, confused; interstriae 1 strongly costate, as high as wide on middle half, area of 2 distinctly impressed, 3 weakly elevated on upper half and armed by about two to four small, pointed tubercles. Glabrous except for a few setae on declivital interstriae 1 and 3.

MALE.— Similar to female except sexual differences as in *petilus*.

DISTRIBUTION.— Chiapas to Panama.

MEXICO: Chiapas: 21 km N Ocozocoautla, 2-VII-69, D. E. Bright. COSTA RICA: Cartago, Tapantí, and Turrialba in Cartago; Beverley and Peralta in Limón; Volcán in Puntarenas; Escasú, San José, and Santa Ana



Fig. 230. *Corthylus concisus*, female antenna. Note the unusually long cirrus.

in San José. PANAMA: Cerro Campana, 26-VI-66, 1000 m, tree branch, S. L. Wood; 13 km S El Hato del Volcán, 7-I-64, 1000 m, tree seedling, S. L. Wood.

HOSTS.— *Conostegia oerstediana, Spondias purpurea, Theobroma cacao,* etc.

BIOLOGY.— Specimens were taken from material 2–5 cm in diameter.

NOTES.— The above treatment was based on the type series of 89 specimens and on 17 other specimens.

### 57. *Corthylus procerus* Bright
Fig. 229

*Corthylus procerus* Bright, 1972, Canadian Ent. 104:1376 (Holotype, female; 10 km or 6 miles S Valle Nacional, Oaxaca, Mexico; Canadian Nat. Coll., 12646)

DIAGNOSIS.— This species is distinguished from *concisus* Wood by the smaller size and by other characters on the female head as indicated below.

FEMALE.— Length 1.7–1.9 mm, 2.1 times as long as wide; color dark brown to almost black.

Frons moderately concave from eye to eye from epistoma to vertex; surface shining, rather finely, closely, uniformly punctured; vestiture essentially as in *concisus.* Antennal club more slender, 1.4 times longer than wide, cirrus weak, shorter than club.

Pronotum and elytra as in *concisus* except elytral declivity flat from interstriae 2 to lateral margin, 3 not elevated and without tubercles.

MALE.— Similar to female except sexual differences as in *petilus* Wood.

DISTRIBUTION.— Oaxaca to Panama.

MEXICO: Oaxaca: 9 km or 6 miles S Valle Nacional, 18-V-71, 700 m, D. E. Bright. COSTA RICA: Finca Gromaco, on Río Coto Brus, Puntarenas, 14-VII-63, 500 m, No. 63, woody vine, No. 77, tree seedling, S. L. Wood; Volcán, Puntarenas, 11-XII-63, 1000 m, No. 304, tree branch, S. L. Wood; 16 km SE Cartago, Cartago, 24-IX-63, 1800 m, No. 203, *Siparuna nicaraguensis,* S. L. Wood. PANAMA: Cerro Campana, 26-VII-66, 1000 m, No. 32, tree branch, S. L. Wood; 13 km S El Hato del Volcán, 7-I-64, 1000 m, No. 371, tree seedling, S. L. Wood.

BIOLOGY.— Specimens were taken from material 2–4 cm in diameter.

NOTES.— The above treatment was based on the holotype of *procerus* and on 24 other specimens.

### 58. *Corthylus eichhoffi* Schedl

*Corthylus eichhoffi* Schedl, 1933, Ent. Blätt. 29:34 (Holotype, female; Iberia, Santa Clara district, Limón, Costa Rica; Schedl Coll.)

DIAGNOSIS.— This species is distinguished from *procerus* Bright by the larger size, by the less strongly elevated declivital interstriae 1, and by striking differences on the female frons and antennal club.

FEMALE.— Length 2.3 mm, 2.2 times as long as wide; color dark brown.

Frons similar to *procerus* except surface more nearly rugose, vestiture on upper margins longer, reddish in color, more dense, extending on lateral margins to slightly below upper level of eye; epistomal area broadly, very strongly elevated, its upper surface yellowish, spongy, with low pile, longer hair on epistomal margin. Antennal club with apex acutely angulate; cirrus distinctly longer than in *procerus.*

Pronotum and elytral disc as in *procerus.* Elytral declivity similar to *praeustus* except circumdeclivital margin very slightly more strongly elevated, interstriae 1 less strongly elevated, and surface more flattened to irregularly subconcave.

DISTRIBUTION.— Costa Rica.

COSTA RICA: Iberia, Santa Clara, 12-IV-24, an welkem laub, F. Nevermann.

NOTES.— The above treatment was based on the holotype.

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